

Living Arrangement of Older Adults and its Effect on Five-Year Survival

ALI BIJANI¹, NIKTA NEGHABI², SEYED REZA HOSSEINI¹,
REZA GHADIMI¹, SIMIN MOUODI¹

¹Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

²Faculty of Medicine, Babol University of Medical Sciences, Babol, Iran

ABSTRACT: Introduction: Given the impact of living alone on health outcomes, this study was conducted to assess the living arrangement of senior adults and its effect on the mortality. Material and Methods: This cohort study carried out on elderly people aged 60 years and over. Demographic characteristics, the number of comorbid disorders and living condition-as being alone or living with other people-were collected. The mini-mental state examination questionnaire, the geriatric depression scale, the Katz index of activities of daily living, the Lawton instrumental activities of daily living scale, and a modified version of Duke social support index were used for data collection. The participants were followed for five years, and their survival was assessed. Results: Out of the 500 examined individuals, 100 (20.0%) were living alone. During 5 years of follow-up, sixteen (19.8%) of the people who died were living alone. The adjusted effect of age ($P<0.001$), male gender ($P=0.004$), the number of comorbidities ($P=0.031$), the person's social support ($P=0.028$) and dependence to others to do complex daily activities ($P=0.020$) on the mortality of the participants was significant, however, other factors including living alone, illiteracy, cognitive impairment and depression did not show such a statistically significant effect ($P>0.05$). Conclusion: Living arrangement, itself, did not show a significant effect on the mortality of older adults.

Keywords: Aging, Loneliness, Survival.

Introduction

Older people need more considerations, either for the physiologic changes related to the process of ageing, or for different conditions such as occupational characteristics, socioeconomic position, behavioral change and the occurrence of various disorders and disabilities that this age-group is faced with [1-4].

Living arrangement defined as live alone or with others has been described as one of the factors that can determine to some degree the risk of disease, disability, and quality of life in late adulthood [1,5].

Loneliness indicates the subjective state of deficit in meaningful attachments (emotional loneliness) or lack of social contacts with friends and family (social loneliness) [6]; both of them may have impact on different aspects of physical and mental health of older adults, especially, whenever a long-time loneliness occurs in this population [7].

Living alone can be associated with some of health-threatening behaviors (such as alcohol drinking and smoking, less physical activity, and poor nutrition), and sleep disorders [8].

Men who live alone are more likely to be depressed than men who live with their spouses [9,10].

Some literature reported the significant positive effect of eating with others on survival of older men [11].

Living in a nursing home can be associated with increased risk of mortality compared to living with a family [10].

In addition to, older adults who live alone are more prone to have the symptoms of anxiety and apathy than people who live with others [12,13].

A 50% elevated risk of developing dementia, a 30% increased risk of incident coronary artery disease or cerebrovascular accident, and a 26% increased risk of all-cause mortality has been reported among older adults who had loneliness or social isolation [6]; however, various regions do not have similar results.

The social contact has been represented as one of the important predictors of morbidity and mortality in late-adulthood.

It has been hypothesized that social interactions can alter the disease risk, and longevity of older adults.

Do not have proper family and social relationships in older adults, can lead to feel worthless, helpless, and disempowered [14].

Health and survival of older adults is related to either intrinsic factors such as genetics and medical conditions, or extrinsic factors such as socioeconomic and environmental determinants [15].

In recent years, urbanization, population density in large cities, small size of living places, economic difficulties as well as the probability of transmitting infectious diseases in closed environments caused several changes in living arrangement of older adults, and increased the prevalence of living alone and loneliness of this population, especially in developing countries [15,16].

Multiple unknown points have been remained about the living condition of the elderly and its impact on their longevity [15].

This research was performed to assess the effect of living alone on survival of older adults.

Material and Methods

Study Design and Participants

This cohort study is part of the Amirkola Health and Ageing Project (AHAP) [17].

All older adults aged 60 years and over participating in the AHAP research whose related data were complete were included in the study by census.

Research Variables

Living Arrangement

Senior adults were interviewed by trained personnel. They were asked who did they live with, and the answer was reported as living alone or living with others.

The living arrangement was assessed at baseline examination.

Survival and Death

The participants were followed for five years and the survival or death was recorded in the research data sheet.

Covariates of Living Arrangement

Demographic characteristics including age, sex, occupation, level of education, and comorbid disorders were recorded.

The Persian translation of Mini-Mental State Examination (MMSE) questionnaire was used to assess the cognitive condition of the elderly and the short form Geriatric Depression Scale (GDS) was used to examine depressive symptoms in the participants.

The person's ability to do basic and complex daily activities was assessed with the Katz index of independence in Activities of Daily Living (ADL) and the Lawton Instrumental Activities of Daily Living (IADL) Scale [18].

The MMSE questionnaire assesses five domains of cognitive function including orientation, attention and concentration,

immediate memory, delayed recall and language.

The maximum and minimum MMSE scores are 30 and 0, respectively. The score as 25 or more out of a possible 30, it is considered normal; 24-21, 20-10 and less than 10 indicates mild, moderate and severe cognitive impairment, respectively. The validity and reliability of its Persian version have been approved in previous studies [19].

The short form Geriatric Depression Scale (GDS) has 15 items. Scores of 0-4 indicate normal mood, 5-8 mild depression, 9-11 moderate depression, and 12-15 are defined as severe depression. The validity and reliability of the Persian translation of this questionnaire have been evaluated and approved for assessment of depressive symptoms in Iranian older adults [20].

The Katz index of ADL examines the person's ability to do seven basic daily activities. The score of 14 means the person is not dependent to other people to do these activities, and the scores less than 14 represent the person's disability. The 10-items Lawton IADL scale assesses the people's ability to do complex daily activities. The score of 20 indicates the person's independence, and less than 20 indicates his/her disability [18].

A modified Duke Social Support Index (DSSI) was used to assess the person's social support. This 11-item questionnaire examines the social interaction and social satisfaction of the participant. Total score ranges from 11 to 33.

A higher score indicates higher level of social support [21].

Data Sources/Measurement

Different data sources were reviewed to determine the five-year survival or death of the participants, including the data bank of death registration system of Babol University of Medical Sciences, obtaining information from the related family physicians in the region, and data banks of the health-care centers in Amirkola.

Statistical Methods

Data were analyzed using SPSS-17 software package.

The effect of living alone on the survival of the elderly was assessed using the Kaplan-Meier method and the log-rank test.

$P < 0.05$ was considered significant.

Results

Totally, 500 elderly people were studied, of which 400 (80.0%) were living with others and 100 (20.0%) were living alone.

Of the 400 individuals living with others, 288 (72.0%) were women and 112 (28.0%) were men, and in the other group, 72 persons (72.0%)

were female and 28 (28.0%) were male (P=1.00).

The baseline characteristics of the two study groups have been presented in Tables 1 and 2.

These two groups had no significant difference in terms of age, gender, the number of comorbidities, ability to do activities of daily living, and social support (p>0.05).

Table 1. The baseline characteristics of the two study groups.

Characteristics	Living arrangement		P-value*
	Living with others (n=400) Mean±SD	Living alone (n=100) Mean±SD	
Age	73.18±7.23	73.30±7.20	0.879
The number of concurrent diseases	3.09±2.13	3.12±1.88	0.906
The ADL score	13.75±1.39	13.82±0.89	0.632
The IADL score	18.62±3.35	18.96±3.43	0.360
The DSSI score	26.51±3.56	25.72±3.88	0.051
The MMSE score	23.72±4.59	24.10±3.81	0.448
The GDS score	5.08±3.45	6.32±3.90	0.002

*t-test

Among senior adults who were living alone, 72 (72.0%) were illiterate, 24 (24.0%) had primary to high school education and 4 (4.0%) had academic education (P=0.466).

Out of them, 12 persons (12.0%) reported no occupation, 62 (62.0%) were housewives,

11 (11.0%) were retired and 15 (15.0%) reported other jobs (P=0.722).

Comparison of cognitive function and depressive symptoms between the two study groups has been presented in Table 2.

Table 2. Cognitive function and depressive symptoms in older adults who were living alone and those who were living with others.

Characteristics	Living arrangement		P-value*
	Living with others Number (percent)	Living alone Number (percent)	
Depressive symptoms: No (n=233)	193 (48.3)	40 (40.0)	0.147
Yes (n=267)	207 (51.8)	60 (60.0)	
Cognitive function: Normal (n=261)	207 (51.8)	54 (54.0)	0.737
Impaired (n=239)	193 (48.2)	46 (46.0)	

*Chi-square test

No significant difference was observed between the two groups about cognitive function (P=0.737) and depressive symptoms (P=0.147).

Five-year follow-up of the study population revealed that 81 individuals (16.2%) died and 419 (83.8%) survived.

Out of the older adults who were living alone 16 (16.0%) and who were living with others 65 (16.3%) died within 5 years (P=0.903) (Figure 1).

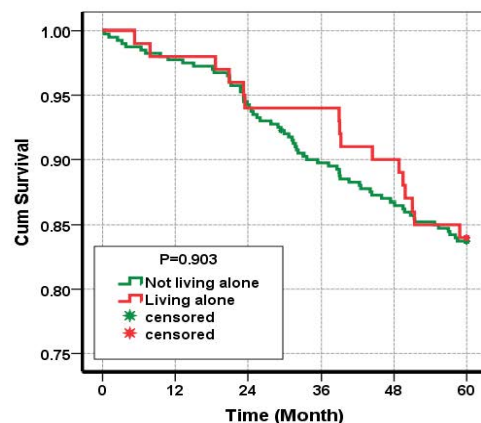


Figure 1. Five-year survival of older adults who were living alone and those living with others.

Crude and adjusted hazard ratio of living alone and other research variables on mortality of the elderly is presented in Table 3.

The findings show that the adjusted effect of age ($P<0.001$), male gender ($P=0.004$), the number of comorbidities ($P=0.031$), the person's social support ($P=0.028$) and dependence to other people to do instrumental and complex

daily activities ($P=0.020$) on 5-year mortality of older adults was significant.

However, other factors including living alone ($P=0.823$), illiteracy ($P=0.527$), cognitive impairment ($P=0.280$), depression ($P=0.900$), and the person's dependence to others to do basic daily activities did not show such a statistically significant effect ($P>0.05$).

Table 3. Crude and adjusted hazard ratio (HR) of living alone and other research variables on mortality of older adults.

Characteristics	Crude HR (95% CI)	P-value*	Adjusted HR (95% CI)	P-value*
Living alone	0.967 (0.559-1.670)	0.903	0.939 (0.540-1.631)	0.823
Older age	1.123 (1.083-1.164)	<0.001	1.079 (1.034-1.126)	<0.001
Female gender	0.507 (0.326-0.788)	0.003	0.479 (0.290-0.789)	0.004
Illiteracy	1.694 (0.980-2.928)	0.059	0.830 (0.466-1.477)	0.527
Number of comorbidities	1.099 (0.993-1.217)	0.069	1.133 (1.012-1.269)	0.031
Cognitive impairment	2.384 (1.502-3.785)	<0.001	1.330 (0.793-2.232)	0.280
Depressive symptoms	1.178 (0.759-1.828)	0.465	1.032 (0.626-1.704)	0.900
ADL score <14	2.487 (1.283-4.822)	0.007	0.896 (0.425-1.886)	0.772
IADL score <20	5.037 (2.427-10.453)	<0.001	2.581 (1.165-5.722)	0.020
The DSSI score	0.876 (0.829-0.925)	<0.001	0.935 (0.880-0.993)	0.028

*Cox regression analysis

Discussion

The current research represented that living alone itself did not have significant impact on five-year survival of older adults.

Available evidence reveals different findings in various studies.

In Udell et al. 's study, conducted as a multicenter research in 44 countries across six major regions from America, Europe, Asia, and Australia, the mortality rate among older adults aged age 66-80 years who were living alone and living with others was 13.2% and 12.3%, respectively (adjusted hazard ratio: 1.12); however, the results was different in different age-groups.

They investigated the modification effect of age on survival of older adults; in younger participants, living alone was correlated with higher mortality compared with those living with others [22].

The study of Shaw et al. in Sweden-on adults ages 77 and over-reported an increased mortality risk of older adults living alone compared to those living with others; also, age, gender, and health condition (such as mobility, and self-rated health) were represented as important characteristics that could change the impact of living alone on the mortality of senior adults [23].

The significant effect of living alone on the survival in late-adulthood has been reported in some other studies.

For example, a study by Ng et al. in Singapore showed a significant mortality risk of living alone (adjusted hazard ratio: 1.66); the risk of mortality in people living alone was higher than in people living with others, even after adjustment for demographic characteristics, the person's disability, history of comorbid chronic disorders and depressive symptoms [24].

O'Súilleabháin et al. in Berlin found that with one unit increase of standard deviation in emotional loneliness of older adults, the mortality rate increased by 18.6% [25].

The variety in findings can be attributed to demographic, cultural, social, economic, and health characteristics of different studies; also, the follow-up duration can be effective on the research results.

In the present study, the covariates of age, male gender and the number of concurrent chronic disorders had a significant enhancing effect on 5-year mortality of older people.

O'Súilleabháin et al. 's study showed that women lived more alone than men, however, the mortality rate was found to be higher in alone men than that of women [25].

Also, a higher mortality rate was found in men living alone than in women in the study of Ng TP et al. [24].

In our research, female gender was a protective factor for elderly mortality.

The Crimmins et al. assessed the differences between males and females in different dimensions of health, and reported the genetics,

epidemiological factors, social environment, individual and social health-related behaviors as important factors influencing on health-related outcomes, incidence of diseases and mortality [26].

Regardless of living arrangement, the persons with more comorbidities are expected to have worse health outcomes and mortality.

Our findings revealed the significant modification effect of dependence to do instrumental activities of daily living and social support on the elderly mortality.

Although living alone and loneliness can be associated with negative health outcomes such as depression, and frailty in older adults, the person's independence to do daily activities, and to have social support might have a mediating role and alleviating effect on these negative points [27].

The older adults with better functioning, more social relationships and satisfaction with their social activities can cope much better with the negative life events, even if they live alone.

The effect of living arrangement on health in late-adulthood is different in various regions [5].

Literature review shows that although some studies evaluated the effect of living arrangement and loneliness on health and survival of older adults in recent years, further studies are needed to determine the exact mortality risk of living alone [8,16,23,25].

At baseline examination, there was no significant difference between the two study groups about the assessed covariates of living arrangement such as age, sex, occupation, level of education, and the number of concurrent chronic disorders.

This setting led to a better comparison of five-year survival and death between the elderly living alone with those living with others.

These points in addition to longitudinal design of the research can be mentioned as strong points of the current study.

We did not assess the economic condition of the two study groups. This can be mentioned as a limitation of this research.

Also, evaluation of health-promoting lifestyle behaviors such as nutrition, smoking and alcohol consumption, and longer follow-up duration in a multicenter research is recommended for future studies.

Conclusion

Living arrangement, itself, did not show a significant effect on the mortality of older adults.

Acknowledgements

The financial support of Babol University of Medical Sciences is appreciated.

Conflict of interests

None to declare.

References

- Gómez F, Osorio-García D, Panesso L, Curcio CL. Healthy aging determinants and disability among older adults: SABE Colombia. *Revista panamericana de salud publica=Pan American journal of public health*, 2021, 45:e98.
- Krause TM, Schaefer C, Highfield L. The association of social determinants of health with health outcomes. *The American journal of managed care*, 2021, 27(3):e89-e96.
- Bennett HQ, Kingston A, Spiers G, Robinson L, Corner L, Bamba C, Brayne C, Matthews FE, Jagger C. Healthy ageing for all? Comparisons of socioeconomic inequalities in health expectancies over two decades in the Cognitive Function and Ageing Studies I and II. *International journal of epidemiology*, 2021, 50(3):841-851.
- Hayes L, Cartwright CH. Using health promotion to support healthy ageing. *Nurs Stand*, 2021, 10 (7748):e11693
- Mouodi S, Bijani A, Hosseini SR, Hajian-Tilaki K. Gender differences in the health status of elderly living alone compared to those who are not alone: Evidence of the AHAP study, North of Iran. *Caspian J Intern Med*, 2016, 7(2):126-132.
- Tragantzopoulou P, Giannouli V. Social isolation and loneliness in old age: Exploring their role in mental and physical health. *Psychiatrike=Psychiatriki*, 2021, 32(1):59-66.
- Martín-María N, Caballero FF, Lara E, Domènech-Abella J, Haro JM, Olaya B, Ayuso-Mateos JL, Miret M. Effects of transient and chronic loneliness on major depression in older adults: A longitudinal study. *International journal of geriatric psychiatry*, 2021, 36(1):76-85.
- Ong AD, Uchino BN, Wethington E. Loneliness and Health in Older Adults: A Mini-Review and Synthesis. *Gerontology*, 2016, 62(4):443-449.
- Saito T, Murata C, Aida J, Kondo K. Cohort study on living arrangements of older men and women and risk for basic activities of daily living disability: findings from the AGES project. *BMC Geriatrics*, 2017, 17(1):183.
- Jeon G-S, Choi K, Cho S-I. Impact of Living Alone on Depressive Symptoms in Older Korean Widows. *Int J Environ Res Public Health*, 2017, 14(10):1191.
- Huang Y-C, Cheng H-L, Wahlqvist ML, Lo Y-TC, Lee M-S. Gender differences in longevity in free-living older adults who eat-with-others: a prospective study in Taiwan. *BMJ Open*, 2017, 7(9):e016575-e016575.

12. Ellwardt L, van Tilburg T, Aartsen M, Wittek R, Steverink N. Personal Networks and Mortality Risk in Older Adults: A Twenty-Year Longitudinal Study. *PLOS ONE*, 2015, 10(3):e0116731.
13. Hawkey LC, Norman GJ, Agha Z. Aging Expectations and Attitudes: Associations With Types of Older Adult Contact. *Research on aging*, 2019, 41(6):523-548.
14. Nari F, Jang BN, Kim S, Jeong W, Jang SI, Park EC. Association between successful aging transitions and depressive symptoms among older Korean adults: findings from the Korean longitudinal study of aging (2006-2018). *BMC Geriatr*, 2021, 21(1):352.
15. Yanguas J, Pinazo-Henandis S, Tarazona-Santabalbina FJ. The complexity of loneliness. *Acta Biomed*, 2018, 89(2):302-314.
16. Donovan NJ, Blazer D. Social Isolation and Loneliness in Older Adults: Review and Commentary of a National Academies Report. *Am J Geriatr Psychiatry*, 2020, 28(12):1233-1244.
17. Bijani A, Ghadimi R, Mikaniki E, Kheirkhah F, Mozaffarpur SA, Motalebnejad M, Esmaili H, Majidi F, Cumming RG, Hosseini SR. Cohort Profile Update: The Amirkola Health and Ageing Project (AHAP). *Caspian journal of internal medicine*, 2017, 8(3):205-212.
18. Pashmdarfard M, Azad A. Assessment tools to evaluate Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) in older adults: A systematic review. *Medical journal of the Islamic Republic of Iran*, 2020, 34:33.
19. Ansari NN, Naghdi S, Hasson S, Valizadeh L, Jalaie S. Validation of a Mini-Mental State Examination (MMSE) for the Persian population: a pilot study. *Applied neuropsychology*, 2010, 17(3):190-195.
20. Malakouti SK, Fatollahi P, Mirabzadeh A, Salavati M, Zandi T. Reliability, validity and factor structure of the GDS-15 in Iranian elderly. *International journal of geriatric psychiatry*, 2006, 21(6):588-593.
21. Nazari S, Afshar PF, Sadeghmoghadam L, Shabestari AN, Farhadi A. Developing the perceived social support scale for older adults: A mixed-method study. *AIMS Public Health*, 2020, 7(1):66-80.
22. Udell JA, Steg PG, Scirica BM, Smith SC, Jr., Ohman EM, Eagle KA, Goto S, Cho JI, Bhatt DL. Living alone and cardiovascular risk in outpatients at risk of or with atherothrombosis. *Archives of internal medicine*, 2012, 172(14):1086-1095.
23. Shaw BA, Dahlberg L, Nilsen C, Agahi N. Trends in the Mortality Risk of Living Alone during Old Age in Sweden, 1992-2011. *Journal of aging and health*, 2020, 32(10):1399-1408.
24. Ng TP, Jin A, Feng L, Nyunt MS, Chow KY, Feng L, Fong NP. Mortality of older persons living alone: Singapore Longitudinal Ageing Studies. *BMC Geriatr*, 2015, 15:126.
25. O Suilleabhain PS, Gallagher S, Steptoe A. Loneliness, Living Alone, and All-Cause Mortality: The Role of Emotional and Social Loneliness in the Elderly During 19 Years of Follow-Up. *Psychosomatic medicine*, 2019, 81(6):521-526.
26. Crimmins EM, Shim H, Zhang YS, Kim JK. Differences between Men and Women in Mortality and the Health Dimensions of the Morbidity Process. *Clinical chemistry*, 2019, 65(1):135-145.
27. Zhao X, Si H. Loneliness and frailty among nursing home older adults: the multiple mediating role of social support and resilience. *Psychogeriatrics*, 2021, 21(6):902-909

Corresponding Author: Simin Mouodi, Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran, e-mail: dr.mouodi@gmail.com