



Original Article

Child Gender Composition and Life Satisfaction in Old Age: Evidence from Neyshabur Longitudinal Study on Aging

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ABSTRACT

Background: Population aging is a major demographic transition. Life satisfaction is a key indicator of successful aging and may be influenced by children's gender composition. To examine the association between offspring sex composition and life satisfaction among older adults using Neyshabur Longitudinal Study on Aging (NeLSA) baseline data.

Methods: This cross-sectional analysis included 1,180 adults aged ≥ 50 years. Life satisfaction was assessed with the Persian Satisfaction with Life Scale (SWLS). Offspring sex composition was categorized as more sons than daughters ($n=504$), equal numbers ($n=210$), and more daughters than sons ($n=466$; reference). Generalized linear models were used. The adjusted model controlled for age, sex, marital status, education, income, employment, BMI, smoking, hypertension, diabetes, physical activity, family size, and social support.

Results: In the crude model, no significant associations were found (more sons: $\beta=0.52$, 95% CI -0.08 to 1.12 ; equal: $\beta=0.11$, 95% CI -0.43 to 1.10). After full adjustment, older adults with more sons than daughters had significantly higher life satisfaction than those with more daughters than sons ($\beta=0.53$, 95% CI 0.03 – 1.08 , $P=0.045$). No significant association was observed for equal numbers ($\beta=0.14$, 95% CI -0.52 to 0.79).

Conclusion: Among Iranian older adults, having more sons than daughters was associated with higher life satisfaction after adjustment, while equal numbers showed no significant association. These findings contrast with some East Asian studies and may reflect traditional gender roles and expectations of sons' support in old age. Longitudinal research is needed.

Introduction

Population aging is one of the most important demographic transitions of the 21st century worldwide. The increased elderly population brings a host of societal, economic, and health system impacts. Iran has experienced continued population aging in recent decades due to factors including a declining fertility rate, increased longevity, and advances in medical technology, and its progression is predicted to accelerate in coming years. The 50+ population of Iran is projected to be three times higher in the next four decades than current figures (1). Accordingly, with the

expected increase in aging population, there is a need for researchers to continue examining the various factors impacting the elderly's quality of life (2, 3). Among the components of subjective wellbeing regarding old age, life satisfaction serves as a significant indicator of successful aging and is influenced by a variety of factors, including health, financial status, support systems, and familial relationships (4, 5). As in the majority cultures worldwide, particularly in Iran, where collectivistic ideals regarding the family remain prevalent, the elderly's reliance on children and family for both emotional and instrumental support is significant (6). Investigating the relationship between



children's various characteristics, particularly their gender, and wellbeing during old age is therefore important (7). Existing research beyond Iran has identified the contribution of offspring to elderly wellbeing (7). In China, while many individuals have gender preferences among their offspring, having daughters — and especially having a female firstborn — was a significantly stronger predictor of higher life satisfaction in the elderly than having a firstborn son (8). Such results may be attributed to growing involvement of women in providing economic support, companionship, and emotional assistance, thereby challenging traditional gender norms (7, 9). Despite this body of research, limited studies in Iran have examined how child gender composition influences life satisfaction in old age.

Given that familial dynamics along with social and gender values are gradually evolving, research in this area is essential for the development and customization of suitable services and assistance programs, leading to improvement in the elderly's lives. It will be highly interesting and useful to harness the potential of the Neyshabur Elderly Longitudinal Study (NeLSA) to fill these gaps, not only in the Iranian context but also in developed countries (10). This cross-sectional study aims to elucidate the association between child gender composition (sons only, daughters only, more sons, more daughters, and equal number) and life satisfaction among older adults in the city of Neyshabur and postulates that having daughters is associated with greater life satisfaction compared to only having sons.

Methods

Study design and participant selection

This is a cross-sectional analysis of the baseline data collected during the NeLSA Study conducted in Neyshabur using a multistage stratified random sampling design. The target population included all adults (aged ≥ 50 years) who participated in the baseline assessment of the NeLSA. To participate in this study, participants were required to be 50+ years old and to complete all questions pertaining to their gender, life satisfaction (using the SWLS), and other covariates specified previously.

We excluded individuals who did not complete both sex and life satisfaction questions, those having no living son or daughter, adults who had never married, and individuals with severe cognitive impairment (defined as a score < 10 on the Mini-Mental State Examination (MMSE)). The MMSE was used for cognitive screening. Participants without children were excluded because the study specifically aimed to examine the association between child gender composition and life satisfaction among parents.

Offspring sex composition was initially classified into five categories: sons only, more sons than daughters, equal numbers of sons and daughters, more daughters than sons, and daughters only. Because of the small numbers of participants in the sons-only ($n=73$) and daughters-only ($n=74$) categories, these groups were combined with the corresponding categories "more sons than daughters" and "more daughters than sons," respectively. Consequently, the exposure variable used in the regression analyses comprised three categories: more sons than daughters ($n=504$), equal numbers of sons and daughters ($n=210$), and of sons and

daughters ($n=210$), and more daughters than sons ($n=466$).

Dependent variable

Life satisfaction was measured using the Satisfaction with Life Scale (SWLS), developed by Diener and colleagues in 1985 (28). The SWLS consists of five statements answered on a 7-point Likert scale (1 = strongly dissatisfied to 7 = strongly satisfied). Participants responded to items such as "In most ways my life is close to my ideal," "The conditions of my life are excellent," "I am satisfied with life," "So far, I have gotten the important things I want in life," and "If I could live my life over again, I would change almost nothing." The Persian version of the SWLS has been validated in Iranian older adults with acceptable psychometric properties (13, 27).

We considered several covariates for adjustment: age, gender (male/female), marital status (married, divorced/widowed, single), housing situation (alone, with other, with a spouse), education level (no education, primary, junior high, high school, university degree or higher), perceived financial status (low, medium, high), family size, and self-reported health. All participants' identification numbers were anonymized using a coding scheme.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics version 27 and R software version 4.5.2. A two-sided P value < 0.05 was considered statistically significant. Continuous variables were summarized as median and interquartile range (IQR), whereas categorical variables were presented as frequencies and percentages. Differences in baseline characteristics across offspring sex composition groups were evaluated using the Kruskal–Wallis test for continuous variables and the Chi-square test for categorical variables.

The association between offspring sex composition and life satisfaction score was examined using generalized linear models with an identity link and normal distribution. Two models were constructed. The crude model included only offspring sex composition. The adjusted model additionally controlled for potential confounders selected a priori, including age, sex, marital status, educational level, income status, employment status, body mass index (BMI), current smoking, hypertension, diabetes, physical activity, and social support. Regression coefficients (β), 95% confidence intervals (95% CI), and P values were reported.

To evaluate whether the association between offspring sex composition and life satisfaction differed by participants' sex, an interaction term between offspring sex composition and sex was examined in an additional model. Effect modification was considered statistically significant at $P < 0.05$.

Results

A total of 1,180 older adults with complete information on offspring sex composition were included in the analysis. Of these, 73 (6.2%) had only sons, 431 (36.5%) had more sons than daughters, 210 (17.8%) had an equal number of sons and daughters, 392 (33.2%) had more daughters than sons, and 74 (6.3%) had only daughters. Participants differed



significantly across offspring sex composition groups in age ($P<0.001$), educational attainment ($P=0.01$), and current employment status ($P=0.03$). No statistically significant differences were observed for sex, marital status, income

status, BMI, smoking status, diabetes, hypertension, self-rated health, physical activity, social support, or life satisfaction (all $P>0.05$) (Table 1).

Table 1. Baseline characteristics of participants according to offspring sex composition

Variable	Overall (N=1180)	Only sons (N=73)	More sons (N=431)	Equal numbers (N=210)	More daughters (N=392)	Only daughters (N=74)	p-value
Age, years, Median (IQR)	60.9 (56.2–67.8)	58.3 (53.2–64.3)	61.6 (56.9–69.9)	61.6 (56.9–69.9)	61.8 (57.0–68.6)	56.7 (53.4–56.8)	<0.001
Sex, n (%)							0.7
Male	550 (46.6)	33 (45.2)	199 (46.2)	104 (49.5)	176 (44.9)	38 (51.4)	
Female	630 (53.4)	40 (54.8)	232 (53.8)	106 (50.5)	216 (55.1)	36 (48.6)	
Marital status, n (%)							0.9
Single	126 (10.7)	8 (11.1)	48 (11.2)	20 (9.6)	41 (10.5)	9 (12.2)	
Married	1048 (89.3)	64 (88.9)	381 (88.8)	189 (90.4)	349 (89.5)	65 (87.8)	
Education, n (%)							0.01
Illiterate	363 (30.8)	14 (19.2)	150 (34.8)	58 (27.6)	127 (32.4)	14 (18.9)	
Literate	817 (69.2)	59 (80.8)	281 (65.2)	152 (72.4)	265 (67.6)	60 (81.1)	
Current job status, n (%)							0.03
Full- or part-time employment	243 (20.6)	19 (26.0)	80 (18.6)	47 (22.4)	72 (18.4)	25 (33.8)	
Housewife	559 (47.4)	34 (46.6)	214 (49.7)	97 (46.2)	189 (48.2)	25 (33.8)	
Retired	275 (23.3)	15 (20.5)	96 (22.3)	48 (22.9)	97 (24.7)	19 (25.7)	
Unemployed	103 (8.7)	5 (6.8)	41 (9.5)	18 (8.6)	34 (8.7)	5 (6.8)	
Income status, n (%)							0.14
Have difficulties	247 (20.9)	17 (23.3)	90 (20.9)	49 (23.3)	82 (20.9)	9 (12.2)	
No problem	127 (10.8)	8 (11.0)	48 (11.1)	20 (9.5)	35 (8.9)	16 (21.6)	
Sufficient for basic needs	806 (68.3)	48 (65.8)	293 (68.0)	141 (67.1)	275 (70.2)	49 (66.2)	
BMI, kg/m ² , median (IQR)	27.4 (24.6–30.4)	27.4 (24.6–30.2)	27.8 (24.5–30.6)	27.8 (24.5–30.6)	27.3 (24.4–30.3)	27.2 (24.8–31.3)	0.6
Current smoking, n (%)							0.09
No	1030 (87.3)	61 (83.6)	382 (89.9)	175 (86.2)	352 (90.7)	60 (82.2)	
Yes	132 (11.2)	12 (16.4)	43 (10.1)	28 (13.8)	36 (9.3)	13 (17.6)	
History of Diabetes, n (%)							0.9
No	854 (72.4)	52 (71.2)	310 (71.9)	151 (71.9)	285 (72.7)	56 (75.7)	
Yes	326 (27.6)	21 (28.8)	121 (28.1)	59 (28.1)	107 (27.3)	18 (24.3)	
History of Hypertension, n (%)							0.3
No	872 (73.9)	54 (74.0)	322 (74.7)	152 (72.4)	282 (71.9)	62 (83.8)	
Yes	308 (26.1)	19 (26.0)	109 (25.3)	58 (27.6)	110 (28.1)	12 (16.2)	
Self-rated health, n (%)							0.68
Very good	50 (4.3)	4 (5.5)	17 (4.0)	10 (4.8)	17 (4.0)	2 (2.7)	
Good	114 (9.7)	7 (9.6)	40 (9.3)	16 (7.7)	39 (10.0)	12 (16.2)	
Moderate	383 (32.6)	21 (28.8)	136 (31.7)	79 (37.8)	121 (30.9)	26 (35.1)	
Bad	516 (43.9)	36 (49.3)	187 (43.6)	90 (43.1)	175 (44.8)	28 (37.8)	
Very Bad	113 (9.6)	5 (6.8)	49 (11.4)	14 (6.7)	17 (4.0)	2 (2.7)	
PASE score, Median (IQR)	60.6 (35.3–119.0)	67.9 (40.3–143.8)	61.8 (33.9–116.6)	61.8 (33.9–116.6)	58.7 (35.2–108.2)	74.8 (39.9–136.7)	0.1
Social support score, Median (IQR)	25.0 (23.0–27.0)	25.0 (22.0–27.0)	25.0 (22.0–28.0)	25.0 (22.0–27.0)	25.0 (23.0–27.0)	25.0 (23.0–28.0)	0.5
Life satisfaction score, Median (IQR)	13.0 (10.0–16.0)	14.0 (11.0–16.0)	13.0 (10.0–16.0)	13.0 (10.0–16.0)	13.0 (9.0–16.0)	13.0 (11.0–16.0)	0.7

Table 2 presents the association between offspring sex composition and life satisfaction. In the crude model, no significant association was observed between offspring sex composition and life satisfaction. After adjustment for age, sex, marital status, education, income, employment status, BMI, smoking, hypertension, physical activity, and social support, older adults with more sons than daughters had significantly higher life satisfaction than the reference group ($\beta=0.53$, 95% CI 0.03–1.08, $P=0.045$), whereas no significant association was found for participants with an equal number of sons and daughters.

Table 2. Association between offspring sex composition and life satisfaction among older adults

Offspring sex composition	Crude Model		Adjusted Model	
	β (95% CI)	P value	β (95% CI)	P value
More sons than daughters	0.52 (-0.08, 1.12)	0.09	0.53 (0.03, 1.08)	0.045
Equal sons and daughters	0.11 (-0.43, 1.10)	0.72	0.14 (-0.52, 0.79)	0.68
More daughters than sons	Reference	–	Reference	–

Adjusted for age, sex, marital status, education, income status, employment status, BMI, smoking, hypertension, physical activity, family size, and social support.



Discussion

This study investigated the association between offspring sex composition and life satisfaction among 1,180 older adults from the NeLSA population in Iran. In contrast to our initial hypothesis that older adults with more daughters would report higher life satisfaction, findings revealed a more complex picture. Even after controlling for potential confounders, older adults who had more sons than daughters were more likely to report higher life satisfaction than those who had more daughters than sons ($\beta=0.53$, 95% CI 0.03–1.08, $P=0.045$). However, no significant effect on life satisfaction was observed among older adults with both sons and daughters compared with those with only sons or daughters.

These findings differ from the results of a recent study conducted in an urban Chinese context (8,9), which indicated higher life satisfaction among older adults with daughters, particularly if the daughters were the first-born children. Similarly, evidence from other East Asian societies, such as Vietnam, reported positive associations between having daughters and life satisfaction (7). In the urban Chinese context, where society is rapidly developing, daughters often provide emotional and practical care for their parents, whereas sons who migrate to other cities may not be available to provide parental care and support (8). This may be explained by the daughters' significant role in providing life-support systems for aging parents. Our results, however, are more consistent with other research in less globalized societies or societal groupings, where traditional gender roles and hierarchies may remain more intact (15,16). In these contexts, sons traditionally assume financial and practical responsibilities for their parents in old age (17,18). In many other societies where traditional gender norms remain strong, sons may therefore provide more practical support to older parents than emotional support (15, 16). This continued role in the retirement period may help parents feel secure during later life (19, 21). In contrast, parents from less Westernized societies tend to seek both sons and daughters for life-maintenance support. In Iranian culture, sons are expected to bear this responsibility, but having sons may not guarantee that they will attain the social or economic position to take this responsibility (21,27).

Our initial hypothesis was that having daughters would be associated with higher life satisfaction among older parents. We found instead that having children of both sexes appeared more beneficial. In Iranian society, married adult sons tend to live with or close to their parental homes, which enhances the potential for receiving both practical and financial support in later life (6,24,27).

Although both daughters and sons could provide support to their elderly parents, living closer to parents may allow sons to provide more frequent and direct support. In this context, having a son living close by may be perceived as sufficient to ensure greater access to support, whereas not having a daughter living close by may leave parents less able to receive such support. According to previous studies, in many Asian societies, parents invest in their sons earlier in life, particularly in relation to marriage and housing, with the expectation that sons will provide support in later life (22,27).

The absence of a significant association between life satisfaction and having an equal number of daughters and

sons highlights another element of the current finding that having at least one son may be an important factor associated with higher levels of life satisfaction for older people in Iran. Similar findings have been documented in Middle Eastern and Southeast Asian societies where preference for having sons has remained strong. For example, a large cross-national survey suggested that having sons, not the absence of daughters, may be important for parental well-being (26).

Strengths and Limitations

Although we controlled for several significant covariates, some confounders were not measured, such as children's health status. Moreover, some parents may place more value on having a son because they may expect greater support from them in later life. Our measure of life satisfaction was purely cognitive and focused on individuals' overall judgments about their lives (28). As a result, the SWLS may not fully capture other dimensions of well-being, particularly emotional support (25).

Given that sons may be expected to provide more practical support, whereas daughters may provide greater emotional support, it is possible that having children of both sexes may provide a broader range of support.

Our sample consisted of older adults living in the Neyshabur district. Therefore, the findings may not be generalizable to older adults living in other regions of Iran. The inclusion of measures of parent-child interactions might have strengthened the ability of the study to offer alternative explanations for the results (25).

Despite the limitations listed above, the study has a number of significant strengths to report. First, we used a representative, census-selected sample drawn from a defined geographic area (26). Second, using validated measures of life satisfaction, we employed the well-validated Persian version of the SWLS (13, 27), which reported acceptable coefficients (Cronbach's α) in our sample (27). Third, we controlled for confounding variables, including a substantial number of social demographics, physical activities, functional limitations, and health state indicators which might have had a spurious association with parental life satisfaction, although this list is not exhaustive (26). Finally, it is the first study on offspring sex and parents' life satisfaction to use data from Middle Eastern countries.

Conclusion

This study found that within a sample of older adults in Neyshabur, Iran, among parents with an unequal ratio of sons and daughters, those with more sons than daughters had higher life satisfaction, even after controlling for confounding factors. This study differs from recent studies in East Asian countries, where parents with more daughters have been reported to have higher well-being. This disparity in results may be related to the influence of historical gender inequalities prevalent in Iranian society. These results could be strengthened by further research examining families with children of both sexes in greater depth. Further studies using a longitudinal design would help clarify these changing trends.



Implications for Policy Makers and Professionals

Practitioners, policymakers, and public health services need to take into account the traditional norms associated with child gender among older individuals, as those with only daughters may be at higher risk because of potentially higher levels of physical limitation and reduced instrumental care as they reach an age when care needs become more demanding, even allowing for daughters' capacity to provide care (23).

Further Research

Several questions require deeper investigation in future research. First, what is the longitudinal relationship between the number of children and life satisfaction among older people, over and above changes in health and marital status in an aging population? As younger cohorts grow up in more egalitarian societies and may therefore exhibit more egalitarian parenting styles, do their attitudes and expectations subsequently influence how they care for and support their parents when they themselves become elderly? Second, what specific functions of family and offspring support (from both daughters and sons) contribute to explaining the observed associations? Additionally, how is this association perceived in the local context? Is geographic distance associated with differences in the type of support (financial, instrumental, and emotional care) delivered by sons versus daughters, and does this relationship have an impact on parents' life satisfaction? Furthermore, future studies should incorporate measures of relationship quality, frequency of contact, and the health and socioeconomic status of children to better understand the mechanisms underlying these associations. Qualitative research could also provide deeper insights into the lived experiences of older parents with large families and the specific challenges they face. Finally, interventional studies evaluating the effectiveness of family-based education and support programs in improving life satisfaction among older adults are warranted.

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Ethical Approval

The study was approved by the Ethics Committee of Neyshabur University of Medical Sciences (Ethics Code: IR.NUMS.REC.1405.002).

Conflict of Interests

The authors declare that they have no known competing

financial or personal interests that could have influenced the work reported in this manuscript.

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