Identifying factors causing decline in physical functionality of geriatric population

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Abstract
The objective of the study was to find major correlates of decline in the physical functionality of the geriatric population. The main focus was the evaluation of demographic, social, economic, and health-related factors that have a potential impact on physical functionality. A sample of 423 elderly people were selected from district Faisalabad, Pakistan by using a snowball sampling approach. Statistical analysis was performed using frequency analysis and some tests for association like chi-square, Cramer’s V, and gamma coefficient. It was observed that 42.8% of the respondents were independent in doing their all-routine work and the physical functional status decline was observed partially in 35.2% and completely in 22.0% of the respondents. Using frequency analysis and association measures, age, education, marital status, living with family, having an independent source of income, level of social network and support, having exercise routine were found to be significantly associated with functional status of elders. The study concluded that besides age and other demographic factors that cannot be controlled, the socio-economic factors can be improved to substantially reduce the decline in the physical functionality of the geriatric population.

Keywords
Geriatric population, Health Status, Physical Functionality, Socioeconomic Factors, Social Support

Date received: 15 August 2019; accepted: 27 May 2021

Introduction
Senior citizens are an asset for any society and their condition in any particular community provides an insight into the social values and preferences of society. An old person has to face more limitations in performing physical activities compared to younger people. The common problems faced by the elderly people are frequent falling off and depression, that are generally not detected and therefore remain untreated.1,2 The worldwide elder population was predicted to be increased by 17% on the average and reached 39.4 million in 2010.3 The growth rate of elder’s proportion is estimated to be 3% in developing and about 6% in developed countries while the same proportion is estimated to be 14.1% in 2050 in Pakistan.4 It is reported that at least 19% of geriatric Pakistani population was contracted with different diseases like stroke, visual impairment which highlights the inefficiency of the health care system to deal with aging effects.5,6 Some studies6–8 did work on geriatric/
elders’ condition in Pakistan, but these were generally aimed at management of elders or some specific problem in elders and were not focused on identifying the factors associated with decline in their physical activities. Our study is first in Pakistan that focused on identifying the significant factors associated with decline in physical functionality of geriatric population.

Life of an aged person gets influenced by many factors including social support and care provided to him/her. In fact, social support acts as pivotal stimulant for elders particularly those living with chronic diseases to remain physically functional and active in their life. Disability or non-functionality in physical activities is a major consequence of aging. This disability or difficulty in physical activities can be classified as impairment, limited activity, and significant participation. In Pakistan, elders are experiencing an increase in non-functionality or limited functionality in daily life activities after 50 years of age and as a result facing poor health, isolation, and other social problems. Other than simply aging, there can be different factors that influence the functional status of elders in the community. Many of these factors have been documented in studies conducted in different parts of the world. Such kind of non-functionality may lead to several other health-related complications. The current study aims at exploring the potential risk factors of decline in the functional status of elder population in the Faisalabad district of Pakistan. This study was conducted in accordance with the Declaration of Helsinki and approved for ethics by institutional review board of Government College University Faisalabad.

Methods

The data was collected using a detailed questionnaire comprising of variables found relevant in literature and some new characteristics or variables potentially relevant in the context of Pakistani society. Data of elder’s population (aged 60 and above) in the district Faisalabad was taken from last documented census in Pakistan that was conducted in 1998. According to that data elder’s population in district Faisalabad was estimated to be 351,988. Using formulae for sample size calculation given by Yamane, the appropriate sample size is approximately 400. The study is exploratory in nature for which a cross-sectional sample of 423 people was taken. The sample was taken using a snowball sampling technique which is based on the link tracing principle. Potential association of different explanatory variables with functional status were investigated by means of descriptive statistics and different measures of association valid for categorical variables.

The goal of this study was to explore the effects of different socio-economic and demographic factors on the functional status of elders in society. To assess the daily living activities of elders, different activity scales are available in literature like Katz index and Lawton index. Lawton index is more comprehensive in covering daily living activities. Following Graf and many others, the functional status was categorized in three different categories on an ordinal scale as Independent Activity of Daily Living (IADL), Limited Activity of Daily Living (LADL), and Totally Dependent (TD). These categories were defined according to different levels/stages of the daily life activities of elders. Specifically, how each elder is categorized in one of three categories is explained below.

**IADL:** includes all those who can perform all their daily routine activities like shopping, preparing food, housekeeping, doing laundry, using transportation, handling medications, and handling finance themselves without depending on others.

**LADL:** includes all those who can perform some of their activities like bathing, feeding, toileting themselves but for some activities (like shopping, housekeeping, laundry, food preparation) they are dependent on others.

**TD:** includes elders who are totally dependent on others for all matters even for bathing, feeding, toileting, dressing, etc.

For studying the contributory factors of the functional status of elders, different demographic and socio-economic variables were used. These variables include age, gender, area of residence, education, marital status, living with family or not, independent source of income, routine daily exercise, health status, and social support level. These potential contributory factors included in the study for possible association with the physical functionality status of elders are briefly described below.
Residence (RES): A categorical (nominal) variable taken as whether a person belongs to urban or rural area.

Age group (AGE): A categorical (ordinal) variable taken as age groups (60–63 years, 64–68 years, 69–73 years, more than 73 years).

Gender (GEN): A categorical (nominal) variable representing gender of the individual (male, female).

Education (EDU): A categorical (ordinal) variable taken as four different levels of education.

Marital status (MS): A categorical (nominal) variable representing whether person is single or not, presently.

Living with family (LF): A categorical (nominal) variable representing with whom the elder person under consideration is living with (single, spouse, sons/daughter, other).

Independent income source (IIS): A categorical (nominal) variable representing whether the elder has an independent source of income (Yes, No).

Health status (HS): A categorical (nominal) variable representing whether the elder has any disease (Yes, No).

Exercise routine (ER): A categorical (nominal) variable representing whether the elder is habitual of doing exercise (Yes, No).

Social network support (SNS): A categorical (ordinal) variable representing the level of moral and emotional support that elder receives from his social networks and circles (Low, Medium, High).

Statistical analysis

Frequency analysis and measures of association were used for data analysis. For frequency analysis, cross-tabulation of the response variable (physical functional status) and potential risk factors was performed. This was performed to see the no. of cases in different groups which may lead to conclude the presence of a relationship between variables. Secondly, to measure the association of functional status with different potential risk factors, we have used chi-square, Cramer’s V coefficient, and gamma coefficient. The chi-square test just tells about the presence or absence of significant association but it does not measure the strength of association on some comparable scale. To measure the strength of association, we have used Cramer’s V coefficient (measures association between nominal variables on a 0–1 scale) and gamma coefficient (measures association between ordinal variables on a ±1 scale). A detailed discussion of these measures of association is provided in Agresti.

All statistical analysis was performed using SPSS version 21.

Results

It is observed that in the sample of 423 respondents, 42.8%, 35.2%, and 22% fall in IADL, LADL, and TD categories of functional status, respectively. Table 1 show the percentages of demographic explanatory variables with levels of functional status. It was found that 42.6% of urban and 43.0% of rural respondents were in the IADL category, while in the TD category there were 23.6% of urban and 20.3% of rural respondents. These values indicate that area of residence does not have an impact on the level of physical functionality of elders. People in higher age groups have a higher percentage (62.8%) of falling in the TD category while people from lower age groups have a high percentage (51.5%) of falling in the IADL category. Education plays a vital role in the functional status of elders as higher percentage (64.1%) of highly educated respondents fall in the IADL category while 40.0% and 31.5% of respondents with no education fall in the LADL and TD categories, respectively. Results also reveal that those who are living with their spouses or families are in higher level of functionality compared to isolated elders. It is observed that having an independent source of income has a positive impact on physical functionality of elders. Fifty-six percent of people having an independent source of income fall in the IADL category compared to only 24% in IADL not having an independent source of income. Health status is another major contributory factor of the functional status of elders as 73.9% of respondents having no disease fall in the IADL category while 45.1% and 30.5% of respondents having at least one disease fall in LADL and TD categories, respectively. Having routine of exercise was found to lessen the decline in physical
functionality as more respondents having habit of exercise were found in the IADL category. In the case of social network and support, respondents with high social network support fall in higher category of functionality (for instance, in IADL 49%, 34%, and 28% had high, medium, and low-level social networking and support, respectively).

After the preliminary analysis through descriptive statistics given in Table 1, the measures of association were found to assess the strength and direction association of different risk factors with the physical functionality of elders. Table 2 presents the measures of association between the functional status of elders and a set of independent variables. The association was judged by Chi-square test (for all variables) and Cramer’s V (for nominal variables), and the Gamma measure of association (for ordinal variables). The details of these measures with respect to the nature of variable can be seen in Agresti.32

### Table 1. Frequency analysis of the level of functional status and explanatory variables.

| Explanatory variables | Total | Count | % |
|-----------------------|-------|-------|---|
|                       |       |       |   |
|                       | IADL  |       |   |
|                       |       |       |   |
|                       | LADL  |       |   |
|                       |       |       |   |
|                       | TD    |       |   |
|                       |       |       |   |
|                       |       |       |   |
| RES                   |       |       |   |
| Urban                 | 216   | 51.10 |   |
| Rural                 | 207   | 48.90 |   |
| Age                   |       |       |   |
| 60–63                 | 121   | 28.60 |   |
| 64–68                 | 103   | 24.30 |   |
| 69–73                 | 98    | 23.20 |   |
| 74+                   | 101   | 23.90 |   |
| GEN                   |       |       |   |
| Male                  | 214   | 50.60 |   |
| Female                | 209   | 49.40 |   |
| EDU                   |       |       |   |
| None                  | 130   | 30.70 |   |
| Primary               | 126   | 29.80 |   |
| Matric                | 103   | 24.30 |   |
| Above matric          | 64    | 15.10 |   |
| MS                    |       |       |   |
| Married               | 276   | 65.20 |   |
| Divorced/wid.         | 147   | 34.80 |   |
| LF                    |       |       |   |
| Spouse                | 102   | 24.10 |   |
| Son/daughter          | 131   | 31.00 |   |
| Joint/relative        | 190   | 44.90 |   |
| IIS                   |       |       |   |
| Yes                   | 210   | 49.60 |   |
| No                    | 213   | 50.40 |   |
| HS                    |       |       |   |
| No disease            | 157   | 37.10 |   |
| Have disease          | 266   | 62.90 |   |
| ER                    |       |       |   |
| Yes                   | 216   | 51.10 |   |
| No                    | 207   | 48.90 |   |
| SNS                   |       |       |   |
| Low                   | 60    | 14.20 |   |
| Med                   | 96    | 22.70 |   |
| High                  | 267   | 63.10 |   |

IADL: independent activity of daily living; LADL: limited activity of daily living; TD: totally dependent for performing daily living activities.
Discussion

From the results of the current study, the association between response variable “functional status” and explanatory variables age, education, marital status, living with family, independent source of income, health status, routine daily exercise, and social network and support were found statistically significant. The findings of the study are in accordance with results from earlier studies for example as Kumar et al. reported that with growing age there are more chances of functional decline.

Concerning the impact of education level, health status, exercise routine, income source, living a married life, social-networking, and support on functional status, the results of the present study are in lines with other studies carried out in different countries.

Although older people are embedded in family networks, changing family structures may affect the pattern of support in future. Availability of spouse in later ages is major source of support in matters related to sickness and emotional support. The percentage decline was observed in personal care, medical care, household activities, supervision, and transport/mobility as the age increases. So, there may be more chances of functional decline in later age. In this study it is observed that 29.6% of the respondents not having their own independent source of income fall in IADL, 45.5% fall in ADL, and 24.9% fall in the dependent category. Also, it is observed that 28.5% of the respondents having no education fall in IADL, 40.0% fall in ADL, and 31.5% fall in TD category. Similar results have been reported in a study on Spanish elders where it was observed that 80.5% respondents with no education had functional decline. It was observed that respondents not married or presently living alone have more chances of functional decline which is in lines with findings of Kumar et al. Similar to the findings of Harrison et al., it is observed low physical activity like exercise is a risk of functional decline.

Limitations

Apart from the relevance and importance of the study, there are certain limitations, for instance, the study does not take into account the clinical variables and information on the occupation of people during their active lives, these variables may have an influence on their physical functionality. Not formally validating the questionnaire and not achieving a saturation point in the data collection process are other limitations of the study.

Conclusion

It may be concluded that elders living with family, with strong social networking, exercise habits have less likelihood or chances of decline in physical

| Table 2. Association of the level of functional status and explanatory variables. |
| Explanatory variables | Degree of freedom | Chi-square (p-value) | Crammer’s V (p-value) | Gamma (p-value) |
|-----------------------|-------------------|---------------------|----------------------|----------------|
| RES                   | 2                 | 0.790 (0.674)       | 0.043 (0.674)        | –              |
| AGE                   | 6                 | 91.430 (<0.000)     | –                    | 0.50 (<0.000) |
| GEN                   | 2                 | 1.494 (0.474)       | 0.059 (0.474)        | –              |
| EDU                   | 6                 | 30.595 (<0.000)     | –                    | –0.240 (<0.000) |
| MS                    | 2                 | 65.852 (<0.000)     | 0.395 (<0.000)       | –              |
| LFS                   | 4                 | 44.604 (<0.000)     | 0.325 (<0.000)       | –              |
| IIS                   | 2                 | 32.101 (<0.000)     | 0.275 (<0.000)       | –              |
| HSF                   | 2                 | 99.672 (<0.000)     | 0.485 (<0.000)       | –              |
| ER                    | 2                 | 49.987 (<0.000)     | 0.3440 (<0.000)      | –              |
| SNS                   | 4                 | 3.21 (0.20)         | –                    | –              |

Chi-square: value of test statistic of Chi-square test of association; Crammer’s V: value of Cramer’s coefficient of association between nominal variables; Gamma: value of Gamma measure of association of ordinal variables; p-value: a p-value < 0.05 indicates a strong association between variables.
functionality. Similarly, it may also be concluded that people with less education, economically dependent, contracted to any disease have an increased risk of being functionally impaired or even dependent in their growing age. The functionality of elders may be prolonged by controlling these factors.

Acknowledgements
Dr. Shahid Mehmood is acknowledged with thanks for proofreading the manuscript. He proofread improved the English language of the article.

Declaration of conflicting interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval
Ethical approval for this study was obtained from Institutional Review Board of Government College University Faisalabad (Study No. 001916-4).

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent
Written informed consent was obtained from all subjects before the study.

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Supplemental material
Supplemental material for this article is available online.

References
1. Cumming RG, Kelsey JL and Nevitt MC (1990) Methodologic issues in the study of frequent and recurrent health problems falls in the elderly. Annals of Epidemiology 1: 49–56.
2. Banazak DA (1996) Late-life depression in primary care. Journal of General Internal Medicine 11: 163–167.
3. Hayes G (2009) Population ageing in the Pacific Islands: Emerging trends and future challenges. Asia-Pacific Population Journal J 24: 79–113.
4. UN (2009) World population prospects: The 2008 revision. Volume II: Sex and Age Distribution of the World Population, https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Jan/un_2008_world_population_propects-2008_revision_volume-ii.pdf (accessed 14 April 2019).
5. Ambrose AF, Paul G and Hausdorff JM (2013) Risk factors for falls among older adults: A review of the literature. Maturitas 75: 51–61.
6. Zafar SN, Ganatra HA, Tehseen S et al. (2006) Health and needs assessment of geriatric patients: Results of a survey at a teaching hospital in Karachi. Journal of Pakistan Medical Association 56: 470–474.
7. Bhamani MA, Khan MM, Karim MS et al. (2015) Depression and its association with functional status and physical activity in the elderly in Karachi, Pakistan. Asian Journal of Psychiatry 14: 46–51.
8. Khan AT-A, Toor RH and Amjad Q (2018) Assessment and management of geriatric care in Pakistan. Journal of Gerontology & Geriatric Research 7: 1–4.
9. Victor CR (2013) Old age in modern society: A textbook of social gerontology. 2nd ed. London: Springer.
10. Shippy RA and Karpik SE (2005) Perceptions of support among older adults with HIV. Research on Aging 27: 290–306.
11. Albert SM (2014) Public health and aging: An introduction to maximizing function and well-being. New York: Springer Publishing Company.
12. Afzal M (1999) Growing old in Pakistan: Challenges for the new millennium. Pakistan: United Nations Population Fund (UNFPA).
13. Hinman MR, O’Connell JK, Dorr M et al. (2014) Functional predictors of stair-climbing speed in older adults. Journal of Geriatric Physical Therapy 37: 1–6.
14. Hernandez ME, Goldberg A and Alexander NB (2010) Decreased muscle strength relates to self-reported stooping, crouching, or kneeling difficulty in older adults. Physical Therapy 90: 67–74.
15. Bischoff-Ferrari HA, Orav JE, Kanis JA et al. (2015) Comparative performance of current definitions of sarcopenia against the prospective incidence of falls among community-dwelling seniors age 65 and older. Osteoporosis International 26: 2793–2802.
16. Baert V, Gorus E, Mets T et al. (2011) Motivators and barriers for physical activity in the oldest old: A systematic review. Ageing Research Reviews 14: 464–474.
17. Turcotte P-L, Carrier A, Desrosiers J et al. (2015) Are health promotion and prevention interventions integrated into occupational therapy practice with older adults having disabilities? Insights from six community health settings in Québec, Canada. Australian Occupational Therapy Journal 62: 56–67.
18. Leirós-Rodríguez R, Romo-Pérez V, García-Soidán JL et al. (2018) Prevalence and factors associated with functional limitations during aging in a representative sample of Spanish population. Physical & Occupational Therapy in Geriatrics 36: 156–167.
19. Maqsood F, Sidra M and Nizammudin M (2013) Risk factors of functional status decline of older persons of Punjab, Pakistan. World Applied Sciences Journal 28: 278–284.

20. Burini RC, Anderson E, Durstine JL et al. (2020) Inflammation, physical activity, and chronic disease: An evolutionary perspective. Sports Medicine and Health Science 2: 1–6.

21. Ertek S and Cicero A (2012) Impact of physical activity on inflammation: Effects on cardiovascular disease risk and other inflammatory conditions. Archives of Medical Science 8: 794–804.

22. Nimmo MA, Leggate M, Viana JL et al. (2013) The effect of physical activity on mediators of inflammation. Diabetes, Obesity and Metabolism 15: 51–60.

23. Yamane T (1967) Statistics: An introductory analysis. 2nd ed. New York: Harper and Row.

24. Katz S (1983) Assessing self-maintenance: Activities of daily living, mobility, and instrumental activities of daily living. Journal of the American Geriatrics Society 31: 721–726.

25. Lawton MP and Brody EM (1969) Assessment of older people: Self-maintaining and instrumental activities of daily living. Gerontologist 9: 179–186.

26. Graf C (2008) The Lawton instrumental activities of daily living scale. AJN The American Journal of Nursing 108: 52–62.

27. Liebzeit D, King B and Bratzke L (2018) Measurement of function in older adults transitioning from hospital to home: An integrative review. Geriatric Nursing 39: 336–343.

28. Buurman BM, Hoogerduijn JG, de Haan RJ et al. (2011) Geriatric conditions in acutely hospitalized older patients: Prevalence and one-year survival and functional decline. PLoS One 6: e26951.

29. Zisberg A, Shadmi E, Gur-Yaish N et al. (2015) Hospital-associated functional decline: The role of hospitalization processes beyond individual risk factors. Journal of the American Geriatrics Society 63: 55–62.

30. Carmona-Torres JM, Rodríguez-Borrego MA, Laredo-Aguilera JA et al. (2019) Disability for basic and instrumental activities of daily living in older individuals. PLoS One 14: e0220157.

31. Murat MF, Ibrahim Z, Adznam SN et al. (2019) Prevalence and determinants of Instrumental Activities of Daily Living (IADL) disability among community-dwelling elderly in a semi-urban setting in Peninsular Malaysia. Malaysian Journal of Nutrition 25(1): 13–25.

32. Agresti A (2002) Categorical data analysis. 2nd ed. New York: John Wiley & Sons.

33. Kumar A, Carpenter H, Morris R et al. (2014) Which factors are associated with fear of falling in community-dwelling older people? Age and Ageing 43: 76–84.

34. Biderman A, Cwikel J, Fried AV et al. (2002) Depression and falls among community dwelling elderly people: A search for common risk factors. BMJ Journals 56: 631–636.

35. Taqui AM, Itrat A, Qidwai W et al. (2007) Depression in the elderly: Does family system play a role? A cross-sectional study. BMC Psychiatry 7: 57.

36. Hairi NN, Bulgiba A, Cumming RG et al. (2010) Prevalence and correlates of physical disability and functional limitation among community dwelling older people in rural Malaysia, a middle income country. BMC Public Health 10: 492.

37. Harrison JK, Clegg A, Conroy SP et al. (2015) Managing frailty as a long-term condition. Age and Ageing 44: 732–735.

38. López SR, Montero P, Carmenate M et al. (2015) Functional decline over two years in older Spanish adults: Evidence from SHARE. NIH Public Access 14: 403–412.

39. Hosseinpoor AR, Bergen N and Chatterji S (2013) Socio-demographic determinants of caregiving in older adults of low-and middle-income countries. Age and Ageing 42: 330–338.

40. López SR, Montero P, Carmenate M et al. (2014) Functional decline over 2 years in older Spanish adults: Evidence from the Survey of Health, Ageing and Retirement in Europe. Geriatrics & Gerontology International 14: 403–412.