Underweight is an important predictor for functional impairment among the older adults in Urban West Bengal, India: A cross sectional analytical study

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Abstract

Objectives: To estimate the prevalence, pattern, and factors associated with functional impairment among elders.

Materials and Methods: A community-based cross-sectional analytical study was conducted among older adults (aged ≥60 years) residing in the urban blocks of West Bengal. An interview was conducted using a structured questionnaire, which included Katz index and half-arm span to measure functional impairment and body mass index (BMI), respectively.

Results: The mean (SD) age (in years) of 457 participants was 69.0 (7.3) years and 52% were males, 72% were graduates, 52% were obese, and 55% had hypertension. The prevalence of functional impairment was 7.4% (95% confidence interval [CI]: 5.21–10.24). The most common aid or appliance used was spectacles (93%) followed by a denture (20%). The functional impairment was more common among the oldest-old (≥85 years) (adjusted prevalence ratio (aPR) 8.26, 95% CI: 2.50–27.28), middle-old (75–84 years) age group (aPR 3.85, 95% CI: 1.44–10.31), underweight (BMI < 18.50 kg/m²) (aPR 3.60, 95% CI: 1.44–9.00), and among the individuals using walking sticks (aPR 3.47, 95% CI: 1.60–7.51).

Conclusion: The burden of functional impairment is low among older adults in the urban area of West Bengal. Policies need to be framed at the household level to reduce the extent of disability among the oldest-old and elders who are underweight and use walking aids.

Keywords: ADL, assistive devices, cross-sectional studies, elderly, functional status

Introduction

We live in a world where people live longer than ever. This improved life expectancy has resulted in an increase in the proportion of the aged population in all the countries; but most importantly, the current pace of increment is considerably faster than ever before. This rapid increase in the aged population will result in a higher proportion of the elderly to adults of the working-age population and it is predicted that by 2025, the proportion will be around 17.5% in India. However, in spite of the increase in the overall life expectancy, the healthy life expectancy has not improved proportionately. The healthy life expectancy in India is around 56 years for males and 57 years for females whereas the actual life expectancy is much higher in both sexes. To achieve a healthy life, the quality of life including autonomy, financial independence, and functional ability supported by the availability of a good health care system are important. But an increase in the proportion of elderly individuals in the population is bound to evoke considerable challenges to the public health care system as health care resources...
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There are already limited in India. There is an inequitable distribution of the existing public health care system and individuals often have to bear high out-of-pocket expenditure for their ailments. In addition to that around 90% of the elderly in India do not possess any form of social security schemes and mostly depend on family for health care expenditure.[3] The present trend of change in the family structure, from large joint families to smaller nuclear families among the working-age population, will further limit the support base for the elderly people.

The maintenance of good health of the elderly population is important for society and the country as a whole. Functional ability is an important part of good health and quality of life, reflecting the capability of performing tasks necessary for daily activities without any help. The ability to perform activities of daily life (ADL) is a commonly used measure to determine the functional status among the elderly which indicates the level of coordination between the neural and motor functions. The assessment of the use of aids/assistive devices for daily activities is also necessary to measure the quality of life. Presently in West Bengal, 8.5% of the total population is of the elderly age group, of which 68 and 32% reside in rural and urban areas, respectively.[8] Out of all the older adults, around 13.5% need assistance with their daily activity in the rural areas of West Bengal.[7]

There are almost no data at present regarding the functional status of the elderly in urban communities of West Bengal. Most of the studies regarding ADL-related functional ability among the elderly have been reported from high-income developed countries. Age, gender, education, economic status, presence of chronic diseases, and support system are important factors associated with functional ability.[8] In India, most of the studies related to the functional ability of the elderly have explored the factors in rural settings. Representative estimates from the urban population are also needed as these populations are different from the rural population in terms of the various sociodemographic parameters and pattern-chronic diseases. The assessment of the functional status and use of aids in older adults at the community level is important to identify the pattern of support needed for rehabilitation or reinforcement adaptation in daily living, and most importantly, for the planning of community- or family-based comprehensive geriatric health care services.

In this study, we wanted to estimate the prevalence and factors associated with functional impairment among the elderly people residing in an urban community, along with the assessment of the morbidity profile and pattern of using common aids like hearing, visual, locomotor, or dental aids.

Methods

Study design and setting: A community-based cross-sectional analytical study was conducted during March 2021 in the urban field practice area of a medical college in Kalyani. It is one of the earliest planned cities of India and is located 50 km away from the metropolitan city of Kolkata, West Bengal. The municipality area is divided into 21 ward/block areas—all similar in sociodemographic and economic characteristics, and caters to a population of around one lakh. There are 2 urban primary health centers and 10 sub-centers in the municipality.

Study participants: All older adults/elders (aged ≥60 years) residing in the ward/block areas of the Kalyani Municipality, district Nadia, West Bengal, for at least the past 1 year were eligible to participate in the study. The elderly with a problem in comprehension and unable to communicate were excluded from the study.

Sample size and sampling method: Considering the expected prevalence of functional impairment as 32.5%, with a 95% CI, 4.5% of absolute precision, and 20% of nonresponse rate, the sample size was calculated to be 520.[9] The list of households was obtained from the Kalyani Municipality. There are a total of 22,100 households/families (in residential complexes or flats) in the study area and all are having a unique number provided by the municipality. Around 6,125 households were listed with at least an eligible participant and this served as the sampling frame. The study households were selected through simple random sampling using a computer-generated sequence from the sampling frame.

Study tool: An interview was conducted using a structured questionnaire, which had three parts. The first section comprised the sociodemography, including details about financial dependence. The morbidity profile was ascertained in the second section. The individuals taking treatment currently for hypertension and diabetes were considered to have the diseases. Anthropometry measurements such as weight and half-arm span were taken with height being estimated from arm span for calculating the body mass index (BMI).[10] The third part collected details regarding their usage of aids and measured functional impairment using the Katz index.[11] The questionnaire was translated into the vernacular language (Bengali) and was cross-checked by back translating to English. It was pretested in 30 residents and modified accordingly.

Data collection: Data were collected using trained medical social workers under the supervision of resident doctors of the Department of Community Medicine and Family Medicine. They were sensitized regarding the objectives of the study, confidentiality of information, participants’ rights, and informed consent, and were also trained to administer the questionnaire to the participants. Data were collected house-to-house using standard precautions and if any house was locked, then the next house was approached. The participants were contacted only once for the study and data collection took place three times a week. If any house had more than one eligible participant, then, one of them was selected using a lottery method.

Ethical approval: Ethical approval was obtained from the Institute Ethics Committee (IEC) (Reference number:
Informal consent was taken before the questionnaire was administered to the study participants.

**Statistical analysis:** Data were collected using EpiCollect version 5.0 and analyzed using Stata version 14 (Stata Corp, College Station, TX, USA). Descriptive statistics were mean and standard deviation (SD) for continuous variables and proportions for categorical variables. The outcome variable for the analysis was stratified as "presence of functional impairment" (by combining moderate and severe impairment—Katz index 3-4 and <3, respectively) and "no impairment" (Katz index >4). Functional impairment was expressed as proportion with 95% CI. The Chi-square test was performed to identify the factors associated with functional impairment and variables with P value < 0.2 were considered for regression to assess the independent effects. We used generalized linear model command with family Poisson and log link for calculating the adjusted prevalence ratio (aPR) with a 95% CI. A P value of <0.05 was considered statistically significant.

### Results

A total of 520 households were contacted, out of which 457 were included in the study. Rest 63 individuals refused to participate citing preoccupied commitments as the reason, making the response rate 87.9%.

The mean (SD) age was 69.0 (7.3) years with 52.1% (n = 238) being males. The sociodemographic and morbidity characteristics of the study participants are described in Table 1. Of the total, 71.9% (n = 329) were graduates, 64.3% (n = 294) were currently married, and 82.5% (n = 377) were staying in their own house. On being asked if they needed financial help to meet their monthly expenses, 12.3% (n = 56) answered “yes.” Regarding comorbidities, 51.6% (n = 236) were obese (BMI ≥ 25.00 kg/m²), 54.9% (n = 251) had hypertension, and 24.1% (n = 110) had diabetes.

A total of 34 participants had functional impairment making the prevalence to be 7.4% (95% CI: 5.21–10.24). Out of the 34 individuals, 23 (50.5%) and 11 (2.4%) had severe and moderate functional impairment, respectively. The most common aid or appliance used was spectacles or lenses (n = 427, 93.4%) followed by denture (n = 92, 20.1%).

Age, gender, marital status, house ownership, financial dependence, BMI, hypertension, and usage of hearing, walking, and denture aid were associated with an increased prevalence of functional impairment [Table 2]. In adjusted analysis, functional impairment was significantly eight times (aPR 8.26, 95% CI: 2.50–27.28) and thrice (aPR 3.85, 95% CI: 1.44–10.31) more common among the oldest-old (≥85 years) and middle-old (75-84 years) age group, respectively, compared to the youngest-old (60–74 years) age group. Similarly, functional impairment was significantly more prevalent among the underweight (BMI <18.50) and among the individuals using walking sticks—dependent of all other factors [Table 2].

### Discussion

The population in developed as well as developing countries is aging rapidly but at a different pace. This is because of the increase in life expectancy. The global life expectancies are predicted to rise to 83 years in developed regions and 75 years in less developed regions by 2050.[23] However, the gap in life expectancies between these two regions is narrowing faster as...
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the life expectancy in developing countries is increasing more rapidly in comparison to the developed countries. This rapid rise in the proportion of the elderly population is going to eventually create a huge burden on the health, economy, and social system of India because this is occurring in the context of the existing disparities of family income and access to health care.[13] With the increase in life expectancy, the quality of life is being recognized as a more relevant index of health status than the length of survival. The functional ability has been recognized as a good leading indicator of health status in older adults and one of the major determinants of quality of life.[14]

In this study, we found the overall prevalence of functional impairment to be 7.4%; it is more common in the oldest-old...
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(≥85 years of age) and the middle-old age group (75–84 years of age) compared to the young-old individuals (60–74 years of age). According to our study result, every 1 in 10 older adults has moderate to severe functional limitation as per the ADL score. This is in contrast with the previous study findings as higher numbers were reported in other parts of the country in rural settings. However, the difference in numbers can be attributed to the characteristics of the study population, geographical region, time, and method of outcome assessment. Our study population was adequately educated (almost 72% have education beyond class 12th standard) and mostly were financially independent (87.7%). Education and economic status have been established as major factors affecting ADL-related scores. This can also be seen as a result of the effective implementation of the existing national policies for the elderly by concerned government agencies. The introduction of several state-specific elderly schemes like Bridhashree Yojana, mobile medical units, and rapid scale-up of Central Government schemes like the National Program for Health Care of the Elderly (NPHCE) might be an influence on such improvement.

However, more large-scale studies involving older adults from urban, rural, tribal areas, and living in old age homes/institutions are required before reaching any such conclusion. We did not find any significant difference in the ADL score with gender, in contrast to most of the other studies. It has been reported that the usual gender difference found in the elderly Indian population is mainly due to the difference in education, financial conditions, and presence of chronic disease. The absence of significant differences in education, economic status, or chronic morbidities to gender in our study population explains the findings.

We found that BMI is an important factor significantly associated with functional limitation apart from increasing age. The elderly population who are underweight (BMI <18.5) have a four times higher prevalence of functional restriction. This is a unique finding because in most of the studies obesity, especially in women, had been reported with functional limitations. Although due to the cross-sectional methodology of our study, we cannot comment on the causal relationship between low BMI and functional ability in the elderly, but sarcopenia and reduced muscle strength related to low BMI are important causes of difficulty in daily activities among older adults. Also, the reduced functional ability can give rise to low BMI causing deficiency in nutrition due to difficulty in cooking, eating, or provisioning essential diets. Irrespective of the functional limitation being a cause or effect of low BMI, it is well established that skeletal muscle mass gradually decreases after 45 years of age due to increased catabolism associated with aging, or gradual loss of motor neuron, or lower level of steroid hormone, and reduced protein intake. At present, though it is not determined the exact point at which the skeletal muscle falls below the threshold level, resistance exercise is proven to be beneficial to slow the age-associated sarcopenia, and identification of older persons at risk of decreased muscle strength may help in this context.

Another factor that is closely associated with functional limitation is the use of assistive devices to carry out daily activities. We found that the most common aid used by our study population was spectacles or lenses followed by the denture. This is in concordance with another study in India. The functional impairment was significantly associated with the use of walking sticks to carry out daily activities. Older adults using walking sticks were more than three times more prevalent in the functional impairment group compared to people not using them. Studies have reported that decreased neuromotor function or muscle strength associated with aging increases the fear of falls and elderly individuals become less confident without assistive devices to carry out daily work. The use of walking devices increases the body base support and helps in physical function. But an improper walking aid may increase the energy demand, and exert a negative impact on coordination causing musculoskeletal pain and abnormal posture in a vicious cycle. So, comprehensive assessment with planned rehabilitation is necessary to ensure the right use of assistive devices, and it should be an important part of the health promotion and prevention strategy of older adults.

The notable strengths in our study are the following: First, our study adds to the limited literature available on the prevalence and factors associated with functional impairment among older adults in India. The community-based nature of the study, large sample size, probability sampling, high response rate, and usage of the validated questionnaires are added advantages of the study. All these factors together enable valuable comparisons with other elderly cohorts across India and other similar settings.

Our study has several important implications for clinical and public health practitioners. The findings in our study will be very much useful for the creation of a common language about the individual functional status of all the clinical practitioners involved in geriatric care. The extent of the burden and the associated factors found in our study can provide important information for the policymakers for devising appropriate intervention plans in high-risk groups. This can be handled by integrating the geriatric healthcare services with the routine healthcare delivery and subsequently will also ensure that the vulnerable older adults undergo early rehabilitative measures for improving their functional status.

However, our study has certain limitations. Since this was a cross-sectional study, a causal relationship cannot be inferred. The inclusion of only community-dwelling older adults can underestimate the prevalence of functional impairment as we could not include those people in old age homes or institutions. Though the Katz index is a validated scale, it does not evaluate advanced ADLs like shopping, heavy housework, telephoning, and managing finances. We also acknowledge the fact that there is considerable controversial reporting on BMI as an appropriate measure for older people and the BMI may not appropriately represent the body composition of the elderly population.

**Conclusion**

The burden of functional impairment is low (7.4%) among older adults in the urban area of West Bengal, India.
Functional impairment is prevalent more among elders who are underweight (BMI <18.5 kg/m²) and those who use walking aids, and its burden increases with advancing age. Visual aid (93.4%) followed by an artificial denture (20.1%) were the commonly used aids. Further longitudinal studies are needed to identify the factors causally associated with functional impairment among older adults. This will help in the early identification of “at-risk” individuals and community-based rehabilitation programs can be planned to achieve healthy and independent aging among them.

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Conflicts of interest
There are no conflicts of interest.

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