

## Assessment of functional disability among a group of slum-dwelling elderly women in Kolkata, West Bengal

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### KEYWORDS

Activities of daily living, psychological distress, aging, combined risk factors

### ABSTRACT

*The world population has been greying rapidly over the decades that increases the proportion of individuals with deteriorating functional health. It poses greater old-age dependency; and affect quality of life and overall well-being of elderly people. With this backdrop, the present study attempts to understand the burden of aging and associated risk factors on slum-dwelling elderly women of Kolkata. This study included a total of 511 women of age 60 years and above living in slum areas under Kolkata Municipal Corporation. Self-designed schedules were used to obtain information regarding socio-economic condition, physical activity level and social engagement. Bengali version of General Health Questionnaire-28 was canvassed to evaluate level of psychological distress. Katz and Lawton Activities of Daily Living scales were used to assess functional disabilities in study population. Results depicts that the prevalence of both basic and instrumental functional disability was higher among the study population, 60.7 and 60.7%, respectively. The prevalence remains high among the elders of age above 80 years. The other potential risk factors related to functional limitations are non-involvement in gainful works, lower level of daily activities and distressed psychological health. The risk of disabilities increases several times due to the combined effect of working status and daily activities for bADL, and psychological health status and age for iADL. Therefore, the study suggests that involvement in daily works and psychological health status helps to mitigate deteriorating functional capabilities in old age.*

### Introduction

Over the years, the elderly population is increasing at an unprecedented rate worldwide (National Institute of Health 2016). It is assumed that every nation has to go through the phase of population aging- sooner or later. The proportion of the world's aged population at the very beginning of this century was about 11% which is likely to double by the mid-21st century (Gupta et al. 2014; Liu et al. 2020). A similar trend of population aging has been encountered in India also. At present, 8.6% of the total Indian population aged 60 years and above which is expected to approach 20.6% by 2050 (Alam et al. 2014). The consequences posed by the increasing number of older people in the population are enormous. For the low-middle income countries like India, the challenges are even more because of the heterogeneity and huge population density.

Aging is a complex and irreversible process that brings with it many degenerative changes in body structure and function. The most common age-related deterioration is the loss of functional ability that leads to increased physical dependency (Vaish et al. 2020). Functional disability is defined as an acquired inability or difficulty in performing necessary tasks for independent living (Vaish et al. 2020; Keshari

and Shankar 2017; Liu et al. 2020). It comprises the incompetence to carry out basic everyday works as well as more complex instrumental activities for daily living, includes bathing, feeding, transferring, continence, household works, laundry, responsibility of medication, management of finance and some others (Katz et al. 1963; Lawton and Brody 1969; Chen and Chippendale 2017). With the expansion of life expectancy in human, the issues related to functional disability is assuming greater relevance.

Functional disability is a multi-factorial process and is the resultant of not only age but also interactions of different factors such as socio-economic condition, lifestyle behavior, perception and environmental factors (Yonamine et al. 2016; Lollar and Crew 2003; Wahrendorf et al. 2013). Functional ability is one of the major determinants of quality of life and overall well-being, especially for older people (Medhi et al. 2019). It is also related to disease burden and adds upon higher utilization of healthcare services (Gupta et al. 2014; Sathya and Premkumar 2020). An intense level of support and care is required for the elderly with disabilities to sustain their livelihood (Travis et al. 2004; World Health Organization, 2016). Although, in the changing socio-cultural milieu where nuclear family structure dominates, the elderly support system often found to be compromised (Keshari and Shankar, 2017).

In India, the prevalence of functional disability is quite high that remains higher among female elders (Usha et al., 2020; Burman et al. 2019; Sakharkar and Sakharkar, 2015; Ohri et al. 2014). The causes and outcomes of functional disability widely vary between populations due to the vast socio-economic and ecological diversity in India. Although the information on functional disability among resource-poor elderly of India is very limited. To address these issues, the present study attempts to determine the burden of functional disability and explore potential risk factors associated with functional limitations in a group of slum-dwelling elderly women in India.

## **Materials and methods**

### ***Study design and participants***

The present study was conducted in slum areas under Kolkata Municipal Corporation, West Bengal, India, during 2016 to 2018. This was a cross-sectional study undertaken in non-clinical participants. Total thirty slum clusters from five Kolkata municipal wards (ward number 7, 8, 15, 27 and 28) were purposively selected based on operational convenience and ethnic homogeneity. A complete enumeration method was applied to include maximum number of participants in this study. Initially, a list of women aged 60 and above was prepared from the electoral list of the respective wards. A total 620 individuals were approached by door-to-door visit; of these, 109 individuals either refused to participate, were unavailable at the time of taking the interview, not in good health to take part or deceased recently. Hence, this study was ended with a total of 511 Hindu elderly women of age 60 years or above, those provided consent to voluntarily participate in this study.

Informed consent was obtained from each of the participants and local political leaders were informed about the study prior to data collection. The ethical committee of the Indian Statistical Institute provided the formal ethical approval of this study.

### ***Data collection***

Each of the participants was interviewed directly by one of the authors (AG) at the residence of the participants. Data have been collected using pre-designed and standard schedules that were

methodologically translated to Bengali considering the literacy level of elderly in slums.

A socio-demographic schedule had been developed to apprehend the basic characteristics of study participants that include age of the participant at the time of interview (in completed years), working status, educational attainment and family expenditure (in Indian rupees). Age of the participants was categorized into three groups viz. 60-69, 70-79,  $\geq 80$  years following the classification of National Policy of Older Persons in India (1999). In this study, working status indicates the involvement in gainful works; thus, the individuals those gainfully employed were labelled as 'working' and others as 'non-working' groups. Educational status was broadly divided into two groups i.e. 'literate' or 'non-literate'.

Bengali adoption of General Health Questionnaire-28 (GHQ-28) was canvassed in the present study to assess the occurrence of psychological distress among the participants (Goldberg, 1978). This instrument contains likert type questions that measured psychological distress in terms of somatic symptoms, anxiety or insomnia, social dysfunction and depression. The cumulative score obtained from the responses was further divided into two groups viz. presence or absence of distress based on the population specific mean value of 52 (16.7 SD).

The aspect of social engagements has been assessed through self-designed questions. The questions regarding the participation and communication with their family and community members demonstrated the level of social engagement of elderly participants. Overall, the responses were presented in dichotomous form as 'yes' or 'no' social engagement.

Daily physical activities of the participants along with the time of involvement in those activities will be noted. The total duration of physical activities on a usual day was recorded in minutes, which later converted into hours per day and categorized as less than one hour, one to three hours and more than 3 hours based on the data types.

The Katz Index of Independence of Activities of Daily Living (bADL) was used to assess basic functional abilities of the participants (Katz et al. 1963). This instrument measures functional adequacy in terms of six basic activities of everyday life such as feeding, bathing, transferring, toileting, dressing and continence. Disability or dependency in any one of these activities demonstrated basic functional disability of the participant.

Similarly, the Lawton Instrumental Activities of Daily Living Scale (iADL) was used to assess the independent living skills that are more complex than the basic activities (Lawton and Brody 1969). A modified form of Lawton iADL scale was applied in this present study where the assessment was done based on four broader domains namely household chores, laundry, transportation, and responsibility of own medication and management of finance/possessions. Disability or dependency in any one of these activities demonstrated instrumental functional disability of the participant.

### ***Data analysis***

The data analysis was done on PASW Statistics (Predictive Analytics Software) version 18.0 (IBM Corporation, 2009). Descriptive statistical analysis such as relative frequency, mean and standard deviation was used to ascertain the basic characteristics of study variables. The bivariate inferential statistical analysis such as Chi-square test (for categorical variable) and Mann-Whitney U test (for continuous

variable) was performed to evaluate the relationship of the variables such as socio-demographic, psychological distress, social engagement and duration of physical activity with functional disability (i.e. bADL and iADL). The variables that showed statistically significant association with bADL and iADL were further included as predictor variables in logistic regression models. Two ordinal logistic regression models were developed to identify significant predictors of bADL and iADL, respectively; and it also depicts the nature of relationship between these variables. Furthermore, the interaction effect of these predictor variables on the increase/decrease of the occurrence of bADL and iADL disability was also examined. Therefore, two logistic regression models were developed considering disability in bADL and iADL as dependent variables, and pair-wise interaction of predictors were included as independent variables in these models. Only the clusters of predictor variables that have significant influence on functional disabilities were presented in this study. For all the logistic regression models, values of odds ratio (OR) present the probability of an individual being functionally disabled with respect to a predictor variable. The value of Nagelkerke  $R^2$  (or pseudo  $R^2$ ) shows the amount of variance explained by the regression model. A probability value of less than 0.05 was considered statistically significant for all statistical methods.

## Results

**Table 1:** Characteristics of participants according to basic and instrumental activities of daily living

Variables		Total N(%) / Mean(SD)	Disability in bADL	p-value	Disability in iADL	p-value
<b>Socio-demographic profile</b>						
Age (in years)	60-69	321(62.8)	177(55.1)	0.000*	169(52.6)	0.000*
	70-79	129(25.2)	82(63.6)		92(71.3)	
	80+	61(11.9)	51(83.6)		51(83.6)	
Educational status	Non-literate	330(64.6)	202(61.2)	0.769	209(63.3)	0.135
	Literate	181(35.4)	109(60.0)		103(56.6)	
Working status	No	350(68.5)	234(66.9)	0.000*	241(68.9)	0.000*
	Yes	161(31.5)	76(47.2)		71(44.1)	
Monthly family expenditure <sup>a</sup> (in INR)		7231.5±3817.8	7291.3±3661.4	0.397	7657.4±4063.1	0.002*
<b>Psychological distress</b>	No	225(44.0)	113(50.2)	0.000*	118(52.4)	0.000*
	Yes	287(56.0)	198(69.0)		194(67.6)	
<b>Social engagement</b>	No	46 (9.1)	30(65.2)	0.522	33(71.7)	0.112
	Yes	462(90.9)	279(60.4)		276(59.7)	
<b>Duration of physical activity (in hours)</b>	<1	303(59.3)	202(66.7)	0.000*	205(67.7)	0.000*
	1-3	178(34.8)	99(55.6)		96(53.9)	
	>3	30(5.9)	10(33.3)		10(33.3)	

\*significant at  $p \leq 0.05$ ; <sup>a</sup> a Mann-Whitney U test

bADL= Basic Activities of Daily Living; iADL=Instrumental Activities of Daily Living

Table 1 presents the basic characteristics of study participants. The average age of the participants was 67.89 years (7.9 SD). Majority of the participants were aged 60 to 69 years (62.8%) and the number of participants aged above 80 years was nearly 11.9%. An overwhelming proportion of elderly from this study has no formal education (64.6%). About one-third of the participants (31.5%) were involved in

gainful employment. On average participants have a monthly family expenditure of INR 7231.5 (3817 SD). The prevalence of psychological distress was 56% as observed from this study. Also, 90.9% of the participants have social engagements. Most of the participants (59.3%) did not perform physical activity for more than one hour on a usual day.

On the other hand, the result also depicts that functional disability was significantly higher among adults of age 80 years and above, both in terms of basic and instrumental activities of daily living. Working status of the participants also showed a statistically significant association with functional disability where more non-working elders showed difficulty in basic and instrumental activities for daily living. Monthly family expenditure significantly affects the instrumental activity status of participants, only. Moreover, functional disability was reported more frequently among the participants with psychological distress; 69.0% and 67.6% of the elders having disability in basic and instrumental ADL were psychologically distressed, respectively. The elderly participants those have no social engagement were relatively more functionally disabled. Again, the functional disability exhibited statistically significant association with the duration of physical activity where the prevalence of both bADL and iADL was found to decrease with increased involvement in daily works (*Table 1*) (Fig. 1 and Fig. 2).

The most common form of basic functional disability observed among the elderly participants was incontinence. Nearly 59% of the participants completely lose their ability of bowel and bladder control. Whereas, dependency for transferring or ambulating from one position to another and walk constitutes another frequently reported functional disabilities that found only among 9.2% of participants (Fig. 1).

It is apparent from Fig. 2 that most of the older women completely depend on others for their medication and management of finance or possessions (52.5%). Nearly one-third of participants found to depend on others for household activities (35.7%) and laundering (35.9%).

**Table 2:** Logistic regression explaining relationship between significantly associated predictors and functional disabilities

Variables	Disability in bADL		Disability in iADL	
	OR (95% CI)	p-value	OR (95% CI)	p-value
<b>Age (80+ years)</b>				
60-69	0.362 (0.2 to 0.8)	0.007*	0.321 (0.2 to 0.7)	0.003*
70-79	0.433 (0.2 to 1.0)	0.039*	0.649 (0.3 to 1.5)	0.295
<b>Working status (Yes)</b>				
No	1.695 (1.1 to 2.6)	0.013*	1.904 (1.2 to 2.9)	0.003*
Monthly family expenditure	---		1.000 (1.0 to 1.0)	0.003*
<b>Psychological distress (Yes)</b>				
No	0.524 (0.4 to 0.8)	0.001*	0.629 (0.4 to 0.9)	0.019*
<b>Duration of physical activity (&gt;3 hours)</b>				
<1	2.433 (1.0 to 5.7)	0.042*	2.243 (0.9 to 5.3)	0.066
1-3	1.969 (0.8 to 4.6)	0.122	1.585 (0.7 to 3.8)	0.297
R <sup>2</sup>	12.3		0.170	

\*significant at  $p \leq 0.05$ ; OR=Odds Ratio; CI=Confidence Interval; Categories of predictor/independent variables in parenthesis represents reference groups

The logistic regression models determine the significant predictors of basic and instrumental ADL. The models were statistically significant,  $\chi^2=48.5$  and  $p<0.001$  for bADL, and  $\chi^2=63.3$  and  $p<0.001$  for iADL. The models explained 12.3% and 17.0% of variance for bADL and iADL, respectively (*Table2*).

The significant predictors related to limitations on basic ADL were age of the participants, working status, psychological distress and lower daily physical activity level. The elderly below 80 years of age were 0.362 (60-69 years of age) and 0.433 (70-79 years of age) times less prone to have basic functional disability. The elders those were physically active for less than one hour and did not involve in gainful works have nearly two times more risk of occurrence of basic functional disability. Also, the risk of basic functional disability decreased 0.524 times among the elders who did not have psychological distress (*Table2*).

The significant predictors of instrumental ADL were age (60-69 years), working status, monthly family expenditure and psychological distress. The adults of age 60-69 years were less likely to have functional limitations than their senior age counterparts. The risk of functional disability increased with increase in monthly family expenditure and among non-working elderly participants. Again, the risk of instrumental functional disability decreased 0.629 times among the elders who did not have psychological distress (*Table2*).

**Table 3:** Interaction effect of significant predictors on functional disabilities

Variables	OR (95% CI)	p-value
<b>Disability in bADL</b>		
Non-working and Duration of physical activity <1 hrs.	28.818 (0.8 to 5.9)	0.009*
Non-working and Duration of physical activity 1-3 hrs.	40.286 (1.1 to 6.3)	0.006*
Non-working and Age of 60-69 yrs.	0.036 (-5.9 to -0.7)	0.011*
Non-working and Age of 70-79 yrs.	0.071 (-5.3 to -0.0)	0.050*
R <sup>2</sup>	0.166	
<b>Disability in iADL</b>		
No psychological distress and Duration of physical activity 1-3 hrs.	0.059 (-5.5 to -0.2)	0.035*
No psychological distress and Age of 60-69 yrs.	7.957 (0.2 to 4.0)	0.031*
Non-working and Monthly family expenditure <sup>#</sup>	1.000 (3.5 to 0.0)	0.015*
R <sup>2</sup>	0.236	

\*significant at  $p\leq 0.05$ ; #Continuous variable

*Table 3* additionally illustrates the impact of significant pairs of predictor variables in terms of the functional disability on bADL and iADL. The models explained 16.6% and 23.6% of the variance for bADL and iADL, respectively. The degree of the relationship varies for each pair of the predictor variables; here only the pairs with significant impact on functional disability were presented.

The highest odds ratio (nearly 40 times) of the occurrence of basic functional disability was observed for the elders those were not involved in gainful works (non-working) as well as less physically active (duration of activity upto 3 hours in a usual day). Also, non-working status along with duration of physical activity for less than an hour increased the odds of having basic functional limitations about 28 times. However, the risk of disability was found to be less for the non-working elderly those aged below 80 years (*Table 3*).

The paired interaction of duration of physical activity, working status, age, monthly expenditure and psychological distress showed significant contribution to the occurrence of disability in iADL. A higher odds ratio (around 8 times) was observed for the combination of non-distressed psychological health conditions and younger age group (60-69 years). Although, the absence of psychological distress along with involvement in physical activities for 1 to 3 hours per day has reduced the risk of instrumental functional limitations. Again, the increased monthly expenditure and non-working status of the elderly participants have significant impact on disability in iADL (*Table 3*).

## Discussion

In recent years the life expectancy at birth has increased worldwide and is expected to increase further in near future. It is well documented that the average lifespan of women is slightly more, so that, a strong preponderance of women has been observed in the elderly age group (Asfiryati and Andayani 2016). As a consequence of increasing elderly population, the number of individuals with functional disability also increased which causes more old age related dependency. Functional limitations in old age affect overall health and quality of life. Therefore, to mitigate the health complications, it is of utmost importance to identify the probable factors responsible for functional decline in older adults.

Overall, this present study suggests a higher prevalence of basic (60.7%) and instrumental (60.9%) functional disability among the elderly participants. The prevalence was even higher among elderly aged 80 years and above with a proportion of 83.6% for both basic and instrumental functional disabilities. The prevalence of functional disability in the study group was higher than those observed in previous studies. The prevalence of basic functional disability varies from 28% to 53.6% in different geriatric populations across India (Keshari and Shankar 2017; Usha et al. 2020; Burman et al. 2019; Sakharkar and Sakharkar 2015). Burman et al. (2019) also reported a lower prevalence of instrumental ADL, i.e. 59.3%, among rural elderly of West Bengal. Though few studies have found that assess the level of functional disability in slum living geriatric population. A study on slum-dwelling elderly in Dehradun suggests 7% and 19.5% prevalence of basic and instrumental ADL, respectively (Ohri et al. 2014). The findings of the present study corroborate with the findings from some other studies that exhibit a higher prevalence of functional disability among the oldest-old age group (80+ years) (Burman et al. 2019; Chakraborty 2018; Ohri et al. 2014). Bowel continence, and responsibility and management of finance were the most common form of disability found among study participants. Similarly, some other studies reveal that continence and climbing stairs are the most common basic disability; and ability to handle finance was the most common form of instrumental disability found in elders (Keshari and Shankar 2017). However, a slum based study indicates bathing and dressing (basic), and using of telephone (instrumental) were the most prevalent disabilities of elderly women (Ohri et al. 2014). The restrictions on bADL and iADL have significantly increased with increasing age of the participants. Similar result was obtained by Ćwirlej-Sozańska et al. (2019) in a study based in Poland. Another study from India indicates higher prevalence of functional disability among the elderly women that have increased with age among those living alone and having chronic diseases (Gupta et al. 2014). Some other studies from developed countries showed lower prevalence of functional disability among older adults (Hairi et al.

2010; Chaudhry et al. 2010; Yoshida et al. 2012; Ćwirlej-Sozańska et al. 2019).

In the present study, it was found that the basic and instrumental ADL have significantly associated with working status, duration of physical activity and psychological wellbeing. The occurrence of disability in bADL and iADL has increased about two times among the elders who were less physically active and did not involve in gainful works. Some other studies from Brazil and India suggest similar findings where they observed lower risk of disability among the working elderly people (Gupta et al. 2014; Virtuoso Júnior et al. 2015). Another study by Virtuoso Júnior et al. (2012) has shown that physical activity was one of the significant predictors of functional disability and involvement in physical activity for more than 4 hours a week helps to maintain functional ability in old age. The present study shows that the prevalence of functional limitations was marginally higher among the elders those did not have any social engagement. A geriatric population based study highlighted the positive impact of social activities on psychological well-being and functional abilities (Ćwirlej-Sozańska et al. 2019). On the other hand, this study found that the risk of disability increased due to distressing psychological health conditions. A study based on slum-dwelling elderly in Mumbai supported the findings of present study where they mentioned psychological distress as a major contributor of functional disability (Subbaraman et al. 2014).

Additionally, this study found the pairs of factors that increased the risk of functional disability of older people. Particularly, the combinations of factors that increased the risk of basic functional disability were non-involvement in gainful works and lower duration of daily physical activity (upto 3 hours). Also, the combination of the non-involvement in gainful works along with increased monthly expenditure affected the likelihood of iADL disability among elderly participants. Interestingly, this study found that the interaction effect of non-distressed psychological health conditions and being at an early phase of aging (aged between 60-69 years) have increased the likelihood of iADL impairment than their counterparts. As an explanation of this, it can be inferred that there may be some other factors that affect the outcome of this paired interaction. Moreover, this study also found that the restriction in basic activities gets reduced among the non-working elderly of age below 80 years; and iADL limitations reduced among non-psychotic elders who involved in daily activity for one to 3 hours per day. However, no studies have encountered so far that evaluate the combination or interactions of probable factors on functional disability among slum living elderly. Ćwirlej-Sozańska et al. (2019) in a study on elderly population of Poland attempt to identify the combined effect of different factors on functional limitations. They suggest that environmental barriers as well as multi-morbidity increased the risk of disability in basic activities; whereas, increased pain level and age above 75 years increased the risk of disability in instrumental activities. In this case, it is difficult to compare the findings of the present and other studies due to the differences in data components.

The observations of the present study highlighted the disabilities in activities encountered by elderly women in everyday life. These limitations in functioning may increase their vulnerability. Therefore, the identification of individual and combination of factors responsible for this functional deterioration is the most important in the context of prevention and policy planning for elderly people.

## **Limitations**

Besides, the distinctiveness of this study in exploring the impact of pairs of risk factors on functional disability among a slum-dwelling geriatric group, there is some limitation which required to be addressed. First, this study portrayed the complications of elderly women only, which confined its generalizability to other populations. Second, this study deals with a few of the plethora of factors, thus, extensive



observation from multiple aspects may provide a broader scenario in this regard. The cross-sectional nature of this study may acknowledge as another limitation.

## **Conclusion**

This study revealed a higher prevalence of disability in basic and instrumental Activities of Daily Living among a group of slum living elderly women. The potential factors related to functional limitations are age, current working status, duration of daily activities and psychological health condition. Even, the combined effect of these factors increases the likelihood of disabilities multiple folds. The findings of this study comprehended the magnitude of functional limitations that attributed to the long-term exposure in stressful and vulnerable environmental conditions in slums.

The present study demonstrates the relevance of understanding functional capabilities of rapidly growing elderly population, especially among the backward and resource-poor sectors of the society. However, more extensive researches will be required in this field to develop appropriate preventions for the restoration of functional health and to provide elderly with an active lifespan.

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### ***Authors' contributions***

*Both the authors contributed to conceptualize the study. AG carried out the data collection, contributed to data presentation, interpretation and drafted the manuscript. SM designed the framework of the study and helped in correction of the manuscript. With approval and agreement from both the authors the final manuscript is processed to be published.*

### ***Conflict of interest***

*The authors declared no conflict of interest.*

## References

- Alam, M., Mazumdar, S., Chakravarty, I., Yadav, P. (2014). *The Status of Elderly in West Bengal, 2011*. India: United Nations Population Fund.
- Asfiryati, and Andayani, L. S. (2016). "Analysis of Elderly Women's Needs in Slum." In *Advances in Health Sciences Research (PHICo 2016)*, 376-381. *Atlantis Press*. <<https://doi.org/10.2991/phico-16.2017.3>>, accessed January 17, 2020.
- Burman, J., Sembiah, S., Dasgupta, A., Paul, B., Pawar, N., Roy, A. (2019). "Assessment of poor functional status and its predictors among the elderly in a rural area of West Bengal." *Journal of mid-life health* 10(3):123.
- Chakraborty, P. 2018. "Activities of Daily Living among the Oldest-old People: A Rural Urban Study." *Journal of Advanced Research in Humanities and Social Science* 5(1):1-4.
- Chaudhry, S.I., McAvay, G., Ning, Y., Allore, H.G., Newman, A.B., Gill, T.M. (2010). "Geriatric impairments and disability: The cardiovascular health study." *J Am Geriatr Soc* 58:1686-92.
- Chen, S. W., Chippendale, T. (2017). "Factors associated with IADL independence: implications for OT practice." *Scandinavian journal of occupational therapy* 24(2):109-115.
- Ćwirlej-Sozańska, A., Wiśniowska-Szurlej, A., Wilmowska-Pietruszyńska, A., Sozański, B. (2019). "Determinants of ADL and IADL disability in older adults in southeastern Poland." *BMC geriatrics* 19(1):1-13.
- Goldberg, D. (1978). *Manual of the General Health Questionnaire*. Windsor: National Foundation of Educational Research.
- Goswami, A. K., Kalaivani, M., Nongkynrih, B., Kant, S., Gupta, S. K. (2019). "Disability and its association with sociodemographic factors among elderly persons residing in an urban resettlement colony, New Delhi, India." *PloS one* 14(9):e0222992.
- Government of India. (1999). *National Policy for Older Persons (NPOP)*. New Delhi: Ministry of Social Justice and Empowerment, Shastri Bhawan. <<http://socialjustice.nic.in/writereaddata/UploadFile/National%20Policy%20for%20Older%20Persons%20Year%201999.pdf>>, Accessed January 13, 2020.
- Gupta, P., Mani, K., Rai, S.K., Nongkynrih, B., Gupta, S.K. (2014). "Functional Disability among Elderly Persons in a Rural Area of Haryana." *Indian J Public Health* 58(1):11-16.
- Hairi NN, Bulgiba A, Cumming RG, Naganathan V, Mudla I. (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.
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). "Studies of illness in the aged: the index of ADL: a standardized measure of biological and psychosocial function." *Jama* 185(12):914-919.
- Keshari, P., Shankar, H. (2017). "Prevalence and spectrum of functional disability of urban elderly subjects: A community-based study from Central India." *Journal of family & community medicine* 24(2): 86.
- Lawton, M. P., Brody, E. M. (1969). "Assessment of older people: self-maintaining and instrumental activities of daily living." *The gerontologist* 9(3\_Part\_1):179-186.
- Liu, H., Jiao, J., Zhu, C., Zhu, M., Wen, X., Jin, J., ... & Xu, T. (2020). "Potential associated factors of functional disability in Chinese older inpatients: a multicenter cross-sectional study." *BMC geriatrics* 20(1):1-12.
- Lollar, D.J., Crews, J.E. (2003). "Redefining the role of public health in disability." *Annu Rev Public Health* 24:195-208.
- Medhi, G. K., Sarma, J., Pala, S., Bhattacharya, H., Bora, P. J., Visi, V. (2019). "Association between health related quality of life (HRQOL) and activity of daily living (ADL) among elderly in an urban setting of Assam, India." *Journal of family medicine and primary care* 8(5):1760.
- Ministry of Statistics and Programme Implementation. (2016). *Elderly in India*. National Sample Survey Office, Govt of India.
- National Institutes of Health. (2016). *World's older population grows dramatically*. <<https://www.nih.gov/news-events/news-releases/worlds-older-population-grows-dramatically>>, accessed on March 16, 2021.
- Ohri, P., Gupta, S. K., Upadhyai, N. (2019). "A study of daily living dependency status among elderly in an urban slum area of Dehradun." *Indian Journal of Community Health* 26(4):417-422.
- Ran, L., Jiang, X., Li, B., Kong, H., Du, M., Wang, X., ..., Liu, Q. (2017). "Association among activities of daily living, instrumental activities of daily living and health-related quality of life in elderly Yi ethnic minority." *BMC geriatrics* 17(1):74.
- Ribeiro, E. H. C., Garcia, L. M. T., Salvador, E. P., Costa, E. F., Andrade, D. R., Latorre, M. D. R. D. D., Florindo, A. A. (2017). "Assessment of the effectiveness of physical activity interventions in the Brazilian Unified Health System." *Revista de saude publica* 51:56.
- Sakharkar, P., Sakharkar, V. (2015). "Functional Status and Difficulty in Activities Of Daily Living Among Aging Population

- Of India." *Value in Health* 18(3):A151. <<https://doi.org/10.1016/j.jval.2015.03.878>>, accessed on March 14, 2021.
- Sathya, T., Premkumar, R. (2020). "Association of functional limitations and disability with elder abuse in India: a cross-sectional study." *BMC Geriatr* 20:220. <<https://doi.org/10.1186/s12877-020-016193>>, accessed on March 10, 2021.
- Subbaraman, R., Nolan, L., Shitole, T., Sawant, K., Shitole, S., Sood, K., ... Patil-Deshmukh, A. (2014). "The psychological toll of slum living in Mumbai, India: a mixed methods study." *Social Science & Medicine* 119:155-169.
- Travis, L. A., Lyness, J. M., Shields, C. G., King, D. A., Cox, C. (2004). "Social support, depression, and functional disability in older adult primary-care patients." *The American Journal of Geriatric Psychiatry* 12(3):265-271.
- Usha, P., Kishore, S., Singh, M., Aggrawal, P., Jain, B., Gawande, K. (2020). "Assessment of Activities of Daily Living (ADL) in elderly population." *Indian Journal of Community Health* 32(2).
- Vaish, K., Patra, S., & Chhabra, P. (2020). "Functional disability among elderly: A community-based cross-sectional study." *Journal of family medicine and primary care* 9(1):253.
- Virtuoso Júnior, J. S., Tribess, S., Paulo, T. R. S. D., Martins, C. A., Romo-Perez, V. 2012. "Physical activity as an indicator of predictive functional disability in elderly." *Revista latino-americana de enfermagem* 20(2):259-265.
- Virtuoso Júnior, J. S., Martins, C. A., Roza, L. B., Paulo, T. R. S. D., Ribeiro, M. D. C. L., Tribess, S. (2015). "Prevalence of disability and associated factors in the elderly." *Texto & Contexto-Enfermagem* 24(2):521-529.
- Wahrendorf, M., Reinhardt, J.D., Siegrist, J. (2013). "Relationships of Disability with Age Among Adults Aged 50 to 85: Evidence from the United States, England and Continental Europe." *PLoS One* 8(8):1.
- Wallace, M., Shelkey, M. (2008). "Kartz index of independence in activities of daily living (ADL)". *American Journal of Nursing* 108(4):67-71.
- World Health Organization. (2015). Global Age-Friendly Primary Health Care (PHC) Centers Toolkit. <[http://www.who.int/ageing/active\\_ageing/en/index.html](http://www.who.int/ageing/active_ageing/en/index.html)>, accessed on March 12, 2021.
- World Health Organization. (2015). World Report on Ageing and Health. Geneva: World Health Organization.
- Yonamine, C. Y., Matsuo, T., Souza, R. K. T. D., Loch, M. R., Cabrera, M. A. S. (2016). "Functional disability for mobility in adults: a population-based study." *Fisioterapia em Movimento* 29(3):449-459.
- Yoshida, D., Ninomiya, T., Doi, Y., Hata, J., Fukuhara, M., Ikeda, F., ... Kiyohara, Y. (2012). "Prevalence and causes of functional disability in an elderly general population of Japanese: The Hisayama study." *Journal of epidemiology* 22(3):222-229.

## Images

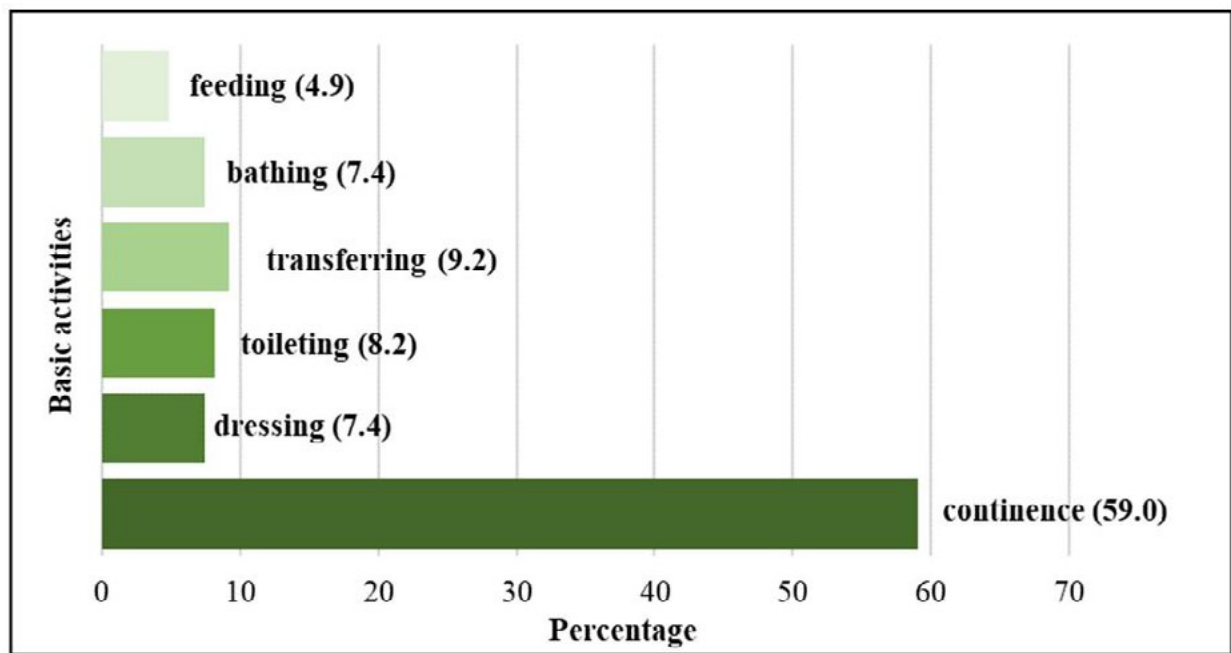


Figure 1: Functional disability in terms of Basic Activities of Daily Living

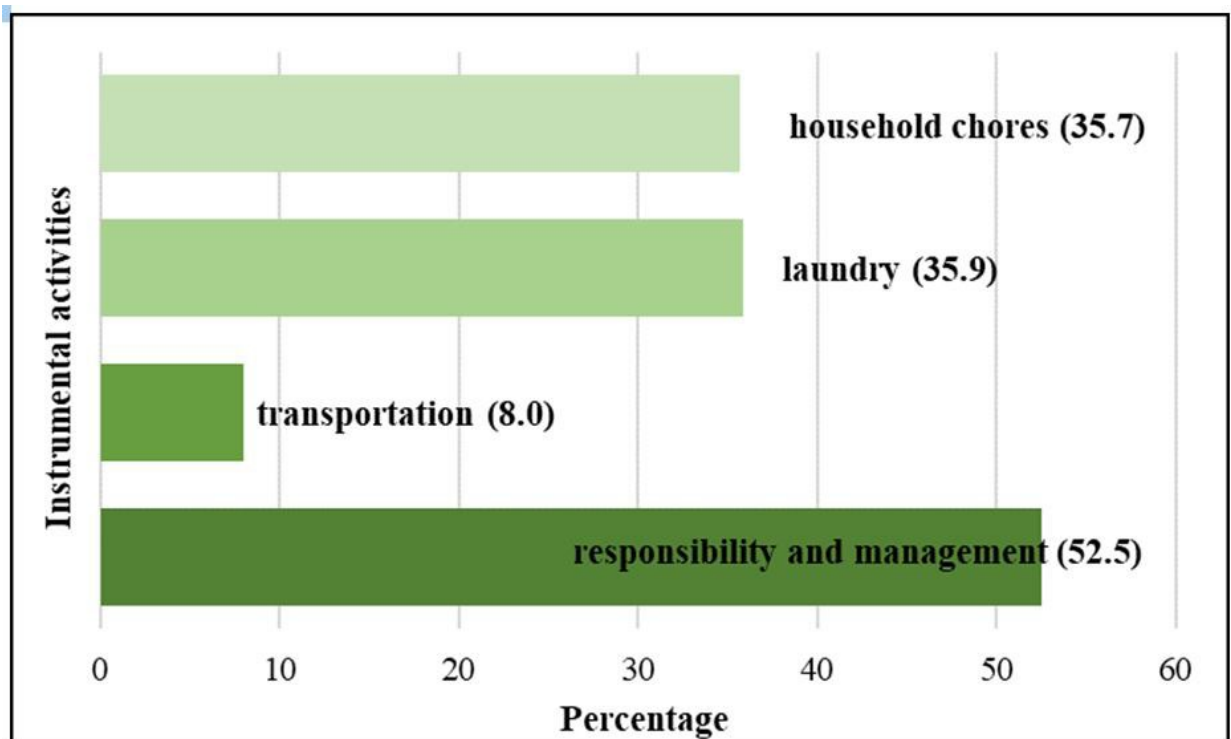


Figure 2: Functional disability in terms of Instrumental Activities of Daily Living