Prevalence and Determinants of Activity of Daily Living and Instrumental Activity of Daily Living Among Elderly in India

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Abstract

Background: The increase in life expectancy has proliferated the number of elderly and subsequently increased the prevalence of disability among the elderly. This study assesses the prevalence of Activity of Daily Living (ADL) and Instrumental Activity of Daily Living (IADL) and analyzed determinants of ADL and IADL among elderly aged 60 and over living in India.

Methods: The study utilized the Longitudinal Ageing Study in India (LASI, 2017-18) data, and information was sought from 31,464 elderly aged 60 years and above. An index of ADL and IADL was created on a scale of three levels, exhibiting no, moderate, or severe levels of ADL/IADL disability. Multinomial logistic regression was used to determine the effect of sociodemographic parameters on ADL and IADL disability among the elderly.

Results: Around 3 percent of the elderly reported severe ADL disability, and 6 percent elderly reported severe IADL disability. Elderly who were not involved in any physical activity than their counterparts were more likely to report severe ADL (RRR=2.68, C.I.=1.66-4.32) and severe IADL (RRR=2.70, C.I.=1.98-3.67) than no ADL and no IADL, respectively.

Conclusion: Amidst the study finding, the study emphasizes the importance of setting-up of geriatric care centres in rural and urban areas. It would be feasible to provide geriatric care under the umbrella of already functioning government health facilities in different parts of the country. Community interventions earmarking the elderly with a focus on physical activity, specifically when they are based in group physical exercise and implemented through existing networks, are rewarding for the elderly.

Background

Globally, the life expectancy at birth has increased from 66.5 years in 2000 to 72 years in 2016 (Patel et al., 2019). On the back of improvements in the educational system, health facilities, and life expectancy, the percentage of elderly in India had risen from 5.3 percent in 1971 to 5.7 percent in 1981 and further from 6 percent in 1991 to 8 percent in 2011 [1]. Furthermore, the decline in fertility levels and increase in life expectancy has led to an increase in an absolute number of elderly in India [2]. Ageing across the countries has been increased for more than 35 years on policy discourse [3]. However, the focus across countries was on demographic transition instead of ageing [4]. The developed countries have moved ahead in providing both healthy and quality life to their citizens than developing countries [5].

Over 1 billion (15%) individuals worldwide have experienced one or more disability conditions. The global trends among the ageing population and the risk of disability lead to a higher disabled population [6]. The higher disability rates result from health risks across various diseases, chronic illness, and injury [1]. Globally, a person with disabilities faces many hindrances in their life. It includes attitudinal, environmental, and institutional barriers which prevent their full participation in any aspects of life [6]. Agenda 2030 for Sustainable Development pledges that no one will be left behind. Its integral part is to promote and protect older adults’ rights and dignity and facilitate their full support in society [7]. India is a country where different religions and cultures co-exist; a country where the traditions constructed by the society have the upper hand still believes in the joint family system, which is closely knit.

India's population is ageing with an increase in the number and proportion of older adults in its population. This phenomenon is expected to have significant implications and demands care in terms of health and financial security. While 8% of India's population was in the age group 60 and above as per Census 2011, it is likely to increase to nearly 20% by 2050 [1]. With this count, the responsibility lies in prioritizing the required services for them concomitant by the social protection for the older adults, protecting senior citizens' rights, and providing them with the practical opportunities to contribute efficiently in the development sector.

The contemporary household settings, especially in the more urbanized localities where different generations are co-residing and where the household lady is bestowed to take care of the senior citizens. The loneliness and insecurity are often felt by the older adults in India due to the decreased inter-generational bonding and changing lifestyles. With the efforts to reduce gender disparity and, eventually, the females contributing equally to economic development and less involvement in the household chores, older adults often feel neglected by their young caregivers. In the 21st century, the low and middle-income countries have experienced an upward shift in life expectancy [6]. Thus, it leads to an increase in longevity and leads to multiple comorbidity conditions, commonly referred to as 'multimorbidity condition', and has become more common among the older adult population [8]. Both high and low-income countries show that older adults are at high risk for multiple chronic diseases [9–11].
Socioeconomic status is strongly associated with the prevalence of morbidity where the socioeconomic status is measured through education \[12–13\], occupation \[14\], income \[15\], or whether it is found to be an area-based deprivation \[16\]. A study focused on East-Mediterranean countries, a review of 26 studies on multimorbidity, resulted in a low level of education, low income, and unemployment associated with the higher prevalence of multimorbidity among older adults \[17\]. It is also associated with adverse health outcomes like reduced physical function \[18\], poor quality of life \[19\], and self-rated health as poor \[20\] and mortality \[21\].

Many studies were conducted for older adults, which measured their functional performance through self-reported activities of daily living (ADL) and instrumental activities of daily living (IADL) based on their daily activities. However, unfortunately, the tools do not provide a clear picture of the actual functional capacity of an older person \[22\]. Thus, in this study, we have tried to examine various indicators among the older adults of India. The indicators include gender, age, education, marital status, living arrangement, place of residence, wealth index, health insurance, use of tobacco (self-rated health), and physical activity performed by the older adults. All these indicators will be measured through activities of daily living (ADL) and instrumental activities of daily living (IADL) disability conditions basically through three categories: severe ADL disability, moderate ADL disability, and no ADL disability. Therefore, these crops up the requirement of understanding the burden felt by the new generation, their views about taking care of the older adults, the contribution of the older adults dependents in the household activities/resources, and the coping mechanisms adopted by the caregivers to lessen their burden. The study results are expected to help implement efficient and effective policies and programs to address the issues and challenges faced by older adults and inculcate them with the need for care.

**Methods**

**Ethical Considerations:**

This study is based on secondary data available in public domain. Anyone can access the data without any legal or ethical considerations. Therefore, there is no ethical approval required for this study as this study did not involve human or animal participants directly. However, the Indian Council of Medical Research (ICMR) provided the ethical approval for conducting the LASI survey. Also, informed consent was provided to the participants before undertaking the survey.

To maximize the cooperation of the sampled HHs and individuals, participants were provided with information brochures explaining the purpose of the survey, ways of protecting their privacy, and the safety of the health assessments as part of the ethics protocols. As per ethics protocols, consent forms were administered to each HH and age-eligible individual. In accordance with Human Subjects Protection, four consent forms were used in the LASI: Household Informed Consent, Individual Informed Consent, Consent for Blood Samples Collection for Storage and Future Use (DBS), and Proxy Consent. As part of the ethics protocols, participants were also provided with biomarker results report cards and referral letters if participant health measurements were outside the normal range.

**Data**

We used the data from the Longitudinal Ageing Study of India (LASI), wave one, a longitudinal survey of the older men and women age 45 years and above in India. The LASI is the first-ever survey in India that provides comprehensive data on health, economics, and social determinants and the consequences of population ageing in all 35 states (except Sikkim) and union territories in India. The survey has used a multistage stratified area probability cluster sampling design to cover an appropriate sample of the elderly. LASI is a nationally representative survey of 72,250 older adults and above, which plan for every two years for the next 25 years with refreshment samples for attrition due to death, dislocation, non-contact, and refusal. Our study was concerned with 31,464 elderly aged 60 years and above.

**ADL Disability and IADL Disability**

Activities of daily living (ADL) and instrumental activities of daily living (IADL) disability were self-reported scores of functional limitations recorded over more than three months. These functional problems that occurred in the last less than three months were excluded from the study. The ADL scale was considered from five indicators: bathing, dressing, mobility, feeding, and toileting. Further, ADL has been categorized into three categories as “severe ADL disability,” “moderate ADL disability,” and “No ADL disability.” Severe ADL ability considered as those elderly who were not able to do in any of five activities, moderate ADL disability included
those elderly who could not function in less than five activities, and no ADL disability includes elderly who were able to perform in all five activities [23].

Further, the IADL scale [24] covered seven instrumental activities: preparing a hot meal (cooking and serving), shopping for groceries, making telephone calls, taking medications, doing work around the house or garden, managing money, such as paying bills and keeping track of expenses and getting around or finding an address in an unfamiliar place. Similarly, the IADL disability has been categorized into three categories as “severe IADL disability,” “moderate IADL disability,” and “no IADL disability.” Severe IADL disability includes those elderly who could not do any of seven activities; moderate IADL disability included those elderly who could function less than seven activities. No IADL disability had to those elderly who were able to perform in all seven activities.

Covariates

The covariates included sex (male and female); age (60–69 and 70 years and above); marital status (Currently married; never married; education (No education; below primary; primary; secondary; higher); living arrangements (living alone, with spouse and with others), place of residence (rural and urban); wealth index (poorest, poorer, middle, richer and richest); covered with health insurance (yes and no); use of tobacco (yes and no); self-rated health (poor and good) and physical activities (yes and no).

Statistical Analysis

Data were analyzed using STATA version 16. Bivariate analyses were carried out to investigate the prevalence of ADL and IADL disability by sociodemographic parameters. Further, multinomial logistic regression was used to determine the effect of sociodemographic parameters on ADL and IADL disability among the elderly. Multinomial logistic regression is used in categorical dependent variable/s found with two or more unordered levels. The outcome of multinomial logistic regression comes in terms of relative risk ratio (RRR), which is the probability of choosing one outcome category over selecting the baseline category. The equation of multinomial logistic regression is;

\[
RRR = \frac{P(y = 1 \mid x + 1)P(\text{base category} \mid x + 1)}{P(y = 1 \mid x)/P(\text{base category} \mid x)}
\]

Where RRR is the relative risk ratio, and P is the probability of occurrence. If the RRR is equal to 1, then the association between the response variable to the exposed group are unlikely to exist, when RRR > 1 then increases the risk of response variable among the exposed group and when RRR < 1 then decreases the risk of response variable among the exposed group.

Results

Figure 1 depicts the prevalence of ADL among the elderly. More than two-thirds (78%) of the elderly did not report any ADL disability. Around one-fifth (19%) of the elderly had moderate ADL disability, and the remaining 3 percent had severe ADL disability.

Figure 2 depicts the prevalence of IADL among the elderly. More than half (52%) of the elderly did not report any IADL disability. Around two-fifth (42%) of the elderly had moderate IADL disability, and the remaining 6 percent had severe IADL disability.

Table 1 depicts the background characteristics of the elderly population. Nearly 47.5 percent of the sample consisted of male elderly, and the remaining (52.5) consist of female elderly. Nearly 62 percent of the elderly were married at the time of the survey, and more than one-third (37.2%) were divorced/-separated/widowed. More than half of the elderly (56.5%) had no education. Nearly 6 percent were living alone, and three-fifths (60.9%) were living with spouse. Around four-fifths (81.8%) of the elderly were not covered by any health insurance.
Table 1
Characteristics of total sample of elderly by sociodemographic parameters in India

|                      | N     | %    |
|----------------------|-------|------|
| **Sex**              |       |      |
| Male                 | 14,931| 47.5 |
| Female               | 16,533| 52.6 |
| **Age**              |       |      |
| 60–69                | 18,410| 58.5 |
| 70+                  | 13,054| 41.5 |
| **Marital status**   |       |      |
| Currently married    | 19,536| 62.1 |
| never married        | 225   | 0.7  |
| divorced/separated/deserted | 11,703 | 37.2 |
| **Education**        |       |      |
| No Education         | 17,782| 56.5 |
| Below primary        | 3,598 | 11.4 |
| Primary              | 3,520 | 11.2 |
| Secondary            | 5,285 | 16.8 |
| Higher               | 1,278 | 4.1  |
| **Living arrangement** |     |      |
| Living alone         | 1,787 | 5.7  |
| With spouse          | 19,176| 60.9 |
| With others          | 10,501| 33.4 |
| **Place of residence** |     |      |
| Rural                | 22,196| 70.6 |
| Urban                | 9,268 | 29.5 |
| **Wealth Index**     |       |      |
| Poorest              | 6,829 | 21.7 |
| Poorer               | 6,831 | 21.7 |
| Middle               | 6,590 | 21.0 |
| Richer               | 6,038 | 19.2 |
| Richest              | 5,175 | 16.5 |
| **Covered with health Insurance** | | |
| Yes                  | 5,685 | 18.2 |
| No                   | 25,477| 81.8 |
| **Use of tobacco**   |       |      |
| No                   | 18,665| 59.8 |
| Yes                  | 12,539| 40.2 |
| **Self-rated health** |     |      |
| Poor                 | 4,630 | 15.0 |
| Good                 | 26,181| 85.0 |
| **Physical activity** |     |      |
| Yes                  | 9,704 | 31.1 |
| No                   | 21,494| 68.9 |
| **Total**            | 31,464| 100  |

Table 2 depicts the prevalence of ADL and IADL among the elderly by various background characteristics. A higher percentage of female elderly had severe ADL disability (3.5% vs. 2.8%) and severe IADL disability (7.5% vs. 4.2%) than their male counterparts. Similarly, a higher percentage of elderly aged 70+ had severe ADL disability (5.7% vs. 1.4%) and IADL disability (11.1% vs. 2.3%)
than elderly who were 60–69 years of age. Around 6.5 percent of the never-married elderly had severe ADL disability. A higher percentage of uneducated elderly had severe ADL disability (2.9% vs. 1.9%) and severe IADL disability (4.6% vs. 1.6%) than elderly who had higher education. Furthermore, severe ADL and IADL disability were more prominent among rural elderly, poorest elderly, those who were not covered by health insurance, who had poor self-rated health and were not involved in any physical activity than their respective counterparts.
Table 2
prevalence of ADL disability (severe, moderate and no ADL disability) and IADL disability (severe, moderate and no IADL disability) among elderly by sociodemographic parameters in India

|                  | ADL Disability |       |       | IADL Disability |       |       |
|------------------|----------------|-------|-------|-----------------|-------|-------|
|                  | Severe ADL disability | Moderate ADL disability | No ADL Disability | Severe IADL disability | Moderate IADL disability | No IADL Disability |
| Sex              | Male            | 2.8   | 16.8  | 80.4            | 4.2   | 34.6  | 61.2 |
|                  | Female          | 3.5   | 21.6  | 74.9            | 7.5   | 49.4  | 43.1 |
| Age              | 60–69           | 1.4   | 15.2  | 83.4            | 2.3   | 38.5  | 59.1 |
|                  | 70+             | 5.7   | 25.1  | 69.1            | 11.1  | 48.0  | 41.0 |
| Marital status   | Currently married | 2.3   | 17.0  | 80.7            | 3.9   | 37.8  | 58.4 |
|                  | never married   | 6.5   | 13.3  | 80.2            | 9.4   | 37.1  | 53.6 |
|                  | divorced/...    | 4.6   | 23.2  | 72.3            | 9.3   | 50.3  | 40.5 |
| Education        | No Education    | 3.9   | 21.2  | 75.0            | 8.1   | 48.6  | 43.3 |
|                  | Below primary   | 2.9   | 24.8  | 72.4            | 4.6   | 44.5  | 50.9 |
|                  | Primary         | 2.5   | 16.1  | 81.4            | 3.8   | 33.8  | 62.5 |
|                  | Secondary       | 1.9   | 13.3  | 84.8            | 2.0   | 30.5  | 67.4 |
|                  | Higher          | 1.9   | 10.7  | 87.4            | 1.6   | 21.7  | 76.7 |
| Living arrangement | Living alone     | 2.5   | 23.6  | 73.9            | 5.7   | 53.8  | 40.5 |
|                  | With spouse     | 2.3   | 16.9  | 80.8            | 3.8   | 37.6  | 58.6 |
|                  | With others     | 4.8   | 22.9  | 72.3            | 9.8   | 49.3  | 40.9 |
| Place of residence | Rural          | 3.3   | 20.0  | 76.7            | 6.8   | 44.8  | 48.4 |
|                  | Urban           | 3.0   | 17.6  | 79.4            | 3.9   | 36.6  | 59.5 |
| Wealth Index     | Poorest         | 4.1   | 20.4  | 75.5            | 7.6   | 42.8  | 49.7 |
|                  | Poorer          | 3.0   | 19.8  | 77.2            | 5.7   | 44.0  | 50.3 |
|                  | Middle          | 2.9   | 19.3  | 77.8            | 5.8   | 40.1  | 54.1 |
|                  | Richer          | 2.5   | 17.9  | 79.6            | 4.8   | 43.9  | 51.3 |
|                  | Richest         | 3.4   | 18.7  | 77.9            | 5.5   | 41.2  | 53.3 |
| Covered with health Insurance | Yes | 2.3   | 15.5  | 82.2            | 3.9   | 39.5  | 56.6 |
|                  | No              | 3.4   | 20.2  | 76.4            | 6.4   | 43.2  | 50.4 |
| Use of tobacco   | No              | 3.4   | 19.0  | 77.7            | 6.2   | 43.2  | 50.7 |
|                  | Yes             | 2.9   | 19.9  | 77.3            | 5.6   | 41.5  | 53.0 |
| Self-rated health | Poor            | 7.9   | 33.6  | 58.5            | 13.9  | 53.4  | 32.7 |
|                  | Good            | 1.6   | 16.5  | 82.0            | 3.5   | 40.6  | 55.9 |
| Physical activity | Yes             | 0.9   | 13.5  | 85.6            | 1.7   | 37.1  | 61.2 |
|                  | No              | 4.2   | 21.9  | 73.9            | 7.8   | 44.9  | 47.2 |
Table 3 depicts the relative risk ratio computed from multinomial logistic regression for ADL and IADL among elderly by various background characteristics. Multinomial logistic regression has two reference categories; the first reference category is the base outcome for ADL and IADL (no ADL/no IADL), and the second reference category is that of respective background variable (For ex. Male is the reference category for background variable named ‘sex’). Since multinomial logistic regression has two reference categories, the results are to be understood while taking both the reference category together. Results found that female elderly than male elderly were 1.25 times (RRR = 1.25, C.I.=1.10–1.42) more likely to report moderate ADL disability than no ADL disability whereas, female elderly than male elderly were 1.70 times (RRR = 1.70, C.I.=1.35–2.14) more likely to report IADL disability than no IADL disability. Age is one of the strongest predictors of severe ADL and IADL among the elderly. Results found that higher educated elderly than uneducated elderly were less likely (RRR = 0.64, C.I.=0.48–0.87) to report moderate ADL as compared to no ADL. The urban elderly compared to rural elderly had a lower risk of reporting (RRR = 0.52, C.I.=0.41–0.65) severe IADL than no IADL. Elderly who were not covered with health insurance than their counterparts were more likely to report ADL disability (RRR = 1.49, C.I.=1.10–2.01) and IADL (RRR = 1.58, C.I.=1.23–2.03) than no ADL disability and no IADL disability, respectively. Elderly consuming tobacco than their counterparts were less likely to report severe ADL (RRR = 0.74, C.I.=0.56–0.98) than no ADL. Self-rated health is another significant predictor of ADL and IADL disability among the elderly. Elderly who reported good self-rated health than those who reported poor self-rated health were less likely to report severe ADL (RRR = 0.16, C.I.=0.13–0.21) and severe IADL (RRR = 0.18, C.I.=0.14–0.22) than no ADL and no IADL disability, respectively. Elderly who were not involved in any physical activity than their counterparts were more likely to report severe ADL (RRR = 2.68, C.I.=1.66–4.32) and severe IADL (RRR = 2.70, C.I.=1.98–3.67) than no ASL and no IADL, respectively.
Table 3  
Multinomial regression analysis for ADL and IADL disability among elderly in India

|                        | ADL Disability |                      |                      | IADL Disability |                      |                      |
|------------------------|----------------|-----------------------|-----------------------|----------------|-----------------------|-----------------------|
|                        | Severe ADL     | Moderate ADL          | Severe IADL          | Moderate IADL  | Severe IADL          | Moderate IADL          |
|                        | disability    | disability           | disability           | disability    | disability           | disability           |
| Relative risk          | (RRR)          | CI at 95 %            | Relative risk        | (RRR)          | CI at 95 %            | Relative risk        | (RRR)          | CI at 95 %            | Relative risk        | (RRR)          | CI at 95 %            | Relative risk        | (RRR)          | CI at 95 %            |
|                        | ratio          |                       | ratio                 |                |                       | ratio                 |                |                       | ratio                 |                |                       | ratio                 |                |                       |
| Sex                    | Male®          |                       |                       | Female         |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 0.90           | 0.68–1.18             | 1.25***               | 1.10–1.42      | 1.70***               | 1.35–2.14             | 1.63***               | 1.45–1.84             |
| Age                    | 60–69          |                       |                       | 70+            |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 3.16***        | 2.44–4.09             | 1.64***               | 1.46–1.84      | 4.76***               | 3.88–5.85             | 1.58***               | 1.40–1.79             |
| Marital status         | Currently married® |                       |                       | never married  |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 5.47**         | 1.26–13.73            | 0.45**                | 0.23–0.88      | 1.38                  | 0.39–4.77             | 0.79                  | 0.46–1.34             |
|                        | 2.34           | 0.84–6.46             | 0.69**                | 0.47–1.00      | 0.81                  | 0.37–1.77             | 0.96                  | 0.67–1.34             |
| Education              | No Education®  |                       |                       | Below primary  |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 1.04           | 0.63–1.70             | 1.38***               | 1.15–1.64      | 0.68                  | 0.46–0.99             | 0.91                  | 0.79–1.03             |
|                        | 0.73           | 0.49–1.07             | 0.84**                | 0.71–1.00      | 0.47***               | 0.34–0.65             | 0.59**                | 0.52–0.68             |
|                        | 0.61**         | 0.40–0.91             | 0.73***               | 0.59–0.89      | 0.28***               | 0.20–0.41             | 0.57***               | 0.45–0.72             |
|                        | 0.59           | 0.29–1.17             | 0.64***               | 0.48–0.87      | 0.26***               | 0.13–0.50             | 0.41***               | 0.29–0.59             |
| Living arrangement     | Living alone®  |                       |                       | With spouse    |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 3.05**         | 0.98–9.53             | 0.64**                | 0.42–0.96      | 0.92                  | 0.38–2.21             | 0.73                  | 0.50–1.06             |
|                        | 1.61**         | 0.97–2.69             | 1.00                  | 0.81–1.23      | 1.86***               | 1.28–2.70             | 1.01                  | 0.82–1.23             |
| Place of residence     | Rural®         |                       |                       | Urban          |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 1.05           | 0.79–1.39             | 0.90                  | 0.78–1.04      | 0.52***               | 0.41–0.65             | 0.76***               | 0.67–0.87             |
| Wealth Index           | Poorest®       |                       |                       | Poorer         |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                        | 0.70**         | 0.50–0.98             | 0.97                  | 0.82–1.12      | 0.79                  | 0.60–1.03             | 1.07                  | 0.94–1.20             |
|                        | 0.65**         | 0.46–0.91             | 0.97                  | 0.83–1.13      | 0.74**               | 0.55–1.00             | 0.94                  | 0.82–1.07             |
|                        | 0.58***        | 0.41–0.82             | 0.90                  | 0.75–1.06      | 0.71                  | 0.53–0.94             | 1.12                  | 0.94–1.33             |
|                        | 0.93           | 0.59–1.44             | 1.00                  | 0.82–1.21      | 0.94                  | 0.67–1.30             | 1.11                  | 0.93–1.31             |
| Covered                | Yes®           |                       |                       |                |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|                      | ADL Disability | IADL Disability |
|----------------------|----------------|-----------------|
| **with health insurance** |                |                 |
| No                   | 1.49***        | 1.10–2.01       |
|                      | 1.35***        | 1.18–1.53       |
|                      | 1.58***        | 1.23–2.03       |
|                      | 1.15**         | 1.02–1.29       |
| **Use of tobacco**   |                |                 |
| No®                  | 0.74**         | 0.56–0.98       |
|                      | 1.15**         | 1.03–1.28       |
|                      | 0.94           | 0.76–1.15       |
|                      | 1.08           | 0.98–1.18       |
| Yes                  |                |                 |
|                      | 0.16***        | 0.13–0.21       |
|                      | 0.39***        | 0.34–0.44       |
|                      | 0.18***        | 0.14–0.22       |
|                      | 0.48***        | 0.43–0.55       |
| **Self-rated health**|                |                 |
| Poor®                | 2.68***        | 1.66–4.32       |
|                      | 1.46***        | 1.27–1.67       |
|                      | 2.70***        | 1.98–3.67       |
|                      | 1.21***        | 1.09–1.35       |
| Good                 |                |                 |
|                      | 0.16***        | 0.13–0.21       |
|                      | 0.39***        | 0.34–0.44       |
|                      | 0.18***        | 0.14–0.22       |
|                      | 0.48***        | 0.43–0.55       |
| **Physical activity**|                |                 |
| Yes®                 |                |                 |
|                      | 0.16***        | 0.13–0.21       |
|                      | 0.39***        | 0.34–0.44       |
|                      | 0.18***        | 0.14–0.22       |
|                      | 0.48***        | 0.43–0.55       |
| No                   |                |                 |

**Note**: No ADL/IADL Disability is considered as base model

**Discussion**

Over the last few decades, India has witnessed a remarkable increase in life expectancy and a significant increase in the proportion of the elderly [25]. Unfortunately, a striking proportion of the elderly is more vulnerable to ageing, leading to poor well-being [26]. All this together lead to poor quality of life among the elderly. Therefore, understanding the determinants that affect the ADL and IADL is crucial in formulating the policy perspective. Hence, this study intends to determine the factors associated with ADL and IADL among the elderly in India and examined the prevalence of ADL and IADL among the Indian elderly.

Female elderly were more likely to have the risk of ADL and IADL limitation than male elderly. Previous studies are in line with the finding of this study [1, 27–30]. Studies worldwide have also shown that the female gender is one of the risk factors for disability in old age [31–32]. Female elderly are still neglected in terms of care with a minuscule focus on their health; it is due to gender-segregated behavioural activities in our society that makes female more vulnerable than male [30]. Researchers feel that gender discrimination in a male-dominated society like India makes females more vulnerable to the risk of disabilities [29]. Furthermore, women in India are more likely to ignore their health and are less likely to seek appropriate health care [33], which may further aggravate their risk of ADL and IADL [33–34]. Also, gender inequalities in the allocation of resources like education, income, political voice, nutrition, and health-care, are very strongly associated with poor health and reduced well-being [35–36]. A study noted that men were more likely to report needing help with cooking meals, doing laundry, and taking medicines. This has substantial weightage on why a higher percentage of older men report limitations with IADL than older women [37].

Age is another strongest predictor of poor ADL and IADL among the elderly. The study found that the risk of severe ADL and IADL increases with an increase in age of the elderly. Almost all the research in the literature arena concord with this finding [27, 38–41]; however, few studies stated that onset of disability can be a reversible event or can reduce overtime during the ageing process [42–43]. To corroborate with the findings of Hung et al. (2011) and Lin et al. (2012), it is imperative to be apprised of and address modifiable factors amalgamated with ADL and IADL [44]. A positive relationship between age and chronic disease suggests that chronic diseases among the elderly increase with an increase in their age [36]. Further, literature has established an association between chronic disease and ADL and IADL disability among the elderly [45–46].

The study noticed that the risk of disability was lower among the elderly with higher education than their uneducated counterparts. The Association between functional disability and the education status of the elderly is also well established [47–48]. Hu et al. (2005) believe that increased resource availability linked to higher education may ameliorate self-perception and decrease limitations with various health conditions [47]. The odds of severe IADL disability were lower among urban elderly than their rural counterparts. Previous studies agree with this study in finding that rural elderly tend to have a higher risk of IADL disability than their urban counterparts [40, 49]. Availability of better healthcare infrastructure in urban areas could be attributed to lower risk of IADL disability among urban elderly. In rural areas, the elderly depend more on family members or other people to manage their finances, payments, and purchases and avoid traveling to carry out these functions, leading to severe IADL among them [49]. Studies have
noted that the elderly in urban areas have better access to healthcare, availability of logistic support in transportation, and better financial support in the form of retirement benefits that keep them free from functional disabilities [46].

In reference to the elderly living alone, elderly living with spouse had higher risk of severe ADL disability. This finding inculpates that elderly living alone tends to help themselves by carrying out work required for daily living; therefore, these elderly are less likely to report severe ADL disability than those who live with their spouse. Further, those with good self-rated health had a lower risk of reporting severe ADL and IADL related disabilities than those who reported poor self-rated health. Previous studies also highlighted that poor self-rated health affect limitations related to ADL and IADL among the elderly [39, 50]. In connection with the possible relationship between self-rated health (SRH) and IADL, Tomioka, Karumatani, & Hosoi (2017) believe that older adults with better SRH may be more likely to engage in social activities that promote better outcomes for IADL among them [39].

The elderly who were not physically active had a higher risk of severe ADL and IADL disability than physically active ones. Studies have noted that physical activities improve ADL and IADL related disabilities among the elderly [44, 51]. Physical activity is the most efficacious preventive and therapeutic factor reducing the risk of physical and mental disorders and affecting the maintenance of independence in everyday life [52]. The safeguarding effect of physical activity on ADL disability is an outcome of complex pathways and is likely to be multifactorial [53]. To put that in perspective, being physically active has been linked to reducing inflammation biomarkers which further avert chronic disease. Further physical activity may increase social interactions preventing depression; all these pathways combining may prevent disability among the elderly [53].

Limitations And Strengths Of The Study

The study is not free from some potential limitations. The foremost limitation is the self-reporting of data related to ADL and IADL. However, several previous studies measured ADL and IADL through self-reporting data only [27, 49, 51]. Furthermore, information related to self-rated health was also self-reported. The self-reporting of critical information may have led to some biases that could have affected the study findings. Also, we could not establish causality between our study variables as the data were cross-sectional. However, such limitations do not comprise the results since the opted methodological procedures were enough to achieve the proposed objective. Despite the above limitations, the study has some considerable strengths too. The study is based on the latest data source that provides in-depth details about various parameters for the elderly in India. Furthermore, a pilot study was successfully carried out in 2010 to test the survey tools and protocols and to understand the ways to strengthen the process of the main survey, i.e., the current survey. The data were collected through the Computer-Assisted Personal Interview (CAPI) technique which ensures data quality through built-in checks in CAPI and real-time data monitoring with an automated data quality control protocol.

Conclusion

Disability is the best quality of life indicator as it captures both diseased and non-diseased persons and hence provides an unambiguous assessment of well-being than traditional morbidity and mortality data [32]. There is growing evidence that female gender and increasing age of elderly are the two important risk factors of disability. This study also determined female gender and increasing age of the elderly as the important risk factor for severe ADL and IADL disability. Furthermore, education, place of residence, health insurance, self-rated health, and physical activity also significantly impact the prevalence of ADL and IADL disabilities among the elderly in India, as outlined in this study. Even though governments have started to plan for the well-being of their ageing society in some developed countries, there remains a ubiquitous need to raise awareness about the importance of population ageing in India. Based on the study finding, it is suggested to give proper attention to female elderly. Amidst the study finding, the study emphasizes the importance of setting-up of geriatric care centers in rural and urban areas. It would be feasible to provide geriatric care under the umbrella of already functioning government health facilities in different parts of the country. Promoting physical activity among the elderly through various channels would bring the desired result. Community interventions earmarking the elderly with a focus on physical activity, specifically when they are based in group physical exercise and implemented through existing networks, are rewarding for the elderly [54].

Abbreviations

ADL
Activities of Daily Living

CAPI
Computer-Assisted Personal Interview

CI
Confidence Interval

IADL
Instrumental Activities of Daily Living

LASI
Longitudinal Ageing Study in India

RRR
Relative Risk Ratio

Declarations

Ethics and consent to participate: This study is based on secondary data available in public domain. Anyone can access the data without any legal or ethical considerations. Therefore, there is no ethical approval required for this study as this study did not involve human or animal participants directly. However, the Indian Council of Medical Research (ICMR) provided the ethical approval for conducting the LASI survey. Also, informed consent was provided to the participants before undertaking the survey.

Consent for publication: Not applicable

Availability of data and materials: The datasets generated and/or analysed during the current study are available with the International Institute for Population Sciences, Mumbai, India repository and could be accessed from the following link: https://iipsindia.ac.in/sites/default/files/LASI_DataRequestForm_0.pdf. Those who wish to download the data have to follow the above link. This link leads to a data request form designed by International Institute for Population Sciences. After completing the form, it should be mailed to: datacenter@iips.net for further processing. After successfully sending the mail, individual will receive the data in a reasonable time.

Competing Interest: The authors declare that they have no competing interests.

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Author's Contribution: The concept was drafted by SK and SC. SK contributed to the analysis design. SC advised on the paper and assisted in paper conceptualization. SC, RP, and RB contributed in the comprehensive writing of the article. All authors read and approved the final manuscript.

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**Figures**

**FIGURE 1: PREVALENCE OF ADL AMONG ELDERLY IN INDIA**

![Figure 1](image_url)

Figure 1
Prevalence of ADL among elderly in India No ADL disability, Moderate ADL disability, & Severe ADL disability