

SHORT ARTICLE

A Comparative Field Based Study of Katz and Barthel Indices in North Indian City of DehradunMegha Luthra¹, Kamal Singh Negi², Sudhir Kumar Gupta³^{1,2,3}Professor, Department of Community Medicine, SGRRIM&HS, Patel Nagar, Dehradun – 248001, Uttarakhand

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E Mail ID: drmeghaluthra@gmail.com**Citation**

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Background: Elderly persons are one of the most vulnerable groups of society and have more chances of disease and disabilities (restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being). It reflects how well an individual is able to function in general areas of life. Magnitude of disability has become an important indicator in measuring disease burden along with morbidity and mortality rates. Katz and Barthel Indices have been largely used to assess disability in activities of daily living among elderly people. **Aim & objectives:** This community-based cross-sectional study was conducted among persons aged 60 years and above in urban field practice area of SGRRIM&HS, Dehradun, Uttarakhand with the aim of comparing these two indices in community setting. The specific objectives were to find ADL dependence by both the indices, find the factors which significantly affect ADL dependence and to find the degree of agreement which is not by chance between Katz and Barthel Indices. **Material methods:** An interview schedule was developed and administered to participants in Hindi, by trained investigators. Information on age, marital status, living status education, occupation and economic dependence was recorded. House-to-house visits were conducted in the selected area to collect the data. All elderly persons residing in the selected area were included in the study. **Results:** Prevalence of ADL dependence was 8.23% as per Katz Index and 28.45% as per Barthel Index, taking a score of less than 20 for BI and less than 6 for KI as criterion for ADL dependence. That there is a moderate degree of agreement between Katz and Barthel Scores which is not by chance was estimated by Kappa Statistic. **Conclusion:** Katz Index is better suited for ADL estimation in a community setting.

Key Words

ADL; Katz; Barthel

Introduction

There has been a sharp increase in no. of people above 60 years of age, all over the world, in last few decades. All over the world, the number of elderly is projected to increase from 605 million in the year 2000, to 2 billion in 2050. The percentage of older persons in India is projected to increase to 19% in 2050 from 8% in 2012(1).

Elderly persons are one of the most vulnerable groups of society and have more chances of disease

and disabilities (limitation of or no ability to perform an activity considered normal for a human being). It reflects how well an individual is able to function in general areas of life. Magnitude of disability has become an important indicator in measuring disease burden along with morbidity and mortality rates (2). Katz and Barthel Indices have been largely used to assess disability in activities of daily living among elderly people.

Katz Index (KI) for assessing ability to perform ADL (Activities of Daily Living) in geriatric population is

easy to use and most effectively used in a variety of care settings (3). Barthel Index (BI) has also been recommended for functional assessment in older age group particularly in the hospital set up, but it has the following limitations:

1. The items on this index are too clear-cut to allow for variations in functional abilities of older individuals over a period of time, e.g. toileting items only look at the functions over the preceding week while these functions are capable of variation over a longer time span and may be influenced by environment and equipment available (4,5).
2. There is evidence that BI might be less reliable when older persons with cognitive impairment are interviewed (6).

Both these indices do not take into account potential measurement errors due to self-reported format (7). However, very few studies have been done to compare Katz Index versus the Barthel Index in the community setting especially in India. (3)

Aims & Objectives

1. To find ADL dependence by both the indices.
2. To find the factors which significantly affect ADL dependence.
3. To find the degree of agreement which is not by chance between Katz and Barthel Indices. This can lay to rest any remaining doubts about the efficacy of usage of KI in the community setting

Material and Methods

This study conducted among persons aged 60 years and above in urban field practice areas of SGRRIM&HS, Dehradun, Uttarakhand is a community based cross-sectional study. There are 13 colonies with a total population of 12,040 in this area. There is a record of all individuals residing in these colonies which is regularly updated with birth, death and migration data. The study was conducted from June 2015 to December 2015.

An interview schedule was developed and administered to participants in Hindi, by trained investigators. Information on age, marital status, living status education, occupation and economic dependence was recorded. Criterion for financial dependence was if he/she had personal income or monetary benefit from a social scheme that was sufficient to maintain himself/herself. The person was considered financially dependent, if dependent for expenses on other family members or income from any source was not sufficient to maintain

himself/herself. Pre diagnosed disease condition was recorded if the participant had a doctor's/ registered medical practitioner's prescription for hypertension, diabetes, coronary artery disease, renal insufficiency, chronic obstructive pulmonary disease (COPD) etc. Adequacy of treatment was judged on the basis of compliance to the prescribed regimen. Treatment was considered adequately taken if the subject was taking medicines as and when written by the doctor for the correct duration.

ADL dependence was defined, for the purpose of this study, as having dependence in activities of daily living as assessed by using Katz as well as Barthel ADL questionnaire. The participant was considered as ADL dependent if she/he had a score of less than 20 in Barthel questionnaire and less than 6 in Katz questionnaire.

House-to-house visits were conducted in the selected area to collect the data. All elderly persons residing in the selected area were included in the study. Older persons who had been living in the area for last 6 months were considered residents and included in the study. Living status was migratory/non migratory on the basis of residence of last 10 years. Temporary guests were excluded from the study. Participants who did not verbally consent to participate or who were not available in spite of three consecutive house visits were taken as non-responders and excluded.

Data was entered in SPSS version 23.0 and transferred to Epi info version 6.0 for statistical analysis. All socio-demographic variables, pre-diagnosed disease conditions, presence of treatment and adequacy of treatment were tested for association with ADL dependence. Chi Square test was applied as test of significance and Kappa statistic was calculated for assessing degree of agreement between KI and BI.

Results

A total of 485 elderly persons were interviewed out of which 254 (52.37%) were females and 231(47.63%) males. 381(78.56%) of the elderly belonged to age group of 60-74 years followed by 84 (17.32%) in age group of 75-84 years and 20 (4.12%) in age group of 85 years and above. 302(62.27%) elderly persons were married with 177 (36.49%) widows and widowers. 405 (83.51%) subjects had been living in the area for more than 10 years and 190 (39.18%) were financially independent. Proportion of ADL dependence was 8.23% as per

Katz Index and 28.45% as per Barthel Index, taking a score of less than permitted maximum in at least one of ADL listed in Katz or Barthel questionnaire as criterion for functional disability.

[Table 1](#) shows that when age groups were cross tabulated with Katz Index score, 6.29% of elderly in age group 60-74 year olds had some ADL dependence as compared to 15.48% of elderly in age group of 75-84 and 15.0% of elderly in age group 85 and above. As per Barthel Index score, 24.67% of elderly in age group 60-74 year olds had some ADL dependence as compared to 41.67% of elderly in age group 75-84 and 45.0% 85 and above age group subjects. This difference was statistically significant ($p < 0.05$).

[Table 2](#) shows that when living status was cross tabulated with Katz Index score, 15.0% migratory subjects had some ADL dependence as compared to 6.91% other subjects. [Table 3](#) shows that as per Barthel Index score, 62.5% migratory subjects had some ADL dependence as compared to 23.71% other subjects. This difference was found statistically significant ($p < 0.01$).

In this study 268 (55.26%) study participants reported a pre-diagnosed disease condition out of whom 220 (82.09%) were taking some treatment. Out of these 220, 146 (66.36%) were taking adequate treatment i.e. treatment as prescribed by a registered medical practitioner. [Table 4](#) shows that when pre diagnosed disease conditions were cross-tabulated with Katz Index score, 10.45% diseased subjects had some ADL dependence as compared to 5.53% apparently healthy subjects. [Table 5](#) shows that as per Barthel Index score, 36.94% diseased subjects had some ADL dependence as compared to 17.97% apparently healthy subjects. This difference was found statistically significant ($p < 0.05$, $p < 0.01$).

[Table 6](#) shows that as per Barthel Index score, 35.91% who were receiving treatment from registered medical doctor had some ADL dependence as compared to 22.26% subjects not receiving any treatment. This difference was found statistically significant ($p < 0.01$).

[Table 7](#) shows that when adequacy of treatment received was cross tabulated with Katz Index score, 13.03% subjects who taking treatment as prescribed by doctor had some ADL dependence as compared to 10.81% subjects not taking treatment as prescribed by doctor. [Table 8](#) shows that as per Barthel Index score, 45.21% who were taking treatment as prescribed by doctor had some

functional disability as compared to 39.19% subjects not taking treatment as prescribed by doctor. This difference was statistically significant ($p < 0.01$).

[Table 9](#) shows that there is a moderate degree of agreement between Katz and Barthel Scores which is not by occurred chance.

Discussion

The present study compares the prevalence of ADL dependence among elderly persons in urban area as determined by Katz and Barthel indices and also highlights the degree of agreement between these scores which is not occurred by chance. Various associations of ADL dependence with socio-demographic variables, pre-diagnosed disease conditions, presence and adequacy of treatment were also determined by using chi square test. The degree of agreement between Katz and Barthel indices was determined by applying Kappa Statistic. Prevalence of ADL dependence was 8.23% as per Katz Index and 28.45% as per Barthel Index. A search of relevant literature revealed that in a study from another hilly state of North India, prevalence of ADL disability by Katz Index was only 5.5% (8). In a study from Faridabad (Haryana), prevalence of functional disability (using Barthel index with presence of visual and hearing impairment) was 37.4% (2).

In a community-based study from West Bengal using only ADL scale, 16.16% elderly persons were found to be functionally disabled (9). Another community-based study from rural Tamil Nadu reported a prevalence of functional disability of 22% using the same scale and other impairment criteria (10).

A further reading into methodologies revealed that wide variation in prevalence is due to various scales used and sometimes inclusion of other criteria like vision and hearing impairment is there.

When age groups were cross tabulated with Katz Index score, 6.29% 60-74 year olds had some ADL dependence as compared to 15.48% 75-84 and 15.0% 85 and above age group subjects. On the other hand, as per Barthel Index score, 24.67% 60-74 year olds had some ADL dependence as compared to 41.67% 75-84 and 45.0% 85 and above age group subjects.

When living status was cross tabulated with Katz Index score, 15.07% migratory subjects had some ADL dependence as compared to 6.91% non-migratory subjects. On the other hand, as per Barthel Index score, 62.5% migratory subjects had some ADL

dependence as compared to 21.73% non-migratory subjects.

When pre diagnosed disease conditions were cross-tabulated with Katz Index score, 10.45% diseased subjects had some ADL dependence as compared to 5.53% apparently healthy subjects. On the other hand, as per Barthel Index score, 36.94% diseased subjects had some ADL dependence as compared to 17.97% apparently healthy subjects.

When treatment received was cross tabulated with Barthel Index score, 35.91% who were receiving treatment from had some ADL dependence as compared to 22.26% subjects not receiving any treatment.

When adequacy of treatment received was cross tabulated with Katz Index score, 13.03% subjects who taking treatment as prescribed by doctor had some functional disability as compared to 10.81% subjects not taking treatment as prescribed by doctor. On the other hand, as per Barthel Index score, 45.21% who were taking treatment as prescribed by doctor had some functional disability as compared to 39.19% subjects not taking treatment as prescribed by doctor.

Age, living status, pre diagnosed morbidity and adequacy of treatment received are significantly associated with Katz scores while age, living status, pre diagnosed morbidity, whether treatment is received and adequacy of treatment received are significantly associated and Barthel scores ($p < 0.05$). That there is a moderate degree of agreement between Katz and Barthel scores which is not by chance as estimated by of Kappa Statistic (11).

Conclusion

Prevalence of ADL dependence was 8.23% as per Katz Index and 28.45% as per Barthel Index, taking a score of less than 20 for BI and less than 6 for KI as criterion for ADL dependence. That there is a moderate degree of agreement between Katz and Barthel Scores which is not by chance as estimated by Kappa Statistic. Hence, as derived from observation of several previous authors and (12), Katz Index is better suited for ADL estimation in a community setting.

This underlines a need to strengthen health care facilities for the elderly persons. Community-based programs should have good share for prevention of disability and adequate treatment of chronic diseases. Management of chronic conditions should take care of the accompanying ADL dependence with

corresponding training of health workers to recognize and tell the patient how to deal with the same.

Recommendation

Katz index is more suited for use in a community setting for ADL dependence in geriatric age group.

Limitation of the study

Due to logistic constraints a rural urban comparison could not be carried out.

Relevance of the study

Removes doubt as to which index should be used in field for testing ADL dependence in geriatric age group.

Authors Contribution

ML: Concept Designing, acquisition, analysis, interpretation of data; KSN: Drafting Article and critically reviewing manuscript; SG: Final approval of the manuscript.

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Tables

TABLE 1 AGE VERSUS KATZ SCORE

Age	Katz Score		Total
	6	0-5	
60-74	357 (93.71)	24 (6.29)	381 (100.0)
75-84	71 (84.52)	13 (15.48)	84 (100.0)
>=85	17 (85.0)	03 (15.0)	20 (100.0)
Total	445 (91.75)	40 (8.25)	485 (100.0)

Chi Square: 8.917 p<0.05

TABLE 2 LIVING STATUS VERSUS KATZ SCORE

Living Status	Katz Score		Total
	6	0-5	
Migratory	68 (85.0)	12 (15.0)	80 (100.0)
Non migratory	377 (93.09)	28 (6.91)	405 (100.0)
Total	445 (91.75)	40 (8.25)	485 (100.0)

Chi Square: 5.773 p< 0.05

TABLE 3 LIVING STATUS VERSUS BARTHEL SCORE

Living Status	Barthel Score		Total
	20	0-19	
Migratory	30 (37.5)	50 (62.5)	80 (100.0)
Non migratory	317 (48.27)	88(21.73)	405 (100.0)
Total	347 (71.55)	138(28.45)	485 (100.0)

Chi Square: 53.3 p<0.01

TABLE 4 PRE-DIAGNOSED MORBIDITY VERSUS KATZ SCORE

Pre-diagnosed Morbidity	Katz Score		Total
	6	0-5	
Yes	240 (89.55)	28(10.45)	268 (100.0)
No	205(94.47)	12(5.53)	217 (100.0)
Total	445 (91.75)	40 (8.25)	485(100.0)

Chi Square: 3.972 p<0.05

TABLE 5 PREDIAGNOSED MORBIDITY VERSUS BARTHEL SCORE

Pre-diagnosed Morbidity	Barthel Score		Total
	20	0-19	
Yes	169 (63.06)	99(36.94)	268(100.0)
No	178(82.02)	39(17.97)	217(100.0)
Total	347(71.55)	138 (28.45)	485(100.0)

Chi Square: 21.751 p<0.01

TABLE 6 TREATMENT RECEIVED VERSUS BARTHEL SCORE

Treatment Received	Barthel Score		Total
	20	0-19	
Yes	141(64.09)	79(35.91)	220(100.0)
No	206(77.74)	59(22.26)	265(100.0)
Total	347 (71.55)	138 (28.45)	485(100.0)

Chi Square: 10.551 p<0.01

TABLE 7 ADEQUACY OF TREATMENT VERSUS KATZ SCORE

Adequacy of Treatment	Katz Score		Total
	6	0-5	
Yes	127 (86.97)	19 (13.03)	146(100.0)
No	66 (89.19)	08 (10.81)	74(100.0)
Not Applicable	252 (95.09)	13 (4.91)	265 (100.0)
Total	445 (91.75)	40 (8.25)	485(100.0)

Chi Square: 8.936 p<0.01

TABLE 8 ADEQUACY OF TREATMENT VERSUS BARTHEL SCORE

Adequacy of Treatment	Barthel Score		Total
	20	0-19	
Yes	80(54.79)	66(45.21)	146(100.0)
No	45(60.81)	29(39.19)	74(100.0)
Not Applicable	222(83.77)	43(16.23)	265 (100.0)
Total	347 (71.55)	138 (28.45)	485(100.0)

Chi Square: 76.691 p<0.01

TABLE 9 DEGREE OF AGREEMENT BETWEEN KATZ AND BARTHEL INDICES

		KATZ		Total
		Positive	Negative	
BARTHEL	Positive	34	104	138
	Negative	6	341	347
Total		40	445	485

Kappa= 0.57