TITLE: Limitations in activities of daily living and its perceived causes among older Singaporeans

INTRODUCTION

Singapore's older population, is projected to increase more than three-fold over the next three decades, making it one of the most rapidly ageing countries in the world. [1] The rapid alteration of the population pyramid is associated with an increasing prevalence of long term functional limitations among older Singaporeans. [2, 3] Previous studies from Singapore report 5-17% of older adults to have limitations in Activities of Daily Living (ADL). [4, 5] Identification of chronic diseases most often associated with ADL limitations at the population level can help plan specific interventions for delaying or even reversing progression along the disability pathway. [6, 7]

It is also important to understand what older individuals who have ADL limitations attribute their disability to. Awareness that specific health conditions, rather than 'old age', may be responsible for ADL limitations may motivate older individuals with such limitations to seek appropriate health care for the underlying health condition/s. Appropriate management of these conditions among those with ADL limitations has been shown to limit or even reverse the decline in ADLs. [8-10] However, little is known about the perceived causes of ADL limitations among older adults. The few studies conducted report that many older adults with ADL limitations attribute the limitations to 'old age'. [11-13] However, these studies are either non-representative or have small samples. [12, 13] Further, they focus on 'old age' as one of the multiple causes [11] or as a principal cause of ADL limitations [12, 13], failing to delineate those who perceive 'old age' to be the sole cause of their ADL limitations without attributing it to any specific disease/s at all. It is possible that such elderly are 'healthy' and thus attribute their ADL limitations only to 'old age'. However, previous studies report that attribution of ADL limitations to 'old age' may, in fact, be a surrogate for an underlying

health condition, [12, 14] though this hypothesis has never been investigated for the group of older adults who attribute their ADL limitations solely to 'old age' and not to any specific disease. It has been reported that attribution of geriatric conditions to 'old age' may direct attention away from the underlying cause for that condition. [13] Such individuals have lower health care utilization [15, 16] as well as higher rates of mortality [17].

The objective of this study was thus to examine the association of ADL limitations with various health conditions among older Singaporeans, assess perceived causes of ADL limitations among those who have them, and compare the prevalence of health conditions and demographics of those who report 'old age' as the sole cause of their limitations relative to those who perceive at least one specific health condition/disease as the cause of their ADL limitations.

METHODS

Social Isolation, Health and Lifestyles Survey (SIHLS) 2009

The SIHLS, a nationally representative survey of community-dwelling Singaporeans aged 60 years and over, was conducted by the Ministry of Community Development, Youth and Sports. A sample of 8,400 older adults, stratified by gender, ethnic group and 5 year age groups, based on the 2007 population distribution was drawn from the national database of dwellings. Adults aged 75 years and over, and Malays and Indians were oversampled by a factor of 2 to ensure sufficient numbers in these groups for analysis. A total of 1,195 (14.2%) addresses were found to be invalid. 5000 older adults were interviewed at their residence, after obtaining written informed consent, yielding a response rate of 69.4%. Proxy interviews were conducted for 458 (9.2%) older adults who were unable to respond.

ADL limitations: Older adults were classified as having an ADL limitation if they reported limitation in any of the seven activities of bathing, dressing, eating, toileting, standing/ sitting, walking (around the house), and going outside the house.

Health conditions: Presence of important (geriatric) health conditions was assessed through the question "Have you ever been diagnosed by a medical professional with...(disease)?". Specific diseases included joint/nerve pain, cerebrovascular disease, pelvic/femoral fractures, heart diseases, diabetes, chronic back pain, hypertension, osteoporosis, chronic respiratory illness, renal/urinary tract illness and cancer.

Perceived causes of ADL limitations: Older adults (or their proxy respondent) who reported limitations in any of the seven ADLs were asked to choose one or more conditions that they felt were responsible for their ADL limitations from a list that included 'old age' and a variety of health conditions (heart diseases, cancer, cerebrovascular disease, hypertension, diabetes, respiratory illness, digestive illness, renal/urinary tract illness, ailment of liver or gall bladder, joint/nerve pain, chronic back pain, osteoporosis, pelvic/femoral fractures, other fractures,

cataract and glaucoma) as potential responses. They were also free to name other conditions not specified in the list.

Demographic variables: Data on a variety of demographic characteristics (age, gender, ethnic group, education (none, primary, secondary, vocational/ junior college/polytechnic, university and above), marital status (married, widowed, divorced/separated, never married), and housing type (1-2 room public, 3 room public, 4-5 room public/ private)) was collected. The analysis was restricted to Chinese, Malays and Indians, respondents belonging to the 'Other' ethnic group (1.2%) were excluded as their numbers were too low for meaningful interpretation.

Statistical analysis

The prevalence of ADL limitations was described by age, gender and ethnicity. Logistic regression analysis was used to assess the association of various health conditions with ADL limitation. The prevalence of perceived causes of limitations was assessed among those with ADL limitations. Older adults reporting 'old age' as the sole cause of their limitations, were contrasted with those who perceived at least 1 specific health condition as the cause of their limitations (regardless of whether they also listed 'old age' as a cause) in terms of demographic characteristics and prevalence of health conditions. Chi-square/ Fishers exact test was applied to detect any significant difference between the two groups. The analysis was conducted using SAS, and sampling weights were applied to adjust for non-response and unequal probability of selection.

RESULTS

Of the 4941 respondents, most respondents were women (54.3%) and aged 65-74 years (42%), those 75+ constituting 25.4% of the sample. About 84% of the respondents were Chinese, followed by Malays (9.6%) and Indians (6.3%). Educational status was low - a third had either no education or up to primary education. Most were married (63.2%) and lived in 4-5 room public/private housing (66.2%). The most common self-reported chronic health condition was hypertension (52.3%), followed by joint/nerve pain (30.9%), diabetes (21.7%), chronic back pain (11%), heart diseases (10.2%), chronic respiratory illness (4.2%), renal/urinary tract illness (4.1%), stroke (3.9%), osteoporosis (3.5%), cancer (3.1%) and pelvic/femoral fractures (3%).

The overall prevalence of ADL limitations was 9.7%, being higher in women (12.7%) than men (6.2%). The ADL with the highest prevalence of limitations was going outside (9.0%), followed by walking (4.5%), bathing (4.4%), standing/sitting (4.0%), dressing (3.8%), toileting (2.5%) and eating (1.5%). The distribution of limitations in each ADL, by age, gender and ethnic group, is described in Table 1.

Joint/nerve pain, stroke, pelvic/femoral fractures, heart diseases, diabetes, osteoporosis, chronic respiratory illness and renal/urinary tract illness were significantly associated with ADL limitations in both the unadjusted and adjusted analysis. Further, being 75 years and older, female, Malay, Indian, and widowed was associated with a higher odds of ADL limitations, while a higher level of education lowered the odds of ADL limitations. (Table 2)

Among the 669 older adults with ADL limitations, the most common perceived cause of limitations was 'old age' (33.0%). Around one-fifth (20.9%) perceived joint/nerve pain as a cause, followed by stroke (16.2%), pelvic/femoral fractures (6.8%), heart diseases (6.1%), diabetes (5.5%), accidents (4.3%), chronic back pain (3.9%), hypertension (3.7%),

osteoporosis (3.3%), chronic respiratory illness (3.2%), renal/urinary tract illness (2.3%), other fractures (2.3%) and cancer (1.4%). Around a quarter (n=174, 26.0%) attributed their ADL limitations solely to 'old age'.

Table 3 contrasts the demographic characteristics and prevalence of health conditions of those who perceived 'old age' as the sole cause of their ADL limitations ("old age group", n=174) with those who attributed their limitations to at least 1 specific health condition (n=495). The prevalence of most of the health conditions was similar in the two groups. Those in the 'old age group' were significantly older, limited in a lower number of ADLs and more likely to be women.

DISCUSSION:

To our knowledge this is the first study to delineate older individuals who attribute their ADL limitations solely to 'old age'. It is also one of the few studies reporting perceived causes of ADL limitations among older adults, and the first to do so from a multi-ethnic Asian country. The study found that joint/nerve pain, stroke, pelvic/femoral fractures, heart diseases, diabetes, osteoporosis, chronic respiratory illness and renal/urinary tract illness were significantly associated with ADL limitations. However, among those with ADL limitations the most common perceived cause of limitations was 'old age' followed by joint/nerve pain, stroke, pelvic fractures, heart diseases and diabetes. Further, the prevalence of most health conditions was similar in the groups attributing their limitations solely to 'old age' and to at least one specific health condition.

A comparison of the prevalence of ADL limitations reported in studies from different countries is hampered by differences in the definition of ADLs and wording of questions. However, prevalence of ADL limitations in this study is higher than other studies from Singapore which have considered only self-care items. [4] Further, the prevalence (25.1%) and odds (OR: 6.0; 95% CI: 4.1-8.8) of ADL limitations was much higher among those 75 years and over, suggesting that increases in life expectancy and changes in age pyramid are likely to further increase the prevalence of ADL limitations among Singaporeans. While the prevalence of limitations was highest for the activities of going outside and bathing, it was lowest for eating and toileting, conforming to the hierarchical structure of ADLs suggested before. [18, 19]

Our finding that gender differences in ADL limitations persist even after adjusting for various health and socio-economic conditions has also been noted in previous studies. [4] These gender differences were more pronounced among those aged 75 years and older, possibly related to the longer life-expectancy among women albeit with ADL difficulties. Malay and

Indian women had a higher prevalence of ADL difficulties compared to Chinese women. The higher risk of ADL limitations among Malays and Indians in multivariate analysis remained unexplained by differences in various health conditions.

Stroke was found to have strongest association with ADL limitations, and was perceived to be the 3rd most common cause (16%) of ADL limitations by older adults with such limitations. The association of stroke with ADL limitations has been reported previously, with studies reporting more than half of stroke survivors to have motor deficits which result in ADL limitations.[20, 21] Similarly, we confirmed the statistical association between ADL limitations and joint/nerve pain, pelvic/femoral fractures, heart diseases, diabetes, osteoporosis, chronic respiratory illness and renal/urinary tract illness identified by other authors. [22-26] The lack of any association between cancer and ADL limitations may be because those with most advanced stages of cancer did not participate in the study.

The fact that one-third of older adults with ADL limitations perceived 'old age' to be the cause of their limitations is striking. More notably, about a quarter perceived 'old age' to be the sole cause of their limitations. This is contrary to the current emphasis in ageing research that considering health problems as inevitable consequences of old age is inappropriate. [27] Such attribution may be considered to be a form of fatalism, and fatalistic attitudes towards health and disease can reduce the self-efficacy of individuals to seek medical care. [28] Older adults doing so may feel that there is little to be gained by consulting a physician, resulting in increased delay in seeking care and higher risk of mortality. [29]

Further, the prevalence of most health conditions was similar in the groups attributing their limitations solely to 'old age' and to at least 1 specific health condition, suggesting that 'old age' is a proxy for underlying health conditions. All health conditions and ADL limitations in this study were self-reported by older adults (or proxy), suggesting that even though older adults are aware of their health conditions, many were not able to link their

disease state to their ADL limitations. Most of these health conditions - fractures, heart diseases, diabetes, osteoporosis and chronic respiratory illness, were also found to be associated with ADL limitations in our analysis. This demonstrates a lack of awareness regarding the impact of these conditions on functional health status among older adults, and is particularly relevant for secondary and tertiary prevention efforts aimed at reducing the impact of the chronic conditions on functional health. Health promotion messages regarding various chronic diseases among older adults should also emphasize the link between these diseases and ADL limitations.

Our finding that individuals in the 'old age group' had significantly lower number of ADL limitations than those attributing their limitations to at least one specific health condition, suggests that those with fewer limitations regard their condition as being less severe and tend to attribute it to the normal physiological processes associated with old age. Only when their limitations become more in number, do they link their ADL limitations to underlying health condition. Similar results have been reported by a previous study. [12] It is also understandable that the individuals in 'old age group' were significantly older. As one ages there may be increased confusion between symptoms of ageing and symptoms of illness and older people may not treat ageing and illness as mutually exclusive. Studies have also reported 'old age' as being synonymous to ill health for many older adults. [16, 17, 30]

The main strength of the study is its large and nationally representative sample, allowing generalizability of the findings to the older population of Singapore. Unlike many previous studies, multiple answers from older adults were recorded for their perceived causes of ADL limitations, reflective of multiple causes of ADL limitations. The study is however not without limitations. First, all ADL limitations as well as health conditions were self-reported, leading to possible misclassifications and underestimation of the prevalence of some of the health conditions. Second, information regarding the severity of diseases was not

available. Third, even though our sample was large and nationally representative, an analysis of those who did not respond to the survey showed that they were more likely to be 75 years and older and women. Their exclusion could have possibly underestimated the prevalence of ADL limitations in our study. Lastly, due to the cross-sectional nature of our data, causality can only be implied.

CONCLUSION: To limit the prevalence of ADL limitations among older Singaporeans, prevention efforts should target diseases which were strongly associated and were common perceived causes of ADL limitations such as stroke, pelvic/femoral fractures and joint/nerve pain. Further, given that attribution of ADL limitations to 'old age' is quite common among older Singaporeans, further research should focus on health care seeking behaviour of such individuals. Clinical suspicion is also called for if individuals with ADL limitations attribute their limitations solely to 'old age'.

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Table 1: Prevalence of ADL limitations by age, gender and ethnicity

Variable	Men						Women					
	60-74 years			75+years			60-74 years			75+years		
	Chinese n = 966	Malay n = 244	Indian n = 145	Chinese n = 567	Malay n = 172	Indian n = 135	Chinese n = 1102	Malay n = 262	Indian n = 144	Chinese n = 941	Malay n = 176	Indian n = 87
At least 1 ADL limitation	4.0	3.1	1.7	15.2	11.6	13.4	3.7	10.8	14.5	30.1	44.7	43.8
Bathing	1.3	1.2	0.6	8.1	5.2	4.7	1.5	4.9	6.6	15.1	20.2	20.7
Dressing	1.0	0.9	0.6	7.2	3.1	4.0	1.5	3.6	3.3	13.2	16.4	17.4
Eating	0.5	0.9	0.6	3.1	3.0	1.3	0.6	1.6	1.9	4.4	5.9	11.1
Toileting	0.6	0.7	0.6	2.9	2.9	5.5	0.9	3.9	2.7	9.3	11.2	14.4
Standing up /sitting down	2.0	1.6	1.1	6.4	3.6	3.4	1.6	5.5	4.1	11.2	19.1	18.9
Walking	2.2	1.6	1.1	7.8	4.1	4.7	1.8	5.3	3.3	12.9	21.8	19.7
Going outdoors	3.2	2.6	1.7	13.7	11.6	12.7	3.2	10.1	13.0	29.2	44.7	42.9

Table 2: Unadjusted and adjusted odds ratio for ADL limitations

Variables	Unadjusted OR (95% CI)	Adjusted OR (95% CI) (N = 4812)
Age (in years)		
65-74	1.9 (1.2 – 2.8)	1.5 (1.0 – 2.1)
75+	9.0 (6.1 – 13.2)	6.0 (4.1 – 8.8)
Gender		
Women	2.1 (1.6 – 2.7)	1.6 (1.2 – 2.1)
Ethnicity		
Malays	1.6 (1.1 – 2.3)	1.7 (1.2 – 2.4)
Indians	1.7 (1.1 – 2.6)	1.7 (1.1 – 2.5)
Educational status		
Primary	0.5(0.4 – 0.6)	0.7 (0.6 – 1.0)
Secondary	0.3 (0.2 - 0.5)	0.5 (0.4 – 0.8)
Vocational/Polytechnic/University and above	0.2 (0.1 – 0.4)	0.4 (0.2 – 0.7)
Marital status		
Widowed	3.5 (2.7 – 4.5)	1.5 (1.2 – 2.0)
Divorced/ Separated	0.8 (0.3 – 2.1)	0.8 (0.3 – 1.8)
Never married	1.2 (0.6 – 2.2)	1.1 (0.6 – 2.0)
Housing type		
1-2 room public	1.0 (0.6 – 1.5)	0.6 (0.4 – 1.0)
3 room public	0.8 (0.6 – 1.1)	0.8 (0.6 – 1.0)
Chronic ailments		
Joint/ nerve pain	2.2 (1.7 – 2.8)	1.5 (1.2 – 1.9)

Stroke	9.9 (6.7 – 14.5)	12.9 (8.8 – 18.9)
Pelvic/femoral fractures	6.2 (4.0 – 9.5)	6.1 (3.9 – 9.4)
Heart diseases	2.6 (1.9 – 3.6)	1.6 (1.2 – 2.2)
Diabetes	2.3 (1.8 – 3.0)	1.6 (1.3 – 2.1)
Chronic back pain	1.3 (0.9 – 1.9)	0.7 (0.5 – 1.0)
Hypertension	1.7 (1.3 – 2.2)	0.9 (0.7 – 1.2)
Osteoporosis	4.5 (2.9 – 6.8)	3.2 (2.0 – 5.0)
Chronic respiratory illness	2.8 (1.8 – 4.4)	1.8 (1.1 – 2.8)
Renal or urinary tract illness	3.9 (2.6 – 5.9)	2.5 (1.6 – 3.8)
Cancer	1.1 (0.5 – 2.3)	1.4 (0.8 – 2.5)

Reference categories are 60-64 years (for age), men (for gender), Chinese (for ethnicity), no education (educational status), married (for marital status), 4-5 room public/ private (type of housing), absence of the ailment (for each chronic ailment)

Table 3: Demographic characteristics and prevalence of self-reported chronic diseases among those who attribute their ADL limitations to only 'old age' versus to 'at least 1 health condition'

Characteristic	ADL difficulty attributed to		p-value [b]
	only 'old age' (N=174) %	'at least one health condition' [a] (N=495) %	
Mean age	84.3	76.4	<0.001
Female %	82.1	67.7	0.004
Number of ADL difficulties	2.5 SD 1.6	3.2 SD 2.0	<0.001
Prevalence of Self-reported chronic diseases			
Joint/ nerve pain	33.5	51.2	0.001
Stroke	6.0	24.2	<0.001
Pelvic/femoral fractures	7.5	13.3	0.10
Heart diseases	19.8	21.0	0.79
Diabetes	27.6	36.0	0.11
Chronic back pain	10.9	17.8	0.09
Hypertension	64.0	62.7	0.81
Osteoporosis	6.6	12.1	0.11
Chronic respiratory illness	6.7	9.6	0.36
Renal or urinary tract illness	4.7	12.7	0.02
Cancer[c]	1.7	5.7	0.03

[a] This group includes those who attribute their ADL difficulty to at least1 health condition.

[b] Using chi-square test

[c] Fishers test is used for comparison and thus non-weighted percentages are given