

ORIGINAL ARTICLE

Functional Disability in Community-dwelling Older People and its Associated Factors: A Cross-sectional Study of Felda Schemes in Pahang, Malaysia

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ABSTRACT

Introduction: Functional disabilities are common in community-dwelling older people, endangering their well-being and ultimately leading to deterioration in health and loss of ability to work. The ageing process and chronic diseases have been found to have a greater impact on physical or mental disabilities. This study examined functional disability in community-dwelling older people and the identified associated factors. **Materials and methods:** A cross-sectional study of 305 community-dwelling older people was conducted within FELDA schemes in Pahang. To complete the Malay version of the Barthel Index and provide information on socio-demographic and health status, face-to-face interviews were conducted. Multiple linear regression analysis was performed to examine the predictive factors. **Results:** The average age of participants was 69.61 years (SD = 6.30). Approximately 90.5% of participants had a functional disability. Age (-0.1 [-0.2, -0.1], $P < 0.001$), BMI (-0.1 [-0.2, -0.0], $P = 0.015$), number of chronic conditions (-0.5 [-0.7, -0.3], $P < 0.001$), and renal disease (-2.1 [-3.7, -0.5]), $P = 0.010$) were significantly associated with functional disability. Meanwhile, stroke (-5.8 [95% CI: -7.2, -4.4], $P < 0.001$), knee pain (-0.8 [95% CI: -1.4, -0.1], $P = 0.016$), and vision problems (-1.8 [95% CI: -2.8, -0.8], $P = 0.001$) were independent predictors, with stroke being the largest contributor. **Conclusion:** Our results suggested that functional disability among elderly people in Malaysia was very severe and mainly related to chronic diseases. A health promotion program should aim to help older people delay the onset of disability while optimizing their functional autonomy.

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INTRODUCTION

The number and proportion of older people is increasing worldwide, including in developing countries. Statistics show that the number of elderly people aged 60 years and older was 1 billion in 2019, which is expected to increase to 1.5 billion by 2030 (1). In Malaysia, the proportion of the population aged 65 years and older increased by 0.2% to 7.4% in 2023 (2). Several factors are influencing this increase, particularly improvements

in health care that are leading to longer life expectancy.

The prevalence of functional disability among older people was predicted to increase with the rapid growth of the ageing population. It is estimated that over 46% of people aged 60 and over worldwide suffer from a functional disability (3). A recent study on the prevalence of functional disability among older people in the Association of Southeast Asian Nations (ASEAN) region found that activities of daily living (ADL) disability was 21.5% and instrumental activities of daily living (IADL) disability was 46.8% (4). In Malaysia, a national study found that the prevalence of ADL disability among older people aged 61 years and above was 41% (5). The definition of disability was based on at least one

disability in the six domains of the ADL, consisting of vision, hearing, walking, cognition, self-care, and communication (5).

In general, functional disability is defined as a limited ability to perform activities that meet the demands of daily living in various aspects of life, including physical, psychological, spiritual, intellectual, and role disability (6). It is commonly operationalized as the degree of dependence a person experiences when performing ADL and IADL (6,7). These items are commonly used in epidemiological and clinical studies to assess functional status (8).

Functional disability is a global burden that causes frailty in older people, and it has implications for family caregivers, clinical practice, and public health (7,9). Studies showed that functional disabilities in older people are mainly associated with older age, presence of chronic diseases, cognitive impairment, and physical inactivity (5,10–12). Other factors that may also be associated with functional disability include being female (8), lack of formal education (5), and malnutrition (10).

In a state of vulnerability, older people are exposed to the consequence of an increase of functional deficits, such as falls, hospitalization, or death (13). A study among elderly Chinese rural residents found that 96.3% of participants who suffered from functional disability and were unemployed had poor quality of life (14). Older people who develop functional disability are at risk of experiencing more functional disability after frailty, leading to higher mortality (13,15). A study also showed that improving functional disability would result in a burden on medical costs (16).

The Malaysian government founded FELDA in 1956 with the aim of eradicating poverty through the cultivation of oil palm and rubber. After 67 years of its establishment, FELDA's mission has been updated to improve the facilities of the schemes, nurture the future generation through adequate education, and bridge the gap between urban and small urban areas (17). Nowadays, the number of older people in FELDA has increased, and many suffer from reduced functional status (18). A study conducted among older people living in FELDA schemes in the southern state of Peninsular Malaysia found that the prevalence of functional disability based on IADL was 47.6% and was associated with depressive symptoms (18).

The current local research lacks information on factors that may contribute to disability as it is not the primary focus of the study. However, it is crucial to conduct further research on this issue, especially since Malaysia is expected to become an ageing nation. There is an urgent need for research specifically focused on the various factors that may cause functional disability in

elderly individuals within the Malaysian context. Such research can provide valuable data that will assist the country in preparing for the challenges that come with an ageing population. This study aimed to evaluate the functional disability of community-dwelling elderly living in Federal Land Development Authority (FELDA) schemes in Pahang and determine the associated factors.

MATERIALS AND METHODS

This study adopted a cross-sectional study design. It was conducted in the FELDA Kuantan Territory in Pahang, Malaysia, one of the eleven FELDA territories in Malaysia. This FELDA area was further divided into 42 FELDA schemes. The study participants were older people who lived in a shared community setting. During data collection, they were defined as people who were at least 60 years old and lived in the FELDA schemes community. The inclusion criteria were Malaysians who had lived in the selected FELDA schemes for at least 12 months and were physically present during data collection. They were excluded if they were unable to understand and communicate in English or Malay or had no relatives who could help complete the data; or staying outside the study area during the data collection period.

Simple random cluster sampling was used to recruit the participants. We clustered community-dwelling older people based on the FELDA schemes where they lived. A simple random sampling of the 42 schemes under the FELDA Kuantan Territory resulted in four being selected. The older people from the selected FELDA scheme were identified and invited to participate in the study after confirming their eligibility criteria. The estimated sample size was calculated using a single proportion formula. With a confidence interval of 95%, a P-value of 0.75 (19), and a precision of 0.05, the estimated sample size was 246. After accounting for 10% of attrition, we decided to recruit 317 participants.

The independent variables of this study were the socio-demographic data (age, gender, marital status, education level, employment status, personal monthly income, and living with spouse) and health status (smoking status, body mass index [BMI], and presence of chronic conditions). Chronic conditions were defined as the presence of any of the following conditions: hypertension, diabetes mellitus, dyslipidaemia, heart disease, stroke, knee pain, or lung disease (8). The number of chronic conditions is an aggregate measure, indicating the total number of specified conditions in each participant. In this study, the dependent variable was the functional status of older people. We defined functional status based on an individual's ability to perform ADL. The Malay version Barthel index was used to assess functional disability. The tool is widely used in population-based health surveys (10,20) and has been shown to be valid and reliable for use among older

Malaysians (19,21,22). It consists of ten items covering various activities related to self-care and mobility: feeding, bathing, grooming, dressing, toilet use, bowel control, bladder control, bed-to-chair transfer, mobility on a flat surface, and stair climbing. Ratings for each item range from 0 to 3, and they are summed to create a total score that can range from 0 (totally disabled/dependent) to 20 (totally independent). A high score indicates greater independence. The participants were considered disabled if their total score was less than 20. Total scores below 14 indicated moderate to severe functional disability, while scores between 15 and 19 indicated mild functional disability.

Data Collection

Data collection was based on a structured questionnaire that consisted of three parts: socio-demographic data, health status, and functional status. Face-to-face interviews were conducted in the older people community setting. To determine the BMI value, we asked participants to self-report their current body weight and height. BMI was then calculated using the formula: $\text{body weight (kg)} / (\text{height [m]} \times \text{height [m]})$. Chronic conditions data were obtained from the participant's follow-up book and by asking the questions, "Has a healthcare professional ever diagnosed or treated you with the following chronic conditions or diseases?" We indicated the chronic conditions and asked participants to answer "yes" or "no". If the chronic conditions were not included in our list, the responses were recorded under "other", and the conditions were specified.

For functional status, the participants were asked to rate the answer that most closely corresponded to their current level of performance. In a condition where they could not answer the researchers' questions, relatives were allowed to help provide the data. Ethical approval to conduct this study was obtained from the Kulliyyah of Nursing Postgraduate Research Committee and the IIUM Research Ethics Committee of Kuantan Campus (IIUM/504/14/11/2/IREC2021-KON-UG), and permission for data collection was obtained from the FELDA Kuantan Territory Office. The purpose of the study was explained to participants and their relatives, and informed written consent was obtained voluntarily from the participants when they agreed to participate.

Statistical Analyses

Data was analysed using the IBM Statistical Package for Social Science (SPSS) for Windows, version 26.0. Descriptive statistics were used to analyse the participants' socio-demographic data, health status, and functional status. The categorical data were presented in the form of frequency and percentage. The numerical data, such as age, number of chronic conditions, and functional status, were presented by mean value and standard deviation (SD).

The associated factors of functional disability were assessed using simple linear regression. For multiple linear regression data analysis, we included independent variables with P -value < 0.25 and significant clinical variables to ensure all possible predictors were considered at the model's initial variable selection stage. Next, forward, backward, and stepwise methods were used to choose the model's variables. A set of variables of the best model from each selection method were compared and were selected if consistently significant to produce a linear model. The two-way interactions and multicollinearity between the variables were checked. We determined that there was no interaction between the variables if the P -value > 0.05 ; and no multicollinearity problem between the variables if the value of the variance inflation factor (VIF) was less than 10. A P -value of < 0.05 was set as the significant level.

RESULTS

Background of the participants

Of the 305 community-dwelling older people, 171 were female (56.1%, $n = 171$). The average age of participants was 69.61 years (SD = 6.30), with an age range of 60 to 88 years. None of the participants consumed alcohol. The majority of participants had chronic conditions (95.1%, $n = 290$). The average number of chronic conditions among participants was 2.90 (SD = 1.52). Hypertension (75.1%, $n = 229$), dyslipidaemia (49.8%, $n = 152$), and diabetes mellitus (47.2%, $n = 144$) were the three most common chronic conditions among participants. Table I shows the background of the participants in this study.

Table I: Characteristics of community-dwelling older people ($n = 305$)

Variable	<i>n</i> (%)	Mean (SD)
Age (years)		69.61 (6.30)
Gender	Male Female	134 (43.9) 171 (56.1)
Marital status	Married Single/divorce/widowed	179 (58.7) 126 (41.3)
Education level	Never/informal school Primary Secondary/tertiary	74 (24.3) 184 (60.3) 47 (15.4)
Employment status	Unemployed/retired Employed	223 (73.1) 82 (26.9)
Personal monthly income (RM)	< 1000 1000 - 1999 2000 or above	101 (33.1) 128 (42.0) 76 (24.9)
Living with spouse	Yes No	172 (56.4) 133 (43.6)
Smoking status	Yes No	50 (16.4) 255 (83.6)
BMI (kg/m ²)		25.8 (3.9)
Presence of chronic conditions	Yes No	290 (95.1) 15 (4.9)

CONTINUE

Table I: Characteristics of community-dwelling older people (n = 305) (CONT.)

Variable		n (%)	Mean (SD)
Hypertension	Yes	229 (75.1)	
	No	76 (24.9)	
Diabetes mellitus	Yes	144 (47.2)	
	No	161 (52.8)	
Dyslipidaemia	Yes	152 (49.8)	
	No	153 (50.2)	
Stroke	Yes	16 (5.2)	
	No	289 (94.8)	
Heart disease	Yes	46 (15.1)	
	No	259 (84.9)	
Knee pain	Yes	145 (47.5)	
	No	160 (52.5)	
Lung disease	Yes	31 (10.2)	
	No	274 (89.8)	
Vision problems	Yes	31 (10.2)	
	No	274 (89.8)	
Thyroid	Yes	12 (3.9)	
	No	293 (96.1)	
Renal disease	Yes	15 (4.9)	
	No	290 (95.1)	
Gout	Yes	27 (8.9)	
	No	278 (91.1)	
Teeth/dentures	Yes	36 (11.8)	
	No	269 (88.2)	

BMI = Body mass index; RM = Malaysian ringgit; SD = standard deviation

Functional Disability in Community-dwelling Older People

The average functional status score of the participants was 17.95 (SD = 3.11). Overall, approximately 90.5% (n = 276) of participants had at least one disability on the ADL items measured. Of these, 84.9% (n = 259) had a mild disability and 5.6% (n = 17) had a moderate to severe disability. Of the ten ADL items assessed, stair climbing (85.2%, n = 260) was the highest disability and grooming (4.6%, n = 14) was the lowest. Table II shows the details of the ADL items.

Table II: Ability to perform ADL by the participants (n= 305)

Items	Functional status	
	Dependence n (%)	Independence n (%)
Feeding	26 (8.5)	279 (91.5)
Bathing	17 (5.6)	288 (94.4)
Grooming	14 (4.6)	291 (95.4)
Dressing	29 (9.5)	276 (90.5)
Toilet use	24 (7.9)	281 (92.1)
Bowel control	15 (6.6)	285 (93.4)
Bladder control	33 (10.8)	272 (89.2)
Transfers bed-to-chair	31 (10.2)	274 (89.8)
Mobility on a level surface	69 (24.3)	231 (75.7)
Stair climbing	260 (85.2)	45 (14.8)

Associated Factors

The associated factor of functional disability is shown in Table III. The results showed that age (-0.1 [-0.2, -0.1], P < 0.001), BMI (-0.1 [-0.2, -0.0], P = 0.015), number of chronic conditions (-0.5 [-0.7, -0.3], P < 0.001), stroke (-5.9 [-7.3, -4.5], P < 0.001), knee pain (-0.7 [-1.4, -0.0], P < 0.043), renal disease (-2.1 [-3.7, -0.5]), P = 0.010 and vision problems (-2.2 [-3.3, -1.0], P < 0.001) were significantly associated with functional disability in older people. The multiple linear regression model showed that there was a significant linear negative relationship between stroke (-5.8 [95% CI: -7.2, -4.4], P < 0.001), knee pain (-0.8 [95% CI: -1.4, -0.1], P = 0.016), and vision problem (-1.8 [95% CI: -2.8, -0.8], P = 0.001) and functional disability score. Approximately 22.7% of the variation in functional disability score was explained by this model (R² = 0.227). The R² value of 0.178 indicated that stroke had the greatest impact on the functional disability score, followed by vision problems (0.034) and knee pain (0.015) (Table IV).

Table III: Factors associated with functional disability among the community-dwelling older people (n = 305)

Factors	Crude b(95% CI) ^a	P-value	Adjusted b (95% CI) ^b	P-value
Age (years)	-0.1 (-0.2, -0.1)	<0.001		
Gender	Women vs men ^c	0.7 (-0.1, 1.4)	0.067	
Marital status	Married vs Single/divorced/widowed ^c	0.02 (-0.7, 0.7)	0.946	
Education level	Formal school vs Never/informal school ^c	0.8 (-0.0, 1.6)	0.052	
Employment status	Employed vs unemployed ^c	0.4 (-0.4, 1.1)	0.384	
Personal monthly income (RM)	1000 or above vs < 1000 ^c	0.4 (-0.4, 1.1)	0.349	
Living with spouse	Yes vs no ^c	-0.5 (-1.2, 0.2)	0.176	
Smoking status	Yes vs no ^c	0.8 (-0.2, 1.7)	0.107	
BMI (kg/m ²)		-0.1 (-0.2, -0.0)	0.015	
Presence of chronic conditions	Yes vs no ^c	-1.0 (-2.7, 0.6)	0.211	

CONTINUE

Table III: Factors associated with functional disability among the community-dwelling older people (n = 305) (CONT.)

Factors		Crude b(95% CI) ^a	P-val- ue	Ad- justed b (95% CI) ^b	P-val- ue
Number of chronic conditions		-0.5 (-0.7,-0.3)	<0.001		
Hypertension	Yes vs no ^c	-0.05 (-0.9, 0.8)	0.908		
Diabetes mellitus	Yes vs no ^c	-0.04 (-1.1, 0.3)	0.271		
Dyslipidaemia	Yes vs no ^c	-0.2 (-0.9, 0.5)	0.594		
Stroke	Yes vs no ^c	-5.9 (-7.3, -4.5)	<0.001	-5.8 (-7.2, -4.4)	<0.001
Heart disease	Yes vs no ^c	-1.0 (-1.9, 0.0)	0.052		
Knee pain	Yes vs no ^c	-0.7 (-1.4, -0.0)	0.043	-0.8 (-1.4, -0.1)	0.016
Renal disease	Yes vs no ^c	-2.1 (-3.7, -0.5)	0.010		
Respiratory problem	Yes vs no ^c	0.1 (-1.0, 1.3)	0.831		
Vision problems	Yes vs no ^c	-2.2 (-3.3, -1.0)	<0.001	-1.8 (-2.8, -0.8)	0.001
Teeth/dentures	Yes vs no ^c	-0.4 (-1.5, 0.7)	0.487		

BMI = Body mass index; CI = Confidence interval; RM = Malaysian ringgit. ^a Crude regression coefficient, ^b Adjusted regression coefficient, ^c the reference category. The preliminary model is built using the stepwise, forward, and backward multiple linear regression methods. The model assumptions were fulfilled. There were no interactions among the independent variables. No multicollinearity was detected. Coefficient of determination (R^2) = 0.212. A P -value of 0.05 was set as significant.

Table IV: Contribution of predictor factors on functional disability

	Unstandardised B		
	Model 1 (Reference model)	Model 2	Model 3
Stroke	-5.803*	-5.713*	-5.885*
Vision problems	-1.795	-1.890*	
Knee pain	-0.767		
R^2	22.7%	21.2%	17.8%
Difference in R^2		1.5%	4.9%

A significant P -value is set at <0.05, * P < 0.001.
 Model 1 = Predictors: stroke, knee pain, and vision problems
 Model 2 = Model 1 – Knee pain
 Model 3 = Model 2 – Vision problems

DISCUSSION

In this study, we assessed the functional disability of community-dwelling older people living in FELDA schemes in Pahang and examined the associated factors. The results showed that about 90.5% of them had a functional disability, particularly related to climbing stairs. Although the overall level of disability was mild, the results indicated that almost every older person had

at least one disability and was dependent on the help of other people. Based on this finding, our study concluded that there was a high prevalence of functional disability among community-dwelling older people living in FELDA schemes of Pahang, suggesting that functional disability was a serious problem for community-dwelling older people.

The finding contradicted what was previously discovered in a state in western Peninsular Malaysia, where nearly 70% of older people were found to have moderate to severe functional disabilities (19). They examined functional status using the same tool as in our study. Compared to our study, the population was older people with chronic diseases who were recruited from outpatient clinics, explaining the high rate of moderate and severe functional disabilities in their study (19). Regardless of the tools used to define functional disability, our result showed one of the highest prevalence compared to previous studies (4,10,18,23). The prevalence varies depending on the definition used in the studies, the cut-off point, the regions, and the eligibility criteria for participation (4). Therefore, it is not possible to compare our results with national findings because different tool was used to indicate disability (5).

Studies consistently showed that the prevalence of functional disability based on IADL was higher than that of ADL (4, 24). The observed disparity between the prevalence of functional disability in IADL and ADL is crucial for understanding the nuanced landscape of disability in elderly populations. In a study conducted among outpatient older adults in Brazil, utilising the Katz index for ADL and the Lawton and Brody scale for IADL revealed a substantial difference in prevalence, with 21.4% experiencing functional disability in ADL compared to a notably higher 78.3% in IADL (24). As elucidated earlier, IADL encompasses complex activities essential for independent living within the community, while ADL focuses on fundamental self-care tasks (25). The distinct positions of these types of disability along the disablement process spectrum in older individuals suggest that IADL disability is more likely to manifest earlier with age (26). It is possible that in an ageing population, the most significant issue is related to mental health conditions, particularly dementia and anxiety, which can accelerate the development of other chronic conditions and disabilities (27). However, this study's findings may be limited, highlighting the need for a comprehensive assessment in future research.

A study examined the pattern of functional decline in older Americans aged 80 years and older who had major chronic illnesses. The results showed that the onset ages of the disabilities ranged from 91.5 to 95.6 years (11). Meanwhile, our study found that advanced age and the presence of two or more chronic conditions were associated with functional disability but were not independently able to predict functional disability

in community-dwelling older people. In general, most of them were younger older people with at least three chronic conditions. The chronic conditions greatly affected their functional status as our data analyses showed that all disability-related factors, except age, were related to health status. Older people with major chronic conditions are at risk of earlier onset and faster progression of disability (11). In the absence of appropriate interventions to slow the progress of disabilities, we anticipate that hospitalisations and long-term service use among Malaysian older people will skyrocket as they age. The interventions may include preventive healthcare initiatives such as regular screenings, targeted exercise and nutrition programs, fall prevention strategies, comprehensive chronic disease and pain management, fostering social engagement, and ensuring access to adaptive technologies to support the overall health of the ageing population.

A previous study showed that functional disability in older people began with bathing, walking, dressing, toileting, transferring and eating (11). Of these, bathing and incontinence/bladder control were the most impaired ADL components (4). In contrast, only 5.6% of our participants were disabled in bathing. For bowel and bladder impairments, the rates were 6.6% and 10.8%, respectively, supporting the findings of a previous study that bowel and bladder impairments were not common in our elderly population (19,21). However, due to the assumption that the disorders are part of a consequence of ageing and cultural sensitivity, there is a likelihood of underreporting, particularly among women and people living in rural areas (28,29).

Our results are consistent with studies among older people in India and Thailand, which found that walking difficulty was higher than toileting and dressing (12,20). This was evident by the fact that 85.2% of our participants had a disability in climbing stairs and 24.3% in mobility on flat surfaces. However, a study of Malaysian adults aged 18 years and older, which also included older people, found that visual impairment was the most common, followed by walking (5). A high rate of disability in walking and climbing stairs among older people poses a high risk of falls, leading to injuries and fractures.

Our data analysis revealed that stroke, knee pain, and vision problems were independent predictors of functional disability in community-dwelling older adults. Of these, the proportion of functional disability due to stroke (17.2%) was greater. The older people who had suffered a stroke scored 5.8 lower in functional status. Our finding is consistent with previous findings that stroke often causes functional disability in older people (8,11,30). For example, in India, a study found that older people with stroke were 2.4 times more likely to

report lower ADL scores than people without stroke (8). The functional disability experienced by stroke patients depends on the type of stroke they have had. A minor stroke or transient ischemic attack (TIA) usually has mild and non-disabling symptoms, and the functional deficits may recover fully. A longitudinal cohort study in China aimed to determine the relationship between cognition and poor functional outcomes. The study found that persisting post-stroke cognitive impairment increased the risk of poor functional outcomes after three months and one-year follow-ups (31).

Knee pain is commonly observed in older people and is often attributed to the degenerative condition known as osteoarthritis (32). A cross-sectional analysis to identify predictors of poor physical function in elderly patients with knee osteoarthritis in Brazil found that pain intensity consequences worse physical function (33). Meanwhile, another study among Brazilian elderly found that arthritis was also the most common chronic disabling disease, along with stroke (30). Stroke and knee pain share certain similarities in their pathophysiology, with the conditions being related to body movements, which may explain the consistency of these chronic conditions in our study.

In our study, older people with vision problems rated their functional status 1.8 times worse than people without vision problems. This finding supported the findings of a study among older Malaysians, which found that vision problems affected older people regardless of their gender (34). In their study, men were 3.8 times more likely to report functional disability, while women were 2.7 times more likely (34). Older people with vision problems have difficulty performing most ADL components, particularly those related to personal and social well-being. A study that examined the impact of glaucoma-associated vision loss on quality of life and social functioning in Indians showed that vision problems led to a decline in the ability to interact in the community, care for oneself, and participate in leisure activities (35). For older people, it poses a greater social burden as it affects their sense of personal security (35). Later consequences include a higher frequency of falls, social isolation and dependence (34).

It is important to note that this study also has some limitations. Measuring functional status using the Barthel Index focused primarily on basic ADL and might not capture more complex functional abilities. The tool is limited to only measuring older people with physical disabilities, not cognitive impairments. Additionally, the data in this study relied on self-reported measures. Hence, there was a risk of recall bias. Although we found that stroke had the greatest impact on disability among community-dwelling older adults, we had to keep in mind that the results were based on a small sample of

stroke reports (5.2%).

CONCLUSION

In conclusion, our study highlighted severe functional disabilities among community-dwelling older people living in FELDA schemes in Pahang, Malaysia. Advanced age and pre-existing chronic conditions were associated with disabilities, particularly stroke, knee pain, and vision problems. The results highlighted the importance of health services that helped older people delay the onset of functional disabilities, particularly to strengthen health promotion and NCDs prevention and to promote a healthy lifestyle as part of life culture from an early age. In future work, it may be useful to examine certain aspects of the impact of functional disabilities in older people on the demands of their care.

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