A study to estimate the frequency of functional disability and associated factors among elderly individuals in a rural field practice area of Bangalore Medical College and Research Center- a cross sectional study

Vishnu Jayarajan[1]* , Jyothi Jadhav[2] , Rose Treesa Mathew[3] ,Anupriya Mathew C[3] , Sini R Krishnan[3], Jai Krishna M G[3] ,Selvi Thangaraj[4]

ABSTRACT

Background

Global increase in elderly population reveals that health of the elderly directly indicates health of a population. With functional disability being an important indicator of disease burden in elderly age group, its estimation and evaluation could pave way for appropriate interventions for betterment of their health contributing to healthy ageing. Hence this study was conducted to estimate the frequency of functional disability and associated factors among elderly individuals in a rural field practice area of Bangalore Medical College and Research Center.

MATERIALS AND METHODS

A cross sectional study was conducted among elderly residents in a rural area of Bangalore. Based on a study done in a rural area of Haryana, (P=37.4%), the sample size was calculated as 200. Samples were selected by Simple Random Sampling method and data collected using Epicollect tool. Sociodemographic factors was assessed using a pre-tested, semi-structured questionnaire and Barthel's Index for activities of daily living.

RESULTS

A total of 200 elderly individuals participated in the study, in the age group of 60- 90 years which included 103(51.5%) females and 97(48.5%) males. Frequency of functional disability among elderly individuals of the study area was found to be 43 (21.5%). Advancing age, female gender, widowhood, illiteracy, unemployment, economic dependence, chronic diseases, and addictive habits were significant risk factors for functional disability.

CONCLUSIONS

Functional disability is prevalent in a significant proportion of elderly individuals in rural area. Hence, it should be identified and addressed through community-based interventions including comprehensive geriatric health assessment and social support promoting activities

Key words: Cross sectional study, elderly, frequency, functionally impaired, rural population

1*Corresponding author: Vishnu Jayarajan ORCID id: https://orcid.org/0009-0000-3095-4524, Email id : jayarajvishnu7@gmail.com, Affiliation: Postgraduate, Bangalore Medical College and Research Institute, Karnataka; 2.Jyothi JadhavORCID id: https://orcid.org/0009-0006-0254-2761, Email id: drjyothijadhav28@gmail.com, Affiliation: Associate Professor, Bangalore Medical College and Research Institute, Karnataka; 3.Rose Treesa Mathew   ORCID id: https://orcid.org/0009-0001-2595-2695, Email id: rosetreesam@gmail.com, Affiliation: Postgraduate, Bangalore Medical College and Research Institute, Karnataka; 4.Anupriya Mathew C ORCID id: https://orcid.org/0009-0005-3437-8305 Email id: anupriyacmathew1994@gmail.com, Affiliation: Senior Resident, Karuna Medical College, Palakkad; 5.Sini R Krishnan ORCID id: https://orcid.org/0009-0001-1284-0491 Email id: sini.navaneetham@gmail.com, Affiliation: Senior Resident, Sri Siddhartha Medical College, Tumkur; 6.Jai Krishna M G   ORCID id: https://orcid.org/0009-0002-2757-1623,Email id: drjaikrishnamg@gmail.com, Affiliation: Senior Resident, Karuna Medical College, Palakkad; 7.Selvi Thangaraj ORCID id : https://orcid.org/0000-0003-3607-1559,Email id : selangel_2006@yahoo.co.in, Affiliation: Professor, Bangalore Medical College and Research Institute, Karnataka

Ethical Approval: The study was approved by the Institutional Ethics Committee (IEC) of Bangalore Medical College and Research Institute (ref no: BMCRI/EC/07/24). Participants were informed about the objectives of the study and also their participation would be voluntary. Written informed consent was obtained

INTRODUCTION

The rapidly increasing aging population globally as well as in India would mean that health of the elderly will be an important issue defining the health status of a population [1]. The proportion of world's elderly population is expected to double from 11% to 22%, between the years of 2000 and 2050[2]. WHO states that 'older persons' are people in the age group 60 years and above[3]. Aging is frequently linked to physical dependency and functional deterioration. Functional disability has been defined as 'acquired difficulty in performing basic everyday tasks or more complex tasks needed for independent living' [4]. Age-related disabilities being a common occurrence can make it harder for the individual to perform everyday tasks like, impairment in activities of daily living (ADLs). In addition to making it harder to carry out daily tasks, vision impairment is linked to a markedly increased risk of falling, being socially isolated, and becoming dependent. A hearing impairment makes it difficult to hear and converse, which hinders socialization.[5] Although a significant proportion of elderly may have chronic illnesses that may not be fully curable, if their functional limitations are identified at the earliest, their health status may be significantly improved. Information regarding the severity of the issue in the community would be necessary for the planning and provision of health care services in this area[6]. Hence estimation and evaluation of functional disability among elderly could pave way for appropriate interventions for betterment of their health and hence contributing to healthy ageing. In this study, the term 'frequency' refers to the proportion of elderly individuals identified with functional disability in the domains of activities of daily living, vision, or hearing. This study was carried out to estimate the frequency of functional disability and associated factors among elderly individuals in a rural field practice area of Bangalore Medical College and Research Center.

MATERIALS AND METHODS

This community-based study was conducted among individuals aged 60 years and above, in a rural area of Nelamangala, rural Bangalore. The study was conducted for a period of 2 months from February to March 2024. The interview schedule was developed in English, and translated into Kannada. It was administered to participants in Kannada. All elderly individuals aged 60 years and above residing in the study area and willing to provide consent were included. The study specifically assessed functional disability in the domains of activities of daily living (ADL), vision, and hearing. Hence, disabilities considered for assessment and comparison were ADL disability (assessed by the Barthel index), blindness (defined as presenting visual acuity <3/60 in the better eye), and bilateral hearing impairment (assessed by whisper test and tuning fork tests). Elderly individuals with severe mental or psychiatric disorders that impaired their ability to provide responses were excluded. Other disabilities such as locomotor, speech, and intellectual disabilities were not considered, as these required different tools for accurate measurement and were beyond the scope of this study.

Socio demographic details were collected using a pretested, semi structured questionnaire. Information on age, marital status, education, working status and economic dependence was recorded. The participant was considered to be economically independent if he or she believed that their personal income or any financial assistance from a social program would be enough to support themselves. If the participant was entirely or partially dependent on other family members for their needs, they were considered as economically dependent. The information on self-reported chronic conditions was recorded. If the participant had a prescription for medication or a diagnosis of a chronic illness such as diabetes, hypertension, joint pain, chronic obstructive pulmonary disease (COPD), their self-reported chronic condition was noted. Based on the history, information on addiction prone habits was also documented.

Functional disability was defined as having disability in activities of daily living (ADL) or blindness or bilateral hearing impairment, or a combination of these[4]. ADL were assessed by using Barthel "ADL" questionnaire[7-9]. The ten ADL items assessed were feeding, bathing, dressing, grooming, toileting, bladder control, bowel control, transferring from bed to chair, walking and stair climbing. The

participant was considered as having ADL disability if she or he had at least one of these ten ADL disabilities.

Presenting visual acuity was assessed by using Snellen's distance vision chart. The vision was recorded at a distance of 3 meters separately for each eye; with distant glasses, if any; the participants were categorized as having vision <3/60 or ≥3/60. Blindness was defined as presenting visual acuity of <3/60 in the better eye with available correction[10].

For the assessment of hearing, all participants were first administered the whisper test. Those participants who failed the whisper test were examined with Rinne's test and Weber's test for hearing status, using a 512 Hz tuning fork. Based on these tests, it was determined if bilateral hearing impairment was present or not. To minimize interviewer bias, data collection was carried out by a single trained investigator. However, as multiple logistic regression was not performed, the potential influence of confounding factors such as age, gender, education, and co-morbidities on the outcomes could not be fully adjusted for.

Sample Size
The sample size was estimated using OpenEpi software at a 95% confidence level with 7% absolute precision[11] using the proportion of functional disability among elderly (37.4%) from a previous study done by Gupta P et al[6]., in a rural area in Haryana. Sample size was calculated and rounded off to **200.**

Sampling technique
Data was collected using simple random sampling method. A total of 42 villages were included in the field practice area of the rural health centre of the Institute which covered a total population of 42,343. Four random villages among these 42 was selected using lottery method and subsequently a visit to the Health Subcentres of those selected villages was conducted to obtain data of the houses with elderly individuals (60 years and above) of that area following which a random house among them was selected. The selected house was visited and the elderly in the household was interviewed after

obtaining due consent. House to house visits were conducted subsequently and data collected till elderly individuals of required sample size were interviewed.

Method of Selection
Inclusion Criteria: -
1. Elderly individuals aged 60 years and above residing in the field of study, with the above mentioned disabilities.
2. Elderly individuals willing to give consent for the study

Exclusion Criteria: -
1. Individuals with severe mental or psychiatric disorders, which impaired them from providing the responses.

Methods of Data Collection
In the first phase, a questionnaire was developed in the Epicollect 5 software. Epicollect 5 is useful for collecting data without utilizing paper or the internet. Data was collected using Epicollect 5 application, which was loaded on an Android phone, and then uploaded onto Epicollect 5 software cloud. The data was then downloaded into an excel file. Pretesting was carried out among 20 participants (≈10% of the sample) to identify scope for improvement. Final data collection began in the field after participants' responses were analyzed and improvement measures were identified. After receiving informed consent from selected participants, the second phase of data collection began. House to house visits were done to conduct interviews.

Statistical Analysis
Data from the Epicollect 5 was converted to an excel sheet and cleaned. The cleaned data was analyzed using SPSS software 21.0. Simple bivariate analysis was used to compute the association between various socio-demographic factors and functional disability of the elderly.

RESULTS
Socio-demographic details
The socio-demographic profile reveals a diverse and representative sample of 200 participants. Gender distribution was nearly equal, with 97 males and 103 females. The majority of participants fell within the age group of 60-69 (58%). Study participants were

Vishnu Jayarajan et al.

predominantly Hindus (97%) and rest 3% Muslims. Marital status varied, with 197 participants who have been married and 3 unmarried individuals. Out of the married 197 individuals, 137 were currently living with their spouses while the rest 60 were widows or widowers. Educational backgrounds ranged widely, with 37% reporting illiteracy, 32% studied up to primary education, and only 3% having education beyond the 10th grade. 65% of study participants were currently not working. Economic dependence varied, with 63% reporting to be dependent, 19% partially dependent and 15% independent. Participants reported various chronic illnesses, including diabetes (38%), hypertension (42%), COPD (7%), and almost half reporting joint pain. Additionally, addiction prone habits such as alcohol consumption (13%), tobacco consumption (32.5%) which includes smoking (22%) and tobacco chewing (eg. betel nut, paan, etc.,) were reported. 11 participants (5.5%) reported both alcohol and tobacco consumption. **Table.1** summarises the socio-demographic characteristics.

Table.1: Socio-demographic characteristics of the study participants.

Sociodemographic characteristics		Number of study participants (n=200)
Gender	Male	97 (48.5%)
	Female	103 (51.5%)
Age Group	60-69	116 (58%)
	70-79	58 (29%)
	80-89	26 (13%)
Religion	Hindu	194 (97%)
	Muslim	6 (3%)
Marital Status	Married	137 (68.5%)
	Widow/ Widower	60 (30%)
	Unmarried	3 (1.5%)
Educational Status	Illiterate	77 (38.5%)
	Studied up to 10th	117 (58.5%)
	Studied above 10th	6 (3%)
Working Status	Working presently	73 (36.5%)
	Not working presently	127 (63.5%)
Economic Dependence	Economically dependent	169 (84.5%)
	Economically independent	31 (15.5%)
Chronic Diseases	Diabetes	77 (38.5%)
	Hypertension	85 (42.5%)
	COPD	14 (7%)
	Joint Pain	99 (49.5%)
Addictive Habits	Alcohol consumption	26 (13%)
	Tobacco consumption	65 (32.5%)
	Both Alcohol and Tobacco	11 (5.5%)
	No Addictive Habits	98 (49%)

(Note: In the Chronic diseases section of the table, total percentage exceeds 100% because some participants have multiple chronic diseases, leading to overlapping counts across different conditions)

Frequency of functional disability (N = 200))
The prevalence of functional disability among elderly individuals in the study area was found to be **21.5%** (n = 43). This indicates that approximately one in five elderly individuals experience some level of functional impairment, highlighting the need for targeted interventions to improve their quality of life. Study revealed that 35 (17.5%) study participants had activities of daily living (ADL) disability, 8 (4%) participants had blindness and 10 (5%) participants had bilateral hearing impairment (Table 2).

Table.2: Frequencies of Functional Disability among study participants

Disability	Frequency	Percentage of study population (n=200)	Percentage of Total Functional Disability (n=43)
ADL Disability	35	17.50%	81.39%
Blindness	8	4%	18.60%
Bilateral Hearing Impairment	10	5%	23.25%

Associated factors for functional disability
The study found a significant association between functional disability and various socio-demographic factors among elderly individuals in the rural field practice area. Functional disability was significantly higher in older age groups, with 43% of individuals aged 70–79 years and 30.8% of those aged 80–89 years affected, compared to only 8.6% in the 60–69 age group (χ^2 = 28.8, p < 0.001). Gender differences were also observed, with females (30.1%) experiencing a significantly higher prevalence of functional disability than males (12.4%) (χ^2 = 9.3, p = 0.002). Marital status influenced functional disability, with the highest prevalence among widowed individuals (40%) compared to married individuals (13.9%) (χ^2 = 17.7, p < 0.001). Educational status also played a role, as illiterate individuals had a higher prevalence (29.9%) compared to those with education up to 10th grade (14.5%) and above 10th grade (50%) (χ^2 = 20.8, p < 0.05). Additionally, individuals who were not currently working had a significantly higher prevalence of functional disability (33.9%) compared to those working (0%) (χ^2 = 31.5, p < 0.05). Economic dependence was also linked, with all dependent individuals showing some level of functional disability (χ^2 = 10, p < 0.05). Presence of chronic diseases (χ^2 = 100, p < 0.001) and addictive habits (χ^2 = 27.2, p < 0.001) were strongly associated with higher functional disability rates. The association of functional disability with various socio-demographic factors is shown in Table 2 and Table 3.
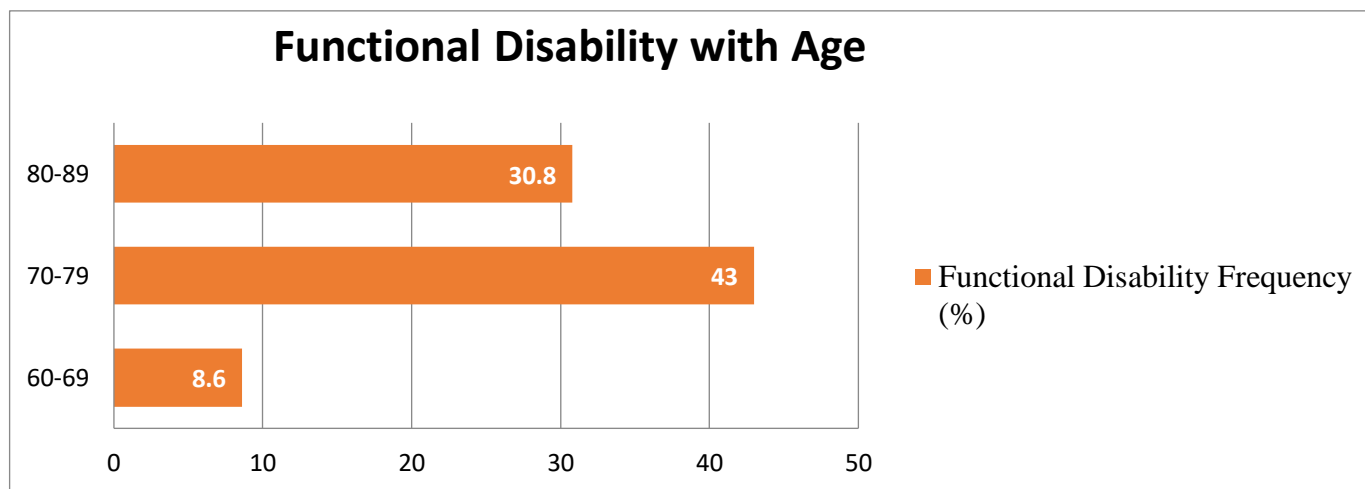
Table 3: Association of functional disability with age, gender, marital status, educational status, working status and economic dependence

Socio demographic Factor		Functional Disability		Frequency of Functional Disability among each socio-demographic subgroup (%)	X²	df	p value
		Absent (n=157)	Present (n=43)				
Age group	60-69	106	10	8.6	28.8	2	<0 .001
	70-79	33	25	43			
	80-89	18	8	30.8			
Gender	Female	72	31	30.1	9.3	1	0.002
	Male	85	12	12.4			
Marital Status	Married	118	19	13.9	17.7	2	<0 .001
	Single/ Unmarried	3	0	0			
	Widow/ Widower	36	24	40			
Educational Status	Illiterate	54	23	29.9	20.8	3	<0.05
	Upto 10th	100	17	14.5			
	Above 10th	3	3	50			
Working Status	Not working presently	84	43	33.9	31.5	1	<0.05
	Working presently	73	0	0			
Economic dependence	Dependent	126	43	25.4	10	2	<0.05
	Independent	31	0	0			
p <0.05 is significant							

Figure 1 and Figure 2 shows the comparison of functional disability in elderly among various age groups and genders respectively.

Figure 1: Elderly functional disability comparison among various age groups.
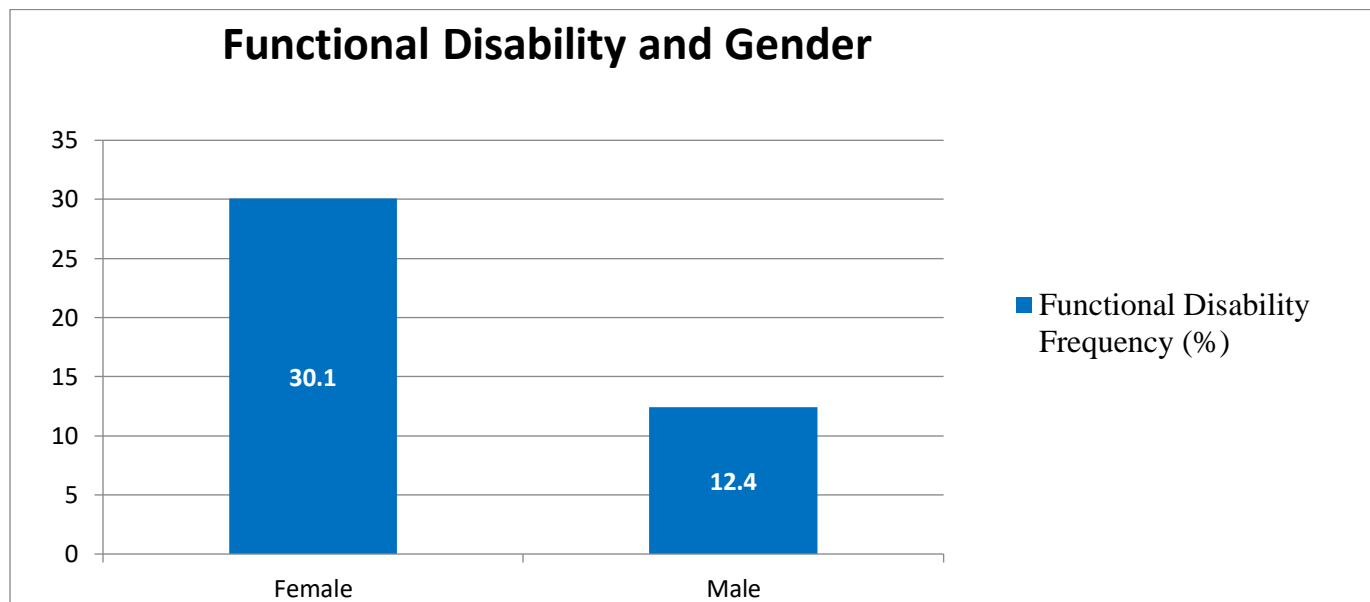
Functional Disability and Gender

Figure 2 Elderly functional disability comparison among genders.

All the socio-demographic factors that were assessed were found to have a significant association with functional disability.Our study revealed that Functional Disability affected 21.5% of the study participants, highlighting its considerable burden within the rural population. Gupta et al.[6] reported a 37.4% frequency of functional disability in an elderly population residing in rural Haryana. In a study done in 2016 to assess nutritional status and functional disability among elderly in another rural area of Bangalore, the frequency was found to be 24.2%[12]. The frequency of functional disability was reported to be 16.16% in West Bengal[13], 20.6% in Tamil Nadu[14], and 23.4% in Jhansi[15]. In another community based study in the rural Tamil Nadu, the frequency was found to be 46.8%[16]. The relatively lower frequency of functional disability in this study could be because of the study area being in close proximity with urban Bangalore, hence having better access to healthcare facilities. Other factors that could have contributed to the same are the area being in the state capital and the higher chance of the population to have higher levels of education and health awareness. It is also possible to explain the variation in frequency by pointing out that different studies have employed different definitions of functional impairment. In this study, a participant was considered to have functionally disability if the Barthel ADL scale score was ≤19, i.e.,

at least one ADL disability was present, or if their better eye presenting vision was <3/60 with available corrections, or if bilateral hearing impairment was present, or a combination of these. The proportion of participants in our study with ADL disability, blindness and bilateral hearing impairment being 17.5%, 4% and 5% respectively showcases the need for conducting routine eye and ENT health checkups along with comprehensive geriatric assessments at the community level.

The findings of this study highlight that advancing age, female gender, widowhood, illiteracy, unemployment, economic dependence, chronic diseases, and addictive habits are significant risk factors for functional disability among the elderly. The strong association between increasing age and functional disability suggests that physiological decline with aging plays a crucial role. Gender differences were notable, with a higher frequency among women compared to men. This higher frequency among females may be attributed to longer life expectancy and increased vulnerability to musculoskeletal and chronic conditions. Marital status played a role, as higher frequency of functional disability was observed among widows or widowers as compared to married participants living with their spouses. Widowhood's impact on functional disability may be due to lack of social and

emotional support. This could be due to higher probability of social support enjoyed by individuals with a spouse and a family. Notably, none of the unmarried participants were found to have functional disability. This could be due to the very small sample size of unmarried individuals, which may not accurately represent the broader trend. Education also emerged as a factor, with higher frequency among illiterate participants compared to those with education up to the 10th standard. This finding strengthens the benefits of education in decreasing the chance of functional disability and thereby quality of life due to increased health awareness and positive health behaviour. The higher frequency among participants who studied above 10th standard could be owing to the less number of study participants in that category (3 in number). Working status also showed a significant association, with frequency more in non-working participants, while none of the working participants displayed it. This signifies that engagement in vocational activities could be associated with better functionality and less chances for functional disability among the elderly. Economic dependence was linked, with economically dependent participants having more frequency of functional disability, while none of the economically independent participants exhibited it. This signifies lesser chance for economically independent elderly individuals in acquiring functional disability. Economic dependence and unemployment contributing to increased vulnerability highlights the importance of financial security in old age. The significant association with chronic diseases and addictive habits reinforces the need for targeted health interventions to manage comorbidities and promote healthier lifestyles to prevent or delay functional disability.

Based on the findings of this study, the following recommendations can be made to improve the functional status of elderly: -

● Conducting comprehensive geriatric assessment (CGA) at the community level for screening, promotion of health care and rehabilitative activities for the elderly starting from the level of subcenters.
● Conducting regular geriatric camps for early screening for functional disability and other

comorbidities along with efficient referral to more specialized services like Geriatrics, Ophthalmology or ENT services if needed.
● Training of healthcare workers for CGA and in addressing the various healthcare needs of the elderly in the community.
● Introducing adult education programs incorporating health literacy to empower individuals in managing their health and disabilities along with vocational training or light employment opportunities to improve physical activity and economic status.
● Community engagement initiatives for promoting a strong network of social support for the elderly in collaboration with friends, family and community at large.

The strengths of the study were the usage of a validated study tool and community-based assessment of the elderly. Study limitations were a relatively small sample size, recall bias while evaluation for activities of daily living. Another limitation that can be added is that family income, family structure and family or social support were not included in the socio-demographic profile.However, the study has thrown light on the magnitude of the problem and hence would possibly pave the way for future action plans for preventive, promotional and rehabilitative activities for the health care of the elderly and also could pave way for research in this field for the betterment of their health.

CONCLUSION
From this community-based study, it was found that functional disability was having a significant frequency among elderly individuals in rural area. Findings of the study underscore the multifaceted nature of functional disability among the elderly, influenced by demographic, social, and economic factors. Hence, it should be identified and addressed through community-based interventions so as to ensure healthy ageing. Comprehensive geriatric assessment in the community level through geriatric camps and other health promoting activities along with improvement in the social support for elderly would help in reaching this goal.

REFERENCES

1) World Health Organization. The World Health Report 2008: Primary Health Care (Now more than ever); 2008. Available from: http://www.who.int/whr/2008/en/.[cited 2025 March 20]

2) Facts on ageing and life course. WHO ageing and life course. Available from: http://www.who.int/features/factfiles/ageing/ageing_facts/en/index.html. [cited 2025 March 20]

3) Decade of healthy ageing: baseline report [Internet]. Available from: https://apps.who.int/iris/handle/10665/338677. [cited 2025 March 20]

4) Rodrigues MA, Facchini LA, Thumé E, Maia F. Gender and incidence of functional disability in the elderly: A systematic review. Cad SaúdePública 2009;25:464-76.

5) Vaish K, Patra S, Chhabra P. Functional disability among elderly: A community-based cross-sectional study. Journal of family medicine and primary care. 2020 Jan;9(1):253.

6) Gupta P, Mani K, Rai SK, Nongkynrih B, Gupta SK. Functional disability among elderly persons in a rural area of Haryana. Indian journal of public health. 2014 Jan 1;58(1):11-6.

7) Fi M. Functional evaluation: the Barthel index. Maryland state medical journal. 1965;14:61-5.

8) Collin C, Wade DT, Davies S, Horne V. The Barthel ADL Index: A reliability study. Int Disabil Stud 1988;10:61-3.

9) Wade DT, Collin C. The Barthel ADL index: A standard measure of physical disability? Int Disabil Stud 1988;10:64-7.

10) NPCBVI - Ministry of Health and Family Welfare [Internet]. Government of India; [cited 2023 Dec 21]. Available from: https://npcbvi.mohfw.gov.in/ [cited 2025 March 20]

11) Dean AG, Sullivan KM, Soe MM. Open Source Epidemiologic Statistics for Public Health. OpenEpi Menu. Available from: https://www.openepi.com/Menu/OE_Menu.htm. [cited 2025 March 20]

12) Kavya C, Santosh A. Geriatric health: Assessment of nutritional status and functional ability of elderly living in rural area of Bangalore, Karnataka, India. Int J Community Med Public Health 2016;3:3460-4.

13) Chakrabarty D, Nandal PK, Manna N, Mallik S, Ghosh P, Chatterjee C, et al. Functional disability and associated chronic conditions among geriatric populations in a rural community of India. Ghana Med J 2010;44:150-4.

14) Paul SS, Abraham VJ. How healthy is our geriatric population? A community based cross sectional study. J Family Med Prim Care 2015;4:221-5.

15) Gupta S, Yadav R, Malhotra A. Assessment of physical disability using Barthel index among elderly of rural areas of district Jhansi (U.P.), India. J Family Med Prim Care 2016;5:853-7.

16) Sowmiya K, Kumar PG, Nagarani. A study on prevalence and correlates of functional disability among the elderly in rural Tamilnadu. Int J Med Res Rev 2015;3:430-5.