Original Research Article

A Study on Non-Communicable Diseases in Geriatric Population of Urban Slum Under a Medical College of North Karnataka

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ABSTRACT

Background: Longevity has increased significantly over the past few decades due to demographic transition in the country. India will be noticed to have the highest number of elderly with multimorbidity of non-communicable disease (NCD) in the world by year 2030.
Objectives: To assess the prevalence of prevailing NCDs among elderly and determine associated factors.
Methodology: A cross-sectional study was conducted in urban field practice area of a medical college of North Karnataka in the year 2019. Sample size was 627 and predesigned; pre-tested, semi-structured questionnaire was utilized to collect the information in the residence of the participants through interview, anthropometric measurements, clinical examination, blood pressure and random blood sugar estimation. Data analysis was done using SPSS software version 20.
Results: In 627 elderly, 48.65% were diabetics, followed by 26.16% hypertensives. Other morbidities were musculoskeletal, cataract, stroke and cancers. Tobacco consumption along with ageing and socio-economic status significant factor for the development of morbidities in the elderly.
Conclusion: The results will help in the policies and programmes to prevent further complications and arising catastrophic health expenditure as majority belongs to lower socioeconomic status.

Keywords: Elderly, non-communicable disease, urban area, diabetes, hypertension

INTRODUCTION

Recent advances in modern technologies and medicine have facilitated a greater number of the population surviving into later life with the potential to reach the age of 120 years. This phenomenon known as the "rectangularization" or "box shaping" of the survival curve of the man, suggests that the average life span of man is increasing.[1] India's population is aging rapidly and the

elderly population is projected to rise from 5.6% in 1961 to 12.4% by the year 2026[2] and triple by 2050.[3]

Old age is not a disease in itself, but the elderly are vulnerable to long term disease of insidious onset such as Hypertension, Diabetes Mellitus, Obesity, Arthritis, Cataract, fall, Fracture and Depression. Along with aging, behavioural factors like tobacco use, physical inactivity, excess consumption of alcohol, and an unhealthy diet further increase the risk of NCDs and mortality due to NCDs. They have multiple symptoms due to decline in the functioning of various body organs. Being old, weak, hard of hearing, partially blind and immobile, the aged seldom move out or approach for help and consultation.[4] There were multiple co-morbidities and the need of urgent interventions to increase the length of life of the elderly was understood from the previous studies[5-8] done all over India and the World. It was known majority of the elderly had hypertension, diabetes mellitus; some had cataract and urinary incontinence as well along with loneliness leading to depression in them.

Recognizing the need for reliable data on NCD in the elderly residing in an urban slum, the present study was designed. By addressing the NCDs among elderly in UHTC area, we will know the burden and plan a multi-faceted approach involving the Government, communities and families. Thus, the study was undertaken to assess the prevalence of different NCDs among the elderly of more than 60 years and to determine the factors associated with NCDs

MATERIALS & METHODS

A cross-sectional study was conducted in the urban field practice area of a medical college of North Karnataka in the year 2019 for a period of one year. According to a study done by Mini GK, Thankappan KR (2017) in selected Indian states, the prevalence of NCD among the elderly was 30.7%.[9] Sample size was estimated using the formula n= $4pq/d^2$ where, n = sample size, p = 30.7%, q = 100-p = 69.3%, d =

3.684 (an allowable error). Thus, estimated sample size was 627. Systematic random sampling method was adopted to select the elderly participant by calculating the kth value i.e., total estimated elderly population/sample size. It was known from the Census 2011 that, elderly constituted 8.1% of total population. The total population of the study area was 18,803. Thus, estimated elderly population in the study area was 1523. Thereby, sampling interval (k^{th} value) was calculated as 2.42. Therefore, every 2nd elderly participant was included in the study until the attainment of the required sample size. Informed written consent was taken from the participants before interview. The nature and purpose of the survey was explained in detail to them in the local language. Confidentiality was assured and interviews were conducted in a non-judgmental manner. Local cultural values and ideas were respected. A predesigned; pre-tested, semi-structured questionnaire was devised to collect information pertaining to sociodemographic variables, socio-economic status and personal history which was validated from the geriatric experts and also from the community medicine experts.

Data was collected in the residence of the participants through interviews, examination and anthropometric measurements. BMI was classified according to South East Asian region (WHO) as underweight – less than 18.5 kg/m^2; normal – 18.5-22.99 kg/m^2; overweight – 23-24.99 kg/m^2; pre-obese – 25-29.99 kg/m^2; obese class I – 30-40 kg/m^2; obese class II – 40.1-50 kg/m^2; obese class III – above 50 kg/m^2. Blood pressure was measured in all the elderly participants. Three measurements of blood pressure of each study participant were measured using mercury sphygmomanometer; first by palpation method followed by auscultation method as per JNC 8 guidelines. Blood pressure measurements were obtained after the subject rested for at least 5 minutes in a sitting position. All blood pressure measurements were made on left arm of

each subject, using a cuff of appropriate size. The average of three readings was noted to describe the blood pressure of the participant. Cut off for hypertension was ≥ 140 mmHg for systolic and ≥ 90 mmHg for diastolic blood pressure. Blood sugar levels were measured in all the elderly participants through random blood sugar measurement. Under all aseptic precautions a drop of blood was drawn from the tip of ring finger after wiping off the first drop. A digital standardized CareSens[TM]N Glucometer was used to measure random blood sugar level. Categorization of subjects by Random blood sugar levels (American Diabetic Association guidelines) was done. Blood sugar level < 140 mg/dl was considered as normal, 140-199 mg/dl was pre-diabetic and ≥ 200 mg/dl was the cut-off to diabetic. They were followed up and advised. Unknown cases whose RBS was ≥ 200 mg/dl were explained about the protocol of further investigations (need for fasting as well as postprandial blood glucose levels and HbA1c levels) for which they were referred to a higher center. Potential biases were minimized during data collection by interviewing family members and cross verifying their medical records. Study protocol was approved by the institutional ethics committee of the college.

STATISTICAL ANALYSIS
Collected data was entered in the MS Excel Sheet and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. Descriptive data was expressed in the form of frequencies and proportions, continuous variables were expressed in the form of mean, standard deviation. Inferential statistics was performed using Chi square test and p value <0.05 was considered statistically significant.

RESULTS
Out of 627 elderly participants, majority (35.24%) were in the age group of 60-64 years followed by 28.86% of 65-69 years age. Only 7.66% participants were aged above 80 years with 8.3% in 75-79 years age. It was observed that 51.68% were females and 48.32% were males. Majority of the elderly (49.12%) were living in joint family and 31.10% were living in a nuclear family and 19.78% were living alone as depicted in table 1.

Table 1: Table showing the sociodemographic variables and morbidities of the elderly

Sociodemographic variables	Frequencies (n)	Proportions (%)
Age		
60-64	221	35.24
65-69	181	28.86
70-74	125	19.94
75-79	52	8.30
80 and above	48	7.66
Sex		
Male	303	48.32
Female	324	51.68
Type of family		
Nuclear	195	31.10
Joint	308	49.12
Living alone	124	19.78
Religion		
Hindu	490	78.14
Muslim	76	12.13
Others	61	09.73
Educational status		
Illiterate	350	55.82
Primary School	117	18.66
High School	57	9.09

SSLC	59	9.41
PUC/Diploma/ITI	30	4.79
Undergraduate/Postgraduate	14	2.23
Socio-Economic Status		
Class I	07	1.12
Class II	15	2.39
Class III	23	3.67
Class IV	179	28.55
Class V	403	64.27
Diet		
Vegetarian	220	35.09
Non-vegetarian	59	9.41
Mixed	348	55.50
BMI		
Underweight	73	11.64
Normal	99	15.79
Overweight	102	16.27
Obese	353	56.30
Habits		
Ever smoker	166	26.47
Never smoker	461	73.53
Ever tobacco chewer	192	30.63
Never tobacco chewer	435	69.37
Ever alcohol drinker	164	26.16
Never alcohol drinker	463	73.84
Morbidities		
Musculoskeletal	42	6.70
Cataract (Operated)	50	7.97
Cataract (non-operated)	11	1.75
Cancer	10	1.59
Diabetes	305	48.65
Hypertension	164	26.16
Diabetes + Hypertension	24	3.83
Stroke	21	3.35

Majority of the elderly (55.82%) were illiterates. It was observed that 64.27% belonged to class V socioeconomic status according to Modified B G Prasad classification. It was observed that 35.09% were vegetarians, 9.41% were non vegetarians and 55.50% had mixed type of diet.

In the present study, 7.26% males and 16.00% females were underweighted, 15.51% males and 15.74% females had normal BMI, 18.48% males and 14.20% females were overweight and 58.75% males and 54.06% females were obese. The most common NCDs among elderly was Diabetes (48.64%) followed by Hypertension in 26.16%, operated cataract in 7.97% and Musculoskeletal disease in 6.70%. Cardiovascular disease (Stroke) was seen in 3.35% and cancer in 1.59% elderly participants as depicted in table 1.

Table 2: Distribution of morbidity in the elderly according to age

Morbidity	Age in years					
	60-64	65-69	70-74	75-79	≥80	Total
Musculoskeletal	09 (04.07%)	12 (06.63%)	12 (09.60%)	03 (05.77%)	06 (12.50%)	42 (06.70%)
Cataract Operated	18 (08.14%)	17 (09.39%)	07 (05.60%)	05 (09.62%)	03 (06.25%)	50 (07.98%)
Cataract non operated	11 (04.98%)	00 (00.00%)	00 (00.00%)	00 (00.00%)	00 (00.00%)	11 (01.75%)
Cancer	06 (02.71%)	02 (01.10%)	02 (01.60%)	00 (00.00%)	00 (00.00%)	10 (01.59%)

Diabetes	109 (49.32%)	86 (47.51%)	62 (49.60%)	26 (50.00%)	22 (45.83%)	305 (48.64%)
Hypertension	51 (23.08%)	53 (29.28%)	34 (27.20%)	12 (23.08%)	14 (29.17%)	164 (26.16%)
Diabetes + Hypertension	08 (03.62%)	06 (03.31%)	06 (04.80%)	01 (01.92%)	03 (06.25%)	24 (03.83%)
Stroke	09 (04.08%)	05 (02.78%)	02 (01.60%)	05 (09.61%)	00 (00.00%)	21 (03.35%)
Total	221 (100.00%)	181 (100.00%)	125 (100.00%)	52 (100.00%)	48 (100.00%)	627 (100.00%)

p = 0.022; χ^2 test

In the current study, it was observed that, there was significant association between ageing population and the presence of morbidity. Higher the ages, higher are the proportions of morbidities which was statistically significant as depicted in table 2.

In the present study, on examination 45.13% were having normal blood pressure, 28.71% were pre hypertensive and 26.16% were hypertensive. Random blood sugar >200mg/dl was observed in 18.18%. Among 627 participants, 30.47% were known diabetics on treatment. On examination, persistence of high blood sugar levels > 200 mg/dl was observed in 83 elderly (72.80%).

Table 3: Association of habits with non-communicable diseases in the elderly

NCDs	Ever smoker 166 (26.47%)	Never smoker 461 (73.53%)	p value*
Musculoskeletal	12 (07.23)	30 (06.51)	**0.006**
Operated cataract	07 (04.22)	43 (09.33)	
Non operated cataract	02 (01.20)	09 (01.95)	
Cancer	04 (02.41)	06 (01.30)	
Diabetes mellitus	69 (41.57)	236 (51.19)	
Hypertension	51 (30.72)	113 (24.51)	
Hypertension with diabetes mellitus	10 (06.02)	14 (03.04)	
Stroke	11 (06.63)	10 (02.17)	
NCDs	**Ever chewer 192 (30.63%)**	**Never chewer 435 (69.37%)**	**p value***
Musculoskeletal	19 (09.90)	23 (05.29)	**0.004**
Operated cataract	11 (05.73)	39 (08.97)	
Non operated cataract	01 (00.52)	10 (02.30)	
Cancer	03 (01.56)	07 (01.61)	
Diabetes mellitus	85 (44.27)	220 (50.57)	
Hypertension	49 (25.52)	115 (26.44)	
Hypertension with diabetes mellitus	12 (06.25)	12 (02.76)	
Stroke	12 (06.25)	09 (02.07)	
NCDs	**Ever drinker 164 (26.16%)**	**Never drinker 463 (73.84%)**	**p value***
Musculoskeletal	16 (09.76)	26 (05.62)	0.089
Operated cataract	12 (07.32)	38 (08.21)	
Non operated cataract	01 (00.61)	10 (02.16)	
Cancer	03 (01.83)	07 (01.51)	
Diabetes mellitus	69 (42.07)	236 (50.97)	
Hypertension	46 (28.05)	118 (25.49)	
Hypertension with diabetes mellitus	07 (04.27)	17 (03.67)	
Stroke	10 (06.10)	11 (02.38)	

*χ^2 test applied, p value < 0.05 are significant and marked in bold

It was noted from the current study, 41.57% ever smokers were found to be diabetic; 30.72% ever smokers were found to be hypertensive; 7.23% had musculoskeletal diseases; 6.63% had stroke among ever smokers. Among never smokers; 51.19% were diabetics, 24.51% were hypertensives, 3.04% were both hypertensive and diabetics

which was found to be statistically significant, suggesting smokers had higher proportion of having morbidities than non-smokers.

The current study noted, the proportion of hypertensives in both ever and never tobacco chewers was relatively similar i.e., 25.52% and 26.44% respectively. There was also similarity in the diabetes mellitus as well, wherein, 44.27% ever chewer were diabetics and 50.57% never chewers were diabetics. It was observed that, 6.25% ever chewers were both hypertensive as well as diabetics. Only 2.76% of the never chewers were having co-morbidity of hypertension and diabetes mellitus. It was also noted, musculoskeletal and stroke was relatively higher in ever chewers than never chewers. Thus, it showed a statistically significant association.

It was found from the current study that, there were lesser proportions of patients with the co-morbidities among never drinkers than ever drinkers. However, 50.97% never drinkers were diabetics and 42.07% patients among ever drinkers. It was noted, among never drinkers, 3.67% were both hypertensives and diabetics, 25.49% were hypertensives, 2.38% had strokes, 5.62% had musculoskeletal disorders. Among ever drinkers, 9.76% were having musculoskeletal disorders, 6.10% were having stroke, 4.27% were both hypertensives and diabetics, 28.05% were hypertensives. However, there was no significant association between drinking and the co-morbidities secondary to the proportion of the patients in both groups.

Table 4: Association between Socio-economic status and morbidity status of the elderly.

NCDs with SES classes	Class I 07 (01.12)	Class II 15 (02.39)	Class III 23 (03.67)	Class IV 179 (28.55)	Class V 403 (64.27)
Musculoskeletal	00 (00.00)	04 (26.67)	02 (08.70)	05 (02.79)	31 (07.69)
Operated cataract	02 (28.57)	00 (00.00)	01 (04.35)	16 (08.94)	31 (07.69)
Non operated cataract	00 (00.00)	00 (00.00)	00 (00.00)	02 (01.12)	09 (02.23)
Cancer	01 (14.29)	00 (00.00)	00 (00.00)	05 (02.79)	04 (00.99)
Diabetes mellitus	02 (28.57)	07 (46.67)	14 (60.87)	85 (47.49)	197 (48.88)
Hypertension	02 (28.57)	04 (26.67)	06 (26.09)	57 (31.84)	95 (23.57)
Hypertensin with diabetes mellitus	00 (00.00)	00 (00.00)	00 (00.00)	05 (02.79)	19 (04.71)
Stroke	00 (00.00)	00 (00.00)	00 (00.00)	04 (02.23)	17 (04.22)

p value: 0.039; χ^2 test

It was noted from the current study, among 1.12% class I elderly patients, 28.57% each had diabetes mellitus and hypertension. Among 2.39% class II elderly patients, 46.67% were diabetic and 26.67% were hypertensives and having musculoskeletal disorders. Class III patients had diabetes mellitus in 60.87% patients and 26.09% had hypertension. Class IV patients also showed 47.49% diabetics and 31.84% hypertensives and among 64.27% class V patients, 48.88% were diabetic, 23.57% were hypertensives and 7.69% had musculoskeletal disorders. Thus, it was observed that, although all the classes of socio-economic status had diabetes mellitus and hypertension, the proportion was found to be decreasing in the lower classes than higher classes and it was

statistically significant showing affluent societies had more of sedentary lifestyle and prone to be having more of such co-morbidities than lower socio-economic class patients. however, stroke was noted in the lower-class patients suggesting non-affordability to the medications of non-communicable diseases leading to complications like stroke.

DISCUSSION

In India, there is no nationwide registry of elderly population. Community based data on NCDs are also not readily available. Absence of reliable and continuous source of data makes the task of researchers difficult. As there is increasing transition according to the age structure of developing

countries, demands on resources by different segments of population are expected to grow. Current statistics for the elderly in India give a prelude to a new set of medical, social and economic problems that could arise if a timely initiative in this direction is not taken by the program managers and policy makers. There is a need to highlight the burden of NCDs that are being faced by the elderly people in India, and strategies for bringing about an improvement in their quality of life.[10] The present study indicated that out of 627 elderly, majority (35.24%) were in the age group of 60-64 years and females outnumbered males. Similar findings were observed in other studies.[11,12] Majority of the elderly (49.12%) lived in joint families and was similar to other studies.[13,14] The joint family system gives physical, social, emotional and economical support to the elderly. In our study, almost 20% of the elderly were living alone. Push factors such as population pressures, and pull factors such as wider economic opportunities and modern communication, cause young people to migrate. Those who migrate may experience their own financial difficulties, and parents hesitate to depend on their employed children for financial support.[15] More than 50% of the elderly in our study were found to be illiterate. In a study done in a rural area of Tamil Nadu, 78.7% of the elderly were illiterates.[5] In another study conducted in a rural area of Pondicherry in the year 2017, 82.5% of the elderly were illiterate.[16] This finding indicates the gravity of the situation regarding awareness of the Government social security schemes for the elderly. Regarding socio economic status of the elderly, more than 90% belonged to Class V and IV combined under modified BG Prasad classification. The Myanmar Aging Survey (MAS) found that a majority of older people in Myanmar typically lived in low-income households and only 55% felt that their income was adequate to meet their daily needs on a regular basis.[17] This finding highlights the need for outreach primary health care services on a daily basis

which is easily accessible to the elderly. Almost 50% of the elderly had diabetes mellitus in our study. In a study among the elderly in the year 2019 in six states, the prevalence of Diabetes was found to be 31.2%.[18] In the economic impact of Diabetes Mellitus in elderly, it was reported that almost half of diabetics were aged 65 years and above with an approximately equal distribution between men and women.[19] According to China, Center for Disease Control and Prevention the overall prevalence of diabetes among people aged 60 years and over was 19.6%; it was lower in men than in women (18.3% and 20.8%).[20] High prevalence of diabetes could be due to dietary pattern of high carbohydrate diet with low protein intake in this part of Karnataka. This kind of diet will lead to metabolic syndrome and insulin resistance. Vigorous targeted NCD screening programs should be planned and would be beneficial to high-risk population. Health awareness regarding an adequate protein diet to prevent and control NCDs should be brought about along with regular moderate physical activity and would be beneficial to the community in the long term. Even introducing eggs through the public distribution system to the elderly would be helpful in prevention and control of non-communicable disease.

In the current study, there was strong association between the smokers and the presence of non-communicable diseases which showed that, among ever smokers, 30.72% were hypertensives, 41.57% were diabetics, 2.41% were suffering from cancer, 7.23% had musculoskeletal disorders, 6.63% had stroke which was higher than among never smokers (p < 0.01). Similarly, was in case of tobacco chewers; wherein, ever chewers had high proportion of non-communicable diseases than never chewers. Similar results were found from the study done by Mini GK and Thankappan KR[9] which showed ever users of tobacco had 1.22 odds of having multimorbidity like diabetes mellitus, hypertension, stroke as well as cataract.

Another study conducted by Negin J[21] et al, in South Africa found a stronger association of smoking and non-communicable diseases as similar with the current study findings. The current study findings also noted, ever drinkers had higher proportions of non-communicable diseases than never drinkers which was noted with 28.05% hypertensives, 6.10% suffering from stroke, 1.83% with cancer, 7.32% with operated cataract and 0.61% non-operated cataract to be higher in drinkers than never drinkers. However, diabetes mellitus was found to be bit high in never drinkers than ever drinkers. A strong association was noted in the similar study done by Mini GK and Thankappan KR[9] wherein, there was 1.53 odds of having non-communicable diseases in drinkers than never drinkers. This showed that drinking alcohol stands as the strong risk factor in the progression of non-communicable diseases. Another study conducted by Negin J[21] et al, in South Africa found a stronger association of drinking alcohol and non-communicable diseases as similar with the current study findings. Thus, it was observed that, both alcohol and tobacco were one of the strong risk factors in the development of non-communicable diseases. Reducing the consumption of tobacco and alcohol will surely benefit the community in reducing the morbidity among elderly.

It was observed from the current study that, there were higher proportions of non-communicable diseases in the elderly in lower socio-economic strata than higher ones. However, higher ones had few other non-communicable diseases namely musculoskeletal disorders, diabetes mellitus and cataract with relatively lower than lower economic strata. Among class V socioeconomic strata, 48.88% were diabetics, 23.57% were hypertensives, 2.23% had non-operated cataract and 7.69% had operated cataract with 4.22% stroke which showed strong significance statistically (p < 0.01). A systematic literature review conducted by Lago-Penas S[22] et al, also reported that, evidences from the literature to be lower socioeconomic strata had higher risk of cardiovascular disease (CVDs), lung and breast cancer and type 2 diabetes mellitus which appeared to have significant consistent impact on morbidity and mortality in elderly population. A systematic review of association between non-communicable diseases and socioeconomic strata was conducted by Williams J[23] et al, wherein, it was compared within low and lower-middle income countries. It was noted, among 57 papers reviewed from 17 low- and lower-middle income countries (LLMIC) showed, 14/18 papers had significant association with low economic strata and cancer risk. 11/15 papers significantly had higher chances of CVDs in lower socio-economic strata population. On restricted analyses to high quality studies for both of these morbidities there was significant association suggesting lower socioeconomic strata had higher proportions of non-communicable diseases. Different geographical settings and sociocultural factors and dietary habits are responsible for the difference in observations when compared to our study. Frequent checkups of blood pressure and compliance to treatment can prevent catastrophic emergencies. Awareness regarding salt intake in diet and physical activity to maintain a normal body mass index needs to be brought about in this vulnerable population.

Strength and Limitations
Strengths: The current study addresses urban slum population which is found to be underserved area in research. There were some relevant findings for policy and public health. Limitations: HbA1c investigations were limitations for the current study. Generalizing the results could not be reached to higher extent as the area was restricted.

CONCLUSION
The National Programme for Health Care of the Elderly (NPHCE) in India has been envisaged to provide comprehensive

services in an integrated manner for the elderly in various government health facilities. The National Program for the prevention of Non communicable Disease should concentrate on the elderly in the urban areas as this is a burgeoning issue to prevent catastrophic health conditions and expenditure as majority belong to lower socioeconomic status. Recently, the new initiative of Ayushman Bharat is to provide free health services to all the elderly above 70 years of age irrespective of their income. This kind of study will be beneficial to the unknown cases of NCDs. Outreach services for early diagnosis and treatment will be serving the underserved population. Interns during their rotating internship can help in providing primary health care services at the door steps of the vulnerable population. Family adoption programme by CBME is also a good initiative to reach the vulnerable population.

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