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Morbidity profile of noncommunicable diseases among elderly in a city in North India

Gurmeet Kaur[a], Rahul Bansal[b], Tanu Anand[a,*], Abhimanyu Kumar[c], Jagmeet Singh[d]

[a] Department of Community Medicine, Hindu Rao Hospital And North Delhi Municipal Corporation Medical College, New Delhi, India, India
[b] Department of Community Medicine, Subharti Medical College, Meerut, India, India
[c] Central Institute of Orthopaedics, Vardhman Mahavir Medical College and Safdarjung Hospoital, New Delhi, India, India
[d] Centre for Laser Cosmetic Surgery, Jalandhar, India, India

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ABSTRACT

Background: Ageing is not an illness, but the elderly are vulnerable to slowly evolving chronic diseases. The difficulties faced by the elderly are uncountable leading to social and cultural differences in the present Indian society.
Objective: This study was conducted to assess the socio-demographic profile, lifestyle practices and morbidities of the elderly and their association, particularly with non-communicable diseases.
Methodology: A cross-sectional study was carried out in the field practice area of a medical college in a city in north part of India. A total of 225 elderly patients (60 years old and above) residing in urban area were interviewed using a pre-tested questionnaire through house-to-house visit.
Results: Out of the total, there were 51.1% females (n = 115), 99.1% Hindus (n = 223), 51.1% married (n = 115), 79.6% lived in joint families (n = 179) and 52.9% belonged to upper middle class (n = 119). Tobacco consumption was seen in 62.1% (smoking; n = 110) and 19.7% (smokeless; n = 35) elderly. About 18% (n = 32) were consuming alcohol. More than half of the study participants were not doing physical activity. Majority of the elderly in the study (n = 197; 87.6%) had one or more diagnosed diseases at the time of study. Morbidity was found associated with type of family, regular exercise, dietary habit, addiction user, duration of smoking, socio-economic status, alcohol consumption, smoking and tobacco chewing.
Conclusion: Many of the lifestyle practices such as tobacco use, alcohol consumption and physical inactivity were prevalent amongst elderly. Majority of them were suffering from more than one morbidity, which was found to be associated with their unhealthy lifestyle practices. There is a need to target interventions for inculcating healthy lifestyle practices amongst elderly.

1. Background

Every citizen holds prime importance in every country but geriatric (aged 60 years and above) [1] are the most valuable asset for any country as their life long experience and wisdom contributes towards the progress of the nation. The independence, participation, care, self-fulfillment, and dignity of older persons has an ensured priority as per the United Nations.[2]

India with 8.2% of its population being more than 60 years old has acquired the level of an aging nation with growth of older Indian population in absolute number comparatively faster than the other regions of the world. It is projected that the elderly population will be doubled by the year 2026 (173 million) in comparison with the year 2006 (83.6 million) in India.[3]

Aging is a naturally occuring universal process of all human beings. It includes changes in an individual's physical, psychological, and health-related capabilities, which are altering with time and its implications for the consequent changes in the individual's role in the economy and in the society.[4] It is not an illness, but the elderly are vulnerable to slowly evolving chronic diseases. They present with mixed symptomatology due to decreased metabolic activities. The difficulties faced by the elderly are uncountable leading to social and cultural differences in the present Indian society. This brings in a greater responsibility on the health services in developing nations like India, where there is constant inadequacy in the present health infrastructure.[5] In the view of all these facts, this study was conducted to study the socio-

* Corresponding author at: Department of Community Medicine, Hindu Rao Hospital And North Delhi Municipal Corporation Medical College, New Delhi, India.
E-mail address: drtanu.anand@gmail.com (T. Anand).

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Table 1
Bivariate analysis of socio-demographic and lifestyle practices amongst elderly population of city in North India.

Socio-demographic Profile		Males N (%)	Females N (%)	Total N (%)	OR	95% CI	P value
Religion	Hindu	110 (100)	113 (98.3)	223 (99.1)	0.88	0.83–0.92	0.706
	Others	0 (0.0)	2 (1.7)	2 (0.9)			
Marital Status	Married	68 (61.8)	47 (40.9)	115 (51.1)	1.73	0.77–3.88	0.181
	Divorced	0(0.0)	1(0.9)	1(0.4)			
	Widow/widower	39 (35.5)	67 (58.3)	106 (47.1)			
	Unmarried	3(2.7)	0(0.0)	3(1.3)			
Type of Family	Joint	81 (73.6)	98 (85.2)	179 (79.6)	4.31	1.88–9.89	**0.000***
	Nuclear	29 (26.4)	17 (14.8)	46 (20.4)			
Education	Illiterate	31 (28.2)	85 (73.9)	116 (51.6)	1.30	0.27–6.20	0.741
	Primary school	13 (11.8)	10 (8.7)	23 (10.2)			
	Middle School	16 (14.5)	10 (8.7)	26 (11.6)			
	High School	20 (18.2)	7 (6.1)	27 (12.7)			
	Intermediate	18 (16.4)	2 (1.7)	20 (8.9)			
	Graduate/Postgraduate	11 (10.0)	1 (0.9)	12 (5.3)			
	Professional	1 (0.9)	0 (0.0)	1 (0.4)			
Socioeconomic status	Upper Class	0 (0.0)	2 (1.7)	2 (0.9)	6.6	2.40–18.05	**0.000***
	Upper middle class	67 (60.9)	52 (45.2)	119 (52.9)			
	Lower middle class	31 (28.2)	48 (41.7)	79 (35.1)			
	Upper lower	12 (10.9)	13 (11.3)	25 (11.1)			
Age	60-64	22 (20.0)	31 (26.9)	53 (23.6)	0.46	0.20–1.04	0.058
	65-69	24 (21.8)	30 (26.1)	54 (24.0)			
	70-74	35 (31.9)	27 (23.5)	62 (27.6)			
	>=80	16 (14.5)	14 (12.2)	30 (13.3)			
Sleep Duration	<4 h	8 (7.3)	14 (12.2)	22 (9.8)	1.22	0.52–2.83	0.650
	4-<6 h	23 (20.9)	36 (31.3)	59 (26.2)			
	6–8 h	62 (56.4)	49 (42.6)	111 (49.3)			
	>8 h	17 (15.5)	16 (13.9)	33 (14.7)			
Involvement in Household work	Yes/actively involved	29 (26.4)	53 (46.1)	82 (36.4)	0.53	0.24–1.17	0.111
	No/Not actively involved	81 (73.6)	62 (53.9)	143 (63.6)			
Dietary Habits	Vegetarian	95 (86.4)	105 (91.3)	200 (88.9)	0.86	0.81–0.91	**0.046***
	Non-vegetarian	15 (13.6)	10 (8.7)	25 (11.1)			
Exercises	Yes	53 (48.2)	40 (34.7)	93 (41.3)	1.27	1.16–1.38	**0.000***
	No	57 (51.8)	75 (65.2)	132 (58.6)			
Type of exercise	Walking	43 (81.1)	35 (87.5)	78 (83.8)	0.92	0.87–0.98	0.283
	Yoga	10 (18.8)	5 (12.5)	15 (16.1)			
Frequency of exercise	Daily	43 (81.1)	27 (67.5)	70 (75.2)	0.59	0.06–5.34	0.636
	Once or twice a week	10 (18.8)	13 (32.5)	23 (24.7)			
Duration of exercise	Less than 30 mins	22 (41.5)	22 (55)	44 (47.3)	0.03	0.05–0.71	0.478
	More than 30 mins	31 (59.4)	18 (45)	49 (52.6)			
Addictions	Yes	86 (78.2)	40 (34.7)	126 (56)	3.66	1.54–8.71	**0.002***
	No	24 (21.8)	75 (65.2)	99 (44)			
Type of addiction	Smoking	55 (60.4)	55 (63.9)	110 (62.1)	1.32	1.19–1.47	0.000*
	Alcohol	12 (13.1)	20 (23.2)	32 (18)	1.17	1.10–1.24	0.021*
	Smokeless tobacco	24 (26.3)	11 (12.7)	35 (19.7)	1.17	1.11–1.24	0.015*
Duration of addiction (>30Years)	Smoking	55 (60.4)	55 (63.9)	110 (62.1)	19.76	2.19–17.83	0.000*
	Alcohol	12 (13.1)	20 (23.2)	32 (18)	0.92	0.79–1.08	0.219
	Smokeless Tobacco	24 (26.3)	11 (12.7)	35 (19.7)	3.80	0.59–24.46	0.143
Trend of addiction of smokers	Ever user	16 (14.5)	11 (9.6)	27 (12.0)	3.66	1.54–8.71	0.002*
	Current user	70 (63.6)	29 (25.2)	99 (44)			
	Never user	24 (21.8)	75 (65.2)	99 (44)			
Quantity of Bidi smoked per day	2 bundles (12 bidi)	36 (65.4)	48 (87.2)	84 (76.3)	0.86	0.82–0.91	0.106
	4 bundles (24 bidi)	19 (34.5)	7 (12.7)	26 (23.6)			

Note: % denote column percentages; *$p < 0.05$.
Titles and variable has been marked as bold.

demographic profile and morbidities of the elderly particularly the non-communicable diseases of insidious onset.

2. Methodology

2.1. Study setting and study participants

This was a community based cross-sectional study carried out among elderly in urban population of catchment area of urban health and training center (UHTC) of a Medical college in a city in North India. The district has a total population of 34, which includes 18, males and 16, females. Population density is 1347 persons per square kilometer. [6]

Study period: The study was conducted between 1 st Jan 2016 to 31 st Dec 2016.

2.2. Sampling and sample size

The sampling universe was 2112 registered families residing in the study area from at least past 1 year and the sampling unit was a family. The morbidity in the pilot study done on similar population was found to be 87.7%.[7] Using the formula: n = 4pq/L2, where, n = required sample size p = prevalence of morbidity (for this study) = 87.7, q = 100-p = 100-87.7 = 12.3, L = 5% of p = 4.38, Sample Size (n) was calculated to be; $4 \times 87.7 \times 12.3/4.38 \times 4.38 = 224.9$ i.e. ≈ 225. In the pilot survey, it was also found that average number of elderly in each family was 1, so number of families required to recruit the required number of subjects was 225. According to systematic random sampling, the sampling interval was 2112/225 = 9.38. For the collection of data, first family was selected randomly by lottery method then every 9 th family was taken and the elderly $\geq$60years of selected family were included in the study till the required number of subjects were interviewed. If any adult $\geq$60years was not found in a family or selected house was found locked at the time of interview then adjacent family was visited.

2.3. Study tool

A pretested, self-administered, structured questionnaire was used for data collection. For illiterate participants, the investigator filled the questionnaire. It included items to record socio-demographic characteristics, assess the presence of due to non-communicable diseases and lifestyle practices associated with them, among elderly. The questionnaire was developed based on literature review and was assessed for suitability, relevance and accuracy in the Indian context. It was pretested in the Hindi language among 50 elderly and was suitably modified by removing 10 questions which were not relevant to objective of study and study settings. Internal consistencies of the items on Morbidity profile of non communicable diseases among elderly were obtained through Cronbach's alpha coefficient (0.90). The questionnaire was divided into 3 sections. The first section consisted of 11 questions pertaining to the socio demographic profile of elderly. The second section consisted of lifestyle practices including hours of sleep, involvement in household work, involvement in part time job, regular exercise patterns, dietary habits and addiction habits including type (smoking, alcohol and smokeless tobacco) and duration of addiction. Among the addiction practices for smoking, agent(cigarette or bidi[e]) and quantity (in number) was also assessed.[8] The third section consisted of questions to assess morbidities among elderly. Morbidity was examined using a checklist including 10 broad diseases and a residual category called "other diseases". The self-reported disease history was confirmed by reviewing medical records and medications, showing that the agreement between self-reports and medical records was fair to excellent (75–97%). Cured morbidities were excluded to assess the prevalence of current morbidities.

2.4. Survey procedure

A single interviewer collected information regarding the population through house-to-house visit. Interview schedule consisted of a structured questionnaire and took roughly 40 to 45 min to complete, followed by a complete physical examination to rule out other co- morbidities.

2.5. Analysis

Data were entered in Microsoft Excel and analyzed in SPSS version 17. Findings were presented as group proportions, and difference in proportions for a given factor was assessed by the Chi-square test. A P value cut off for statistical significance was set at 0.05. Factors which were significantly associated ($P < 0.05$) with stress due to physical environment and job requirements in univariate analysis, were further analyzed using Binomial Logistic regression analysis. Odds Ratios (ORs) were calculated indicating the relative odds of occurrence of non-communicable diseases among elderly.

2.6. Ethical issues

All elderly who participated in the study were informed about the purpose of the study and full free and voluntary written consent was taken before their inclusion. Each participant was free to withdraw from the study at any point in time and was ensured confidentiality of the responses. The study was approved by the institutional ethics committee of the medical college.

3. Result

Out of 225 participants, (51.1%) were females and (48.9%) were males. Mean age of the study population was 70.6 years Most of elderly subjects were from 70 to 74 years age group, comprising (27.6%) of the study population. The entire study population were predominantly Hindu by religion (99.1%) and (51.1%) were married. Majority of the population (79.6%) lived in joint families. Almost half of the study population were illiterate (51.6%) of which 73.9% were males and 28.2% were females. Nearly half of the elderly (52.9%) belonged to upper middle socio economic class according to Modified Kuppuswamy classification. (Table 1) Majority were vegetarians (88.9%) and almost half (49.3%) of the elderly population slept for duration of 6–8 h. More than half of the population (63.6%) were not involved in any type of household work and 58.6% did not perform any form of exercise. (Table 1)

Addiction was prevalent in more than half (56%) of the elderly population from past 30 years. Majority (62.1%) of them smoked bidi, of which 76.3% smoked 2 bundles (12 bidi) and 23.6% smoked 4 bundles (24 bidi) per day. Alcohol consumption was prevalent among (18%) while the rest (19.7%) were addicted to smokeless tobacco.

Majority of the elderly in the study (87.6%) had one or more diagnosed diseases at the time of study. (Table 2) Maximum number of diseased states was found in 70 to 74 years age group (75.8%).The total number of morbidities found in the study population was 756 and the number of morbidities per person

[e] Bidis are small thin handrolled cigarettes which comprise of tobacco wrapped in a tendu or temburni leaf (plants native to Asia) and may be secured with a colorful string at one or both ends. These contain higher concerntrations of nicotine, tar and carbon monoxide than conventional cigarettes sold in United states and other countries.[8]

Table 2
Presence of morbidity in the study population.

	Morbidity				Total	
	Present		Absent			
	N	%	N	%	N	%
Males	94	85.4	16	14.5	110	100
Females	103	89.5	12	10.4	115	100
Total	197	87.6	28	12.4	225	100

Table 3
Age-wise distribution of study population as per number of morbidities.

Age (in years)	Number of Morbidities								Total	
	Nil		1		2		>2			
	N	%	N	%	N	%	N	%	N	%
60–64	0	0.0	7	13.2	9	17.0	37	69.8	53	100
65–69	3	5.5	7	13.0	10	18.5	34	63.0	54	100
70–74	1	1.6	4	6.5	10	16.1	47	75.8	62	100
75–79	0	0.0	2	7.7	5	19.2	19	73.1	26	100
≥80	0	0.0	4	13.3	5	16.7	21	70.0	30	100
Total	4	1.8	24	10.7	39	17.3	158	70.2	225	100

was 3.36. Morbidity rate was higher among elderly females 435 (3.8 morbidities per female elderly) than among elderly males 321 (2.9 morbidities per male elderly). (Table 3)

Among the elderly population, maximum were the ocular problems (78.7%) followed by musculoskeletal disorders (71.6%), hypertension (52.4%), respiratory diseases (51.1%), gastro-intestinal (36.9%), coronary artery diseases (19.6%) and diabetes mellitus (11.6%). Other diseases included hearing loss (7.1%), urinary incontinence (7.1%), prolapse (0.9%) and renal calculi (0.4%). The elderly women had more ocular problems (81.7%), musculoskeletal disorders (83.5%), hypertension (67%), coronary artery disease (21.7%), diabetes mellitus (12.2%), acid peptic disease (37.4%), gallstones (6.1%), hemorrhoids (1.7%) and hearing loss (9.6%) has compared to males.

On Bivariate analysis (Table 1) possible factors responsible for morbidity among study population were type of family OR = 4.307, 95%CI = 1.875–9.83, p value <0.001, regular exercise OR = 1.267, 95% CI = 1.160–1.383, p value < 0.001,dietary habit(OR = 0.860, 95% CI = 0.813–0.909, p value = 0.002), addiction user (OR = 3.656, 95% CI = 1.535–8.708, p value = 0.002), duration of smoking OR = 19.762, 95%CI = 2.190–178.309, p value <0.001,Socio-economic status OR = 6.588, 95%CI = 2.404–18.049, p value <0.001,Alcohol consumption(OR = 1.170, 95%CI = 1.104–1.240, p value = 0.021), smoking OR = 1.322, 95%CI = 1.192–1.466, p value <0.001 and tobacco chewing (OR = 1.73, 95%CI = 1.106–1.244, p value = 0.015)

4. Discussion

The prevalence of morbidity among elderly population in this study was 87.6% which was similar to those reported in other studies. [8–14] Two previous studies done in the United States, documented that the prevalence of morbidity was 87.6% and 82.0% respectively.[10,12] Similarly the prevalence of morbidity was 86.7% in a community dwelling of Jewish group in Israel.[10] The prevalence of morbidity among non-institutionalized older people in Spain was much higher, which was 95.3%[15] and 88.9% in elderly residents of Northern India. The differences in the prevalence may be attributable to differences in the racial and ethnic origins of the study populations and prevailing socio-demographic differences among them but our study findings were found consistent with the other Indian and Israeli studies which included subjects aged 60 years and over and those aged 75–94 years, respectively Our observations on age wise morbidity, were found consistent with study of Srivastava et al[5]who observed that in urban Meerut nearly 60% were belonging to 60–69 years age group and 33% belonged to 70–79 years age group. Similar observations were made in other studies conducted in Meerut city[6] as 62.4% and 30.3%. In our study, females outnumbered males that is similar to studies conducted in various parts of India including Meerut, Ahmedabad and Patiala.[5,6,15,16,17] Out of 225 elderly subjects, 106 (47.1%) were widows/widowers of which widows were 63.2% and widowers were 36.8%. The observation was similar to Khokhar et al [18]and Niranjan et al.[19]

As elderly women were unemployed, widow, engaged in less exercise, smoking and other addiction practices, it could probably lead to poorer health status of elderly women in this study. Alternatively, the women may have been more interested in their own health and, consequently, may have indicated the presence of more disease conditions than did the men. Therefore, differences between men and women in the level of awareness and concern about their personal health could have affected their answers to the questions about current morbidity.

It was observed that illiteracy was high among the elderly with majority of elderly females being illiterate Other authors too noted a high illiteracy as well[19,20,21,22]. In this study, we found that lower level of education was associated with increased morbidity due to over reporting and improper management of chronology of diagnosed disease states.[23] Addiction was more common among elderly males (78.2%) as compared to elderly females (34.7%). Smoking was found to be the most common addiction and was prevalent in 60.4% of the study population. which was similar to Khokhar et al [18].

Life style-related diseases including ocular problems, musculoskeletal disorders, hypertension, respiratory diseases, and gastro-intestinal diseases were the most common among these morbidities. Furthermore women had a greater number of morbidities than men,which was supported by Niranjan et al.[19] and Padda et al[24] Similar observations were found in Dey et al [25], Khan et al[26] and Nirankar et al.[6] Ocular problems were the most prevalent morbidity in our study affecting 78.7% of the study population. Here also, elderly females were more commonly affected than elderly males. Many authors have reported ocular problems, as the most prevalent morbidity [9,18,27,28,29,30]. The second most common morbidity in our study was musculoskeletal disorders affecting 71.6% of the study population. Of which 83.5% were elderly females as compared to elderly males (59.1%)and it was found significant with sex. Many authors have reported a high prevalence rate including Singh et al (61.5%), Dey et al(35.3%) and Khokhar et al(60.1%)[11,18,19,30] In our study, 52.4% of the population was suffering from hypertension which was more among females comprising 34.2% of the study population as compared to elderly males (18.2%) which was found significant with sex. Our findings are in agreement with those reported by other authors Banker et al (54.2%), Lena et al (59.1) and Prakash et al (48%)[16,6,18,20,21,25,27,31,32]. Half of our study population was suffering from respiratory problems which was supported by Joshi et al [9], Prakash et al [27], Kishore et al [33], Mohapatra et al [34] and Ashok et al [28] who observed similar prevalence. It was significantly higher among more than 80 years age group (60%), having addiction and those who slept for less than 4 h Coronary artery disease was prevalent in 19.6% of the study population in the present study. Other authors reported similar prevalence as well which included Dey et al [25](18.9%), Srinivasan et al[35] (27.9%) and Kakkar et al [36](26.1%). Here also, the prevalence was more among females (21.7%) as compared to males

(17.3%) Diabetes was prevalent in 11.6% of the study population which is similar to Bhatt et al [31] (10.6%), Bhatia et al [20](11.9%) and Mohapatra et al [34](7.9%).Diabetes was found to be most prevalent in 75to 79 years age group and it was found to be statistically significant (p-value <0.05). This current data are also relatively consistent with those in the study of an elderly cohort in Israel.[10] In the study from Northern India, however, anemia and dental problems were reported to be the most prevalent diseases based on provisional diagnoses made after general physical examinations of the subjects.[9] Hypertension, chronic obstructive airway disease, cataracts, osteoarthritis and only 5% of the subjects in that study had diabetes mellitus. In the study from Spain, osteoarthritis and related diseases were found to be the most prevalent morbidities, followed by vision impairment and hypertension.[14] Again, the data in these studies are not entirely comparable owing to many differences in the conditions of the four studies.

It was found that progressive ageing was not significantly related to morbidity among the elderly, although old age is usually accompanied by a decline in physical fitness and increasing experience of body aches and pains.[9] Therefore, it was concluded that most of the major chronic diseases in the current sample were established or diagnosed before the age of 60 and that thereafter a large proportion of the subjects had chronic diseases. After adjusting for socio-demographic variables, chronic disease was strongly associated with lifestyle and addiction practices. Multiple studies had demonstrated that lifestyle practices and addiction practices are a good predictor of mortality and functional ability, even after controlling for objective measurements of medical morbidity (for example, laboratory tests or physician reports).[37,38,39,40,41,42] In this regard, it was reported that lifestyle and addiction practices are multifaceted, nuanced indicator of underlying health status that incorporates different dimensions of health (including physical disability and functional limitations), severity of any conditions, and comorbidity.[43]

The present study has several limitations that must be addressed in future studies. First, because the sample was drawn from one limited geographic area within the district, the results cannot properly be generalized to the national population. Second, because of the cross-sectional design, this study was unable to determine whether the various factors that showed correlations with morbidity in the elderly are antecedent to or consequences of morbidity. To resolve this question, a longitudinal follow up study using this cohort is currently being conducted. Third, geriatric epidemiologists are concerned that misreporting on self-assessments may increase with age and may vary greatly depending on the disease considered. More over, because morbidity was investigated using a questionnaire and the subjects were instructed to answer 'yes' only for diagnosed diseases, any unexpressed or undiagnosed diseases were not investigated. Nevertheless, the present study also has an advantage, which was based on a large, stratified, random sample of the elderly in India.

4.1. Conclusion and recommendations

This study has emphasized on the fact that the elderly suffered from multiple morbidities, which are often attributed to aging and more so in females. Many of the lifestyle practices such as tobacco use, alcohol consumption and physical inactivity were prevalent amongst elderly. The presence of morbidity was significantly found to be associated with unhealthy lifestyle practices. There is a need to target interventions for inculcating healthy lifestyle practices amongst elderly, which are very essential for prevention and control of non-communicable diseases amongst them.

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