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Chronic Diseases and their Association with Disability among the Elderly in India

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Abstract

Morbidity among the elderly has an important influence on their physical functioning and psychological well-being. Understanding the role of chronic diseases in disability among them is pertinent for policies and programmes aimed at their welfare and management of chronic diseases. This study assesses the association between chronic diseases and disability among the elderly in India. Data from the "Building a Knowledge Base on Population Ageing in India (BKPAI)" survey conducted in seven states of India in 2011 has been used for bivariate and multivariate analysis. Twenty-nine per cent of the elderly have arthritis, 21 per cent hypertension, 13 per cent cataract, 10 per cent diabetes, 7 per cent asthma and 6 per cent heart disease. Eight per cent elderly have at least one functional disability and 73 per cent have at least one physical disability. Multivariate analysis corroborated the bivariate findings that elderly persons with chronic diseases are significantly more likely to have functional and physical disability. Periodic assessment of the health status of the elderly and provision of required preventive as well as curative measures for a healthy elderly population should be a policy priority.

Key words: Chronic disease, physical disability, functional disability, elderly, India

I. Introduction

Elderly population and chronic diseases are increasing across the world. The elderly accounted for eight per cent of the Indian population in 2011 (RGI, 2011) and are expected to increase to 19 per cent by 2050 (Rajan et al., 2003). Disability in old age is regarded as a social phenomenon that relates to an individual's physiological and psychological conditions as well as socioeconomic position, cultural norms and broader environmental contexts. Increase in the number of the elderly is presumably also resulting in an increase in the number of the elderly with disabilities (Mathers et al., 2008). Disability increases economic burden, risk of hospitalization, requirement of home help, risk of premature death and decreases quality of life (Burden of Disease Network Project, 2004). Disability in the elderly is an important health indicator pointing to jeopardized quality of life (Agrawal, 2016).

Old age is one of the risk factors of chronic diseases. Data suggest almost half of the Indian elderly suffer from chronic diseases with the prevalence of diseases increasing with age from 39 per cent in 60-64 years to 55 per cent in those older than 70 years (NSSO, 1991). Swami (2002) found that morbidity among the elderly is higher in the urban areas as compared with the rural areas with the more prevalent disorders in order of magnitude being hypertension (58 per cent) followed by arthritis (50 per cent). Cardiovascular diseases followed by respiratory diseases are the leading causes of death (Guha, 1994), and hearing and visual impairments are two common causes of morbidity among the elderly in India (Hughes & Gove, 1981; Shah &Prabhakar, 1997). A

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community based study in Tamil Nadu revealed that 72 per cent of the elderly had at least one disease, while 48 per cent had at least two diseases (Purty et al., 2006). A more recent study estimated the prevalence of functional disability among the elderly aged 60 years to be 47 per cent in rural Tamil Nadu (Sowmiya et al., 2015).

Morbidity among the elderly people has an important influence on their physical functioning and psychological well-being. Very few studies have explained the broader spectrum of elderly disability in India. The disease and disability have been largely described in the context of arthritis, while other chronic diseases and co-morbidity have not been given much attention. The association between morbidity and elderly disability continues to be a grey area that demands in-depth research. Hence, understanding the role of chronic diseases in disability among the elderly is pertinent, and findings will be useful for policies and programmes aimed at elderly welfare and management of chronic diseases. This study has been undertaken to determine the prevalence of different chronic diseases and disability, and the association between chronic diseases and disability among the elderly in India.

II. Methods

Data source

The data used in the study are obtained from the "Building a Knowledge Base on Population Ageing in India (BKPAI)" survey conducted by UNFPA, India. BKPAI is a multi-cohort study of persons 60 years and older, designed primarily to measure changes in health, functional status, living arrangements and health service utilization. It was carried out in seven states, namely, Himachal Pradesh, Punjab, West Bengal, Odisha, Maharashtra, Kerala and Tamil Nadu, representing different regions, income groups and states in different stages of demographic transition in 2011. Probability proportional to population size (PPS) sampling design was adopted to choose the respondents the details of which can be ascertained from the report (United Nations Population Fund, 2011). Informed consent was taken prior to the interview of the participants. The findings are based on the data of 9,852 people aged 60 years and above.

Variables

The variables used were drawn primarily through extensive literature review that has social relevance and potentiality to affect physical and functional disability among the elderly. They can be divided into two categories, that is, outcome and predictor variables.

Outcome variables

Physical disability: Respondents were asked whether they faced difficulties relating to vision, hearing, walking, teeth (chewing), speaking and memory. Individuals suffering from any of them were used as outcome variables to define "at least one physical disability".

Functional disability: Respondents were asked whether they required help for activities of daily living (ADL) such as bathing, dressing, toilet, mobility, continence and feeding. Based on the ADL scores, they were divided into two groups: (a) Scores>6 denoted dependent/functionally disabled, and (b) scores ≤6 denoted independent/functionally not disabled.

Predictor variables

This study used selected chronic morbidities (arthritis, heart disease, diabetes, asthma, hypertension and cataract) and personal habits (smoking cigarettes or bidis, alcohol consumption, chewing tobacco or other intoxicants) as the primary predictor variables. The other variables included in the analysis were age of respondent (60-69, 70-79, 80+), gender (male/female), locality (rural/urban), marital status (never married/divorced/separated, currently married,

widow/widowed), schooling (no schooling, up to 5 years, 6-10 years , 10+ years), religion (Hindu, Muslim, Sikh and others), caste/tribe (Scheduled Caste, Scheduled Tribe, Other Backward Classes and Others), occupation (never worked/HH work, skilled, semi-skilled, unskilled), annual income (no income, ≤24000, >24000) and family composition (living alone, living with spouse, and living with all others).

Statistical analysis

Descriptive statistics and bivariate analyses were carried out to understand the socio-economic and demographic differentials in the magnitude of selected chronic morbidities and physical and functional disability among the elderly. Bivariate analyses were used to estimate physical and functional disability by selected chronic morbidities and other risk factors. Binary logistic regression was carried out to estimate the adjusted effect of chronic morbidities, life style and socio-economic and demographic covariates on physical and functional disability. Binary logistic regression was used due to the dichotomous nature of outcome variables, that is, "no" and k"yes" (coded as 0 and 1 respectively). The results were presented in the form of odds ratios (OR) with 95 per cent of confidence interval. An OR explains the probability that an elderly person with any specific attribute or characteristics will require help in at least one AD Land will have some physical disability compared with an elderly person with other attributes or characteristics requiring the same. The model can be put into a more compact form as follows:

$$\ln(\frac{p_i}{1-p_i}) = \beta_0 + \beta_{1X_1} + \cdots + \beta M_{X_{mi}}$$

Where $\beta_o \ldots . \beta_M$ are regression coefficients indicating the relative effect of a particular explanatory variable on the outcome variable. The coefficients for each of the remaining categories of the variable express the magnitude of the effect of each category on the outcome controlling the effects of other variables in the model, relative to the reference category. In all the analyses, weights were used to restore the representativeness of the sample. IBM-SPSS software (Version 20.0) was used for analysis.

III. Results

Prevalence of selected chronic diseases among the elderly

Twenty-nine per cent of the elderly have arthritis, 21 per cent hypertension, 13 per cent cataract, 10 per cent diabetes, 7 per cent asthma and 6 per cent heart disease (Table 1). There is a progressive increase in the prevalence of these diseases with increasing age, except for heart disease and diabetes. The prevalence of arthritis, asthma and cataract is higher among the elderly in the rural areas, whereas the rest of the diseases are more prevalent among the elderly in the urban areas. Arthritis and hypertension are higher among widows/widowed, whereas the currently married elderly reported more diabetes. Elderly persons with 10 and above years of schooling reported a higher percentage of heart disease, diabetes, and hypertension than those with no schooling or fewer years of schooling. Elderly persons from the non-SC/ST/OBC categories suffer more from chronic diseases as compared with their other counterparts. Arthritis is negatively associated with income, while heart disease is positively associated with it. Arthritis is higher among the elderly who live alone, while the remaining diseases are more prevalent among the elderly living with other family members.

Prevalence of functional and physical disability among the elderly

Eight per cent of the elderly have at least one functional disability, while 73 per cent have some physical disability (Table 2). The elderly who have at least one chronic disease are more likely to report functional and physical disability as compared with those without any chronic disease. A higher percentage of the elderly with cataract (13 per cent and 95 per cent) are more

likely to have suffered from functional and physical disability as compared with those without cataract (7 per cent and 69 per cent) respectively. The pattern remains true irrespective of the chronic disease. The result is statistically significant at 1 per cent level of significance. The percentage of physical disability is higher among the elderly who use tobacco products (smoking, alcohol and chewing tobacco) as compared with those who never use tobacco products. However, tobacco use has an inverse association with functional disability. The percentage of functional and physical disability is higher among the elderly aged 80 years and above (26 per cent and 91 per cent), those who live in the rural areas (8 per cent and 74 per cent), among the widows/widowed (11 per cent and 78 per cent), and those who live with all others (9 per cent and 75 per cent) as compared with their respective counterparts respectively. A higher percentage of the elderly with no schooling (9 per cent) have functional disability than those with some years of schooling. More than three-fourths (77 per cent) of the elderly with up to five years of schooling have physical disability in comparison with 73 per cent of the elderly with 10 and above years of schooling. The percentage of functional disability is higher among Muslims (12 per cent), whereas physical disability is more among the elderly who belong to the "other" religious category (83 per cent). Around 8 per cent of the elderly from the scheduled castes have at least one functional disability, whereas around 78 per cent of the elderly from the "Non-SC/ST/OBC" category have at least one physical disability. The elderly who have never engaged in any work are more likely to report at least one functional disability (10 per cent) in comparison with those engaged in skilled work who are more likely to have suffered from physical disability (78 per cent). Income and functional disability are negatively associated: elderly persons with annual income up to INR 24,000 are more likely to have suffered from at least one physical disability than their counterparts.

Association between chronic diseases and disabilities among the elderly

We have carried out three models, each showing the association of chronic diseases and other socio-demographic characteristics with functional and physical disability (Tables 3 and 4). Findings from Model 1 reveal that having controlled the effects of other variables, elderly persons with arthritis are significantly more likely to have some functional disability than those without it [OR-1.354, CI: 1.157-1.584]. The association of arthritis with functional disability remains significant in Models 2 and 3 as well (Table 3). The odds of reporting any functional disability are significantly higher among the elderly who have chronic diseases compared with those who do not. Additional adjustment was made for some risk factors in Model 2. The likelihood of reporting any functional disability is lower among the elderly who consume alcohol compared with those who do not and the results are found to be highly significant at 1 per cent level of significance [OR-0.523, CI:0.354-0.773]. In Model 3, after adjusting socio-economic and demographic predictors, the likelihood of any functional disability remained significantly higher among the elderly who had chronic diseases [OR-1.38, CI-1.17-1.64]. The chance of any functional disability is higher among the elderly aged 80 years and above [OR-7.93, CI-6.37-9.88], among Muslims [OR-1.50, CI-1.15-1.96] and those who live with all others [OR1.73, CI-1.15-2.59] compared with their respective counterparts.

Data in Table 4 show that having controlled the effect of other variables included in Model 1, elderly persons with arthritis are significantly more likely to have some physical disability than those without arthritis [OR-1.65, CI-1.50-1.82]. The likelihood of any physical disability is significantly higher among the elderly who have chronic diseases compared with those who do not. The elderly who smoke or chew tobacco daily are 1.5 times more likely to have any physical disability than those who did not. The odds of any physical disability are lower among the elderly who consume alcohol compared with those who do not, and the result is highly significant ($p<0.001$). Unlike functional disability, the likelihood of physical disability is significantly higher among females [OR-1.17, CI: 1.00-1.36], those aged 80 years and above [OR=2.74, CI:2.74, CI-2.28-3.30], those with 10 and more years of schooling [OR=1.30, CI:1.03-1.33], and among Muslims [OR=1.31, CI:1.09-1.57] than their respective counterparts.

IV. Discussion

The study found that a sizable number of the elderly in India suffer from various chronic diseases, and a substantial percentage has functional and physical disability. Multivariate analysis corroborates the bivariate findings that elderly persons with chronic diseases are more likely to have functional and physical disability. Arthritis and hypertension were found to be the most common diseases among the elderly as more than one-fifth of them had these diseases. Earlier studies by Khanam et al. (2011)and Banjare and Pradhan (2014) also had similar findings. This study found a sizable percentage of the elderly with cataract and diabetes, revealing the disease burden among the elderly, and it is in concurrence with the past study by Swami et al.(2002). Like a past study by Angra et al. (1997), we too found that the prevalence of cataract is slightly higher among the rural elderly, which may be due to the higher exposure of ultraviolet radiation during long hours of work in the open fields. We found that 8 per cent of the elderly have functional disability, whereas 73 per cent have physical disability. Using the 10 item Barthel index, an earlier study observed that around18 per cent of the elderly were dependent in at least one daily living activity (Gupta et al., 2014). The difference in the result could be due to a difference in the scale used and the inclusion of blindness and hearing impairment in the definition of functional disability.

In the present study, functional and physical disability is found to be significantly associated with chronic diseases. This finding is consistent with the findings of other population based studies where it was evident that the prevalence of functional disability increased with co-existing illness (Joshi et al., 2003; Tas et al., 2006; Hairi et al., 2010; Gupta et al., 2014). We found that after adjusting the personal habits and socio-economic and demographic factors, functional and physical disability increases in advancing age. This finding on advancing age having a significant association with functional disability is seen in most of the other studies conducted in India (Ganesh et al., 2008, Maikho & Goli, 2013; Gupta et al., 2014). Our results are also in conformity with the past studies that restriction in participation in activities of everyday life was influenced by increasing age and impairment in cognitive functions (Srinivasan et al., 2010). A study by Tejashwini and Chethna (2016) found age and morbidities like hypertension, diabetes and cataract as contributing to disability among the elderly and our study has similar findings. We found that persons living alone did not have the worst functional status which is consistent with the findings of Hughes & Gove (1981) and Arokiasamy et al. (2012).

The strengths of the study are that it provides an update on the prevalence of selected chronic diseases and disabilities among the elderly. The findings showing a significant association between the chronic diseases and disabilities among the elderly are of importance for on-going and prospective programmes and policies meant for addressing issues affecting the elderly.

V. Conclusions

The burden of chronic diseases and disability is notably high among the elderly, although there are differentials by socio-economic and demographic characteristics. Chronic diseases have a significant association with the prevalence of functional and physical disability among the elderly. Given the high prevalence of chronic diseases among the elderly and increasing aging population, this study indicates the need to strengthen health care services for them. Emphasis on a periodic assessment of their health status and provision of required preventive as well as curative measures for a healthy elderly population should be a policy priority.

VI. Limitations of the study

The cross-sectional nature of the data limits the scope for ascribing causality to any of the associated factors in the study. Chronic diseases were self-reported which might differ from the actual prevalence of chronic morbidity among the elderly. There may be other factors for causation of disability such as nutrition which we were unable to consider due to unavailability of data.

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Table 1: Prevalence of selected chronic diseases among the elderly by background characteristics, India

Background characteristics	Selected chronic diseases						N
	Arthritis	Heart disease	Diabetes	Asthma	Hyper-tension	Cataract	
Age group							
60-69	26.3	5.3	10.2	6.6	19.4	8.3	6239
70-79	32.1	7.0	10.5	8.5	24.0	18.7	2601
80+	39.3	5.8	9.1	12.2	23.2	24.4	1012
Locality							
Rural	31.1	5.5	8.8	8.0	20.0	13.1	5138
Urban	24.3	6.8	13.8	6.9	23.9	12.3	4714
Marital status							
Never married	30.6	6.3	8.9	9.9	16.8	16.4	192
Currently married	27.7	6.1	10.4	7.8	19.6	11.1	5886
Widowed	31.9	5.4	9.8	7.6	23.5	15.7	3768
Education status							
No schooling	36.0	4.0	6.6	7.3	18.1	13.7	4533
Up to 5 years	25.4	7.1	12.3	9.4	24.3	13.6	1996
6 – 10 years	19.6	8.0	13.4	7.8	22.3	10.4	2437
10+ years	22.0	9.1	20.6	5.5	30.0	11.9	831
Religion							
Hindu	28.1	4.5	8.2	7.3	18.0	11.7	7781
Muslim	23.8	12.9	17.7	11.8	27.1	16.0	804
Sikh	47.4	8.0	12.5	6.2	35.0	14.8	826
Non-Hindu/Muslim/Sikh	23.6	12.9	25.6	11.4	35.1	24.0	440
Caste/tribe							
Scheduled castes	30.2	4.5	7.2	6.8	17.1	12.9	1898
Scheduled tribes	28.0	1.4	4.3	6.6	11.4	12.3	485
OBCs	24.0	6.0	11.1	7.6	20.4	11.9	3353
Non-SC/ST/OBC	33.8	7.0	11.7	8.6	25.3	14.1	4033
Occupation							
Never worked/HH work	34.7	5.3	10.3	6.2	26.0	13.0	3586
Skilled	24.1	12.0	23.5	6.7	33.0	12.4	571
Semi-skilled	26.0	5.8	9.7	8.9	17.3	11.8	2412
Unskilled	26.8	5.7	8.7	8.7	17.0	13.6	3237
Annual income (INR)							
No income	31.4	5.6	10.9	7.9	21.5	12.9	4264
≤24000	30.2	5.6	7.9	7.7	20.8	15.3	2691
>24000	24.9	6.5	11.4	7.6	20.5	10.1	2897
Living arrangement							
Living alone	31.4	3.9	7.5	6.2	13.7	11.2	612
Living with spouse	28.9	5.8	9.4	6.7	18.5	10.9	1468
Living with all others	29.2	6.0	10.5	8.1	22.1	13.4	7770
Total	**29.3**	**5.8**	**10.1**	**7.7**	**21.0**	**12.9**	**9850**

Table 2: Prevalence of functional and physical disability among the elderly by background characteristics, India

Background Characteristics	At least one functional (FD) and physical disability (PD)				N
	Per cent FD	x^2	Per cent PD	x^2	
Age group					
60-69	3.5	675.03 (.000)	65.7	426.54 (.000)	6239
70-79	9.8		81.2		2601
80+	25.9		90.9		1012
Locality					
Rural	7.9	2.82 (.093)	74.4	41.67 (.000)	5138
Urban	6.9		67.8		4714
Marital status					
Never married	7.9	124.93 (.000)	74.7	76.78 (.000)	192
Currently married	5.3		69.5		5886
Widowed	11.5		77.7		3768
Education status					
No schooling	9.3	61.69 (.000)	75.7	175.20 (.000)	4533
Up to 5 years	7.9		77.1		1996
6 – 10 years	4.6		61.7		2437
10+ years	3.9		72.8		831
Religion					
Hindu	7.4	29.80 (.000)	71.6	41.82 (.000)	7781
Muslim	12.3		78.9		804
Sikh	6.1		71.0		826
Others	6.4		82.7		440
Caste/tribe					
Scheduled castes	8.0	4.20 (.240)	74.2	142.67 (.000)	1898
Scheduled tribes	5.5		74.5		485
OBCs	7.7		65.7		3353
Others	7.6		78.1		4033
Occupation					
Never worked	10.0	58.10 (.000)	74.7	27.29 (.000)	3586
Skilled	2.9		77.9		571
Semi-skilled	5.6		69.3		2412
Unskilled	7.1		72.5		3237
Annual income (INR)					
No income	10.4	121.57 (.000)	72.7	67.27 (.000)	4264
≤24000	7.5		77.2		2691
>24000	3.2		67.4		2897
Living arrangement					
Living alone	4.4	59.89 (.000)	66.4	113.37 (.000)	612
Living with spouse	3.5		62.9		1468
Living with all other	8.7		75.2		7770
At-least one chronic disease					
No	3.1	156.86 (.000)	53.9	946.33 (.000)	3495
Yes	10.1		82.8		6357
Arthritis					
No	6.9	20.22 (.000)	67.9	268.04 (.000)	7074
Yes	9.5		84.1		2778
Heart disease					
No	7.4	14.07 (.000)	71.9	49.81 (.000)	9251
Yes	11.7		85.3		601
Diabetes					
No	7.4	5.60 (.018)	71.6	50.54 (.000)	8755
Yes	9.5		82.2		1097

Table 2: Prevalence of functional and physical disability among the elderly by background characteristics, India…..(continued)

Background Characteristics	At least one functional (FD) and physical disability (PD)				N
	Per cent FD	x^2	Per cent PD	x^2	
Asthma					
No	7.3	20.44 (.000)	71.5	84.72 (.000)	9128
Yes	11.8		86.9		724
Hypertension					
No	7.0	18.46 (.000)	69.5	184.02 (.000)	7705
Yes	9.9		84.5		2147
Cataract					
No	6.9	52.62 (.000)	69.3	380.73 (.000)	8647
Yes	12.6		95.4		1205
Smoking					
Yes	6.2	4.72 (.030)	79.7	43.99 (.000)	1393
No	7.9		71.4		8459
Alcohol					
Yes	4.3	12.42 (.000)	75.8	4.01 (.045)	746
No	7.9		72.4		9106
Chewing tobacco					
Yes	8.2	1.28 (.258)	82.3	128.62 (.000)	2044
No	7.5		70.0		7808
Total	**7.6**		**72.7**		**9852**

FD= Functional disability, PD= Physical disability.

Table 3: Results of logistic regression analysis and C.I. of functional disability among the elderly, India

Background characteristics	Functional disability (ADL)								
	Model 1			Model 2			Model 3		
Disease	OR	C.I.		OR	C.I.		OR	C.I.	
		L	U		L	U		L	U
Arthritis									
No®	1.000			1.000			1.000		
Yes	1.354***	1.157	1.584	1.549***	1.323	1.814	1.38***	1.170	1.647
Heart disease									
No®	1.000			1.000			1.000		
Yes	1.467**	1.116	1.929	1.291*	.972	1.715	1.30*	.964	1.766
Diabetes									
No®	1.000			1.000			1.000		
Yes	1.131	.894	1.431	1.197	.956	1.499	1.32**	1.035	1.685
Asthma									
No®	1.000			1.000			1.000		
Yes	1.545***	1.219	1.957	1.590***	1.245	2.029	1.37**	1.060	1.782
Hypertension									
No®	1.000			1.000			1.000		
Yes	1.279***	1.073	1.526	1.311***	1.101	1.561	1.25**	1.045	1.517
Cataract									
No®	1.000			1.000			1.000		
Yes	1.768***	1.464	2.135	1.684***	1.384	2.048	1.185	.961	1.461
Risk factors									
Alcohol									
Never had alcohol®				1.000			1.000		
Yes				.523***	.354	.773	.738	.485	1.124
Chewing									
Never had tobacco®				1.000			1.000		
Occasionally				1.684***	1.150	2.467	1.114	.737	1.684
Daily				1.042	.851	1.276	.961	.773	1.196
Socio-demographic variables									
Sex									
Male®							1.000		
Female							.875	.663	1.154
Age group									
60-69 ®							1.000		
70-79							2.74***	2.258	3.348
80+							7.93***	6.374	9.885
Religion									
Hindu®							1.000		
Muslim							1.50**	1.150	1.961
Sikh							0.72**	.530	1.002
Non-Hindu/Muslim/Sikh							.756	.495	1.156
Annual income Rs.									
No income®							1.000		
≤24000							0.74***	.614	.901
≥24000							0.44***	.345	.584
Living arrangement									
Living alone®							1.000		
Living with spouse							1.080	.655	1.782
Living with all other							1.73***	1.157	2.594

Notes: Other variables included in Model 3 are locality, education, caste, occupation;R=reference category.

*** 1 per cent, ** 5 per cent, and *10 per cent level of significance.

Table 4: Results of logistic regression analysis for odds ratio and C.I. of physical disability among the elderly, India

Background characteristics	Physical disability								
	Model 1			Model 2			Model 3		
	OR	C.I.		OR	C.I.		OR	C.I.	
Disease		L	U		L	U		L	U
Arthritis									
No[(R)]	1.000			1.000			1.000		
Yes	1.657***	1.502	1.827	1.707***	1.544	1.887	1.617***	1.455	1.797
Heart disease									
No[(R)]	1.000			1.000			1.000		
Yes	1.564***	1.273	1.922	1.565***	1.279	1.915	1.495***	1.213	1.842
Diabetes									
No[(R)]	1.000			1.000			1.000		
Yes	1.519***	1.297	1.780	1.596***	1.370	1.859	1.620***	1.382	1.900
Asthma									
No[(R)]	1.000			1.000			1.000		
Yes	1.743***	1.458	2.083	1.659***	1.380	1.994	1.539***	1.272	1.861
Hypertension									
No[(R)]	1.000			1.000			1.000		
Yes	1.977***	1.759	2.223	1.806***	1.611	2.025	1.637***	1.453	1.844
Cataract									
No[(R)]	1.000			1.000			1.000		
Yes	7.237***	5.887	8.896	7.074***	5.705	8.771	6.271***	5.016	7.839
Risk factors									
Smoking									
No smoking[(R)]				1.000			1.000		
Occasionally				1.826***	1.406	2.370	1.905***	1.449	2.503
Daily				1.479***	1.265	1.730	1.622***	1.368	1.923
Alcohol									
Never had alcohol[(R)]				1.000			1.000		
Yes				.772***	.641	.930	0.871	.717	1.058
Chewing									
Never had tobacco[(R)]				1.000			1.000		
Occasionally				1.821***	1.313	2.526	1.612***	1.147	2.266
Daily				1.510***	1.345	1.695	1.470	1.300	1.662
Socio-demographic variable									
Sex									
Male[(R)]							1.000		
Female							1.173*	1.009	1.362
Age group									
60-69 [(R)]							1.000		
70-79							1.774***	1.590	1.979
80+							2.747***	2.284	3.305
Education status									
No schooling®							1.000		
Up to 5 years							1.179***	1.039	1.338
6 – 10 years							0.890*	0.782	1.014
10+ years							1.309***	1.059	1.617
Religion									
Hindu®							1.000		
Muslim							1.314***	1.098	1.572
Sikh							0.763***	0.644	0.902
Non-Hindu/Muslim/Sikh							1.148***	0.903	1.461

Note: Other variables included in Model 3 are locality, caste, occupation, annual income and family composition;
*** 1 per cent, ** 5 per cent, and *10 per cent level of significance; R=reference category.