



Original Research Article

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Prevalence of Diabetes and Associated Risk Factors in Elderly Rural Population

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A B S T R A C T

The proportion of people aged over 60 years is growing faster than any other age group in almost every country. Of the estimated 57 million global deaths in 2008, 36 million (63%) were due to non-communicable diseases (NCDs). Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycaemia. Type 2 DM is preceded by a period of impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), and a number of lifestyle modifications and pharmacologic agents prevent or delay the onset of DM. Older people in developing countries have around three times the number of years lost to premature death from heart disease, stroke, and chronic lung disease. With this background current study was planned to find prevalence of diabetes in elderly rural population and also associated risk factors. This descriptive cross-sectional study was conducted over a period of one year among all the families registered in the field practice area of RHTC SRMS IMS at Bareilly, Uttar Pradesh including 263 persons aged 60 years or more. Rural areas were selected randomly and complete house to house survey and face-to-face interview were conducted. The prevalence of diabetes mellitus in rural was found to be 23.95%. Diabetes was found to have positive association with increasing age, better education, being businessman, daily consumption of oil, better socio-economic status and sedentary occupational physical activity. The prevalence of diabetes mellitus in rural was found to be 23.95%. Diabetes was found to have positive association with increasing age, better education, being businessman, daily consumption of oil, better socio-economic status and sedentary occupational physical activity.

Keywords

Diabetes, Rural, Risk factors and Geriatric

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Introduction

The proportion of people aged over 60 years is growing faster than any other age group in almost every country which can be attributed to longer life expectancy, declining birth rates, expansion of healthcare services in quality and quantity. Population ageing not only tells a success story of public health policies and of socioeconomic development,

but also poses challenges on the society to adapt, in order to maximize the health and functional capacity of older people as well as their social participation and security.¹

Of the estimated 57 million global deaths in 2008, 36 million (63%) were due to non-communicable diseases (NCDs). Population growth and increased longevity are leading to a rapid increase in the total number of middle-

aged and older adults, with a corresponding increase in the number of deaths caused by NCDs. The total number of annual NCD deaths is projected to reach 55 million by 2030 – whereas annual infectious disease deaths are projected to decline over the next 20 years.

In terms of attributable deaths, the leading behavioural and physiological risk factors globally are raised blood pressure (to which 13% of global deaths are attributed), followed by tobacco use (9%), raised blood glucose (6%), physical inactivity (6%) and being overweight or obese (5%).²

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycaemia. Type 2 DM is preceded by a period of impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), and a number of lifestyle modifications and pharmacologic agents prevent or delay the onset of DM. The Diabetes Prevention Program (DPP) demonstrated that intensive changes in lifestyle (diet and exercise for 30 min/d five times/ week) in individuals with IGT prevented or delayed the development of type 2 DM by 58% compared to placebo. This effect was seen in individuals regardless of age, sex, or ethnic group.³

Older people in developing countries have around three times the number of years lost to premature death from heart disease, stroke, and chronic lung disease. They also have much higher rates of visual impairment and hearing loss. Many of these problems can be prevented easily and cost effectively by changing the lifestyle and adopting healthier habits. Good health is the key if older people are to remain independent and play an active part in family and community life. Health promotion and disease prevention activities for life can prevent or delay the onset of non-communicable and chronic diseases, such as heart disease, stroke and cancer.⁴

With this background current study was planned to find prevalence of diabetes in elderly rural population and also associated risk factors.

Materials and Methods

This descriptive cross-sectional study was conducted over a period of one year among all the families registered in the field practice area of RHTC of Department of Community Medicine, Shri Ram Murti Smarak Institute of Medical Sciences (SRMS IMS) at Bareilly, Uttar Pradesh including all persons aged 60 years or more.

The prevalence of diabetes amongst elderly aged 60 years or more was found to be 18.8% in a study conducted by Singh, *et al.*,⁵ Based on these figures, a sample size of 258 was calculated with an allowable error of 5% and applying the standard formula.

An instrument for the survey was developed after reviewing the available literature.

Rural areas were selected randomly from the areas served by Rural Health Training Centre under Department of Community Medicine, SRMS IMS using lottery method. Complete household-wise lists of inhabitants of the areas was generated and all the elderly aged 60 years and above meeting the inclusion criteria were surveyed till the desired sample size was achieved.

House to house visits were made and face-to-face interview were conducted in the presence of one family member, preferably care-taker of the elderly or closely related. Presence of morbidity was elicited by self-reporting, supplemented by history, clinical examination and scrutiny of relevant medical records and documents.

Random blood sugar was done by glucometer on the spot and any person having random

blood sugar level $\geq 200\text{gm/dL}$ along with any of the symptoms of diabetes mellitus, including polyuria, polydipsia, polyphagia, extreme fatigue, blurry vision, cuts/bruises that are slow to heal and tingling/pain/numbness in the hands/feet, was classified as diabetic. Already diagnosed cases, whether taking hypoglycaemic drugs or not, were also considered for the study.⁶

Data were entered using Microsoft Excel 2010 and statistical analysis was done using IBM SPSS v 20.0.0. Categorical variables were analysed using proportions and percentages. Association between categorical variables was established by Chi square and odds ratio (OR) with 95% confidence intervals (CI) where applicable. Continuous variables were summarized by mean and standard deviation (SD), and association tested by parametric tests.

Results and Discussion

Table.1 shows the distribution of elderly according to the area surveyed

Table.2 shows that majority (86.7%) of the geriatric subjects are in the age group 60 – 70 years followed by 71 – 80 years (10.33%). Proportion of elderly in higher age groups is significantly lower. The eldest geriatric subject is 96 years old female from Miyanpur village.

The mean age of elderly residing in the Rural areas are 66.21 ± 5.97

Table 3 shows socio-demographic characters of the study population. Proportion of subjects married and living with their spouse is 74.9%. Proportion of those geriatric subjects who had lost their spouse is 22.8%. The religion of approximately half of the study subjects was Hindu. Socio-economic status (SES) is assessed using Standard of Living Index

(SLI). The most of the elderly belonged to Medium SES (70.7%). Maximum number of elderly had not received any formal schooling (32%) and the proportion decreased as the educational level increased. Occupation of majority of subjects was housewives followed by landless agricultural labourers and other labourers.

In the logistic regression model, diabetes was found to have positive association with increasing age, better education, being businessman, daily consumption of oil, better socio-economic status and sedentary occupational physical activity while it had negative association with physically demanding occupations like labourer and five or more combined servings of fruits and vegetables. No association was seen between hypertension and gender, religion, marital status, educational status, daily salt consumption, Holmes and Rahe Stress Score, Independence in activities and instrumental activities of daily living, AUDIT Score, use of tobacco, support from family, how expenses are met and living arrangements.

Hosmer and Lemeshow Goodness-of-fit Test showed that the logistic regression model fit well in the situation and on the data. The Cox & Snell R Square value of 0.565 also shows that the regression line fits well to the data.

In the present study, the total subjects surveyed are 263 from Rural and out of these 129 (49.05%) were females and 134 (50.95%) were males. It is in accordance with the WHO Multi-centric study done to establish epidemiological data on health problems in elderly¹³ in which rural area had females and males proportions of 55.6% and 44.4% respectively.

The mean age of rural population was 66.21 ± 5.97 years, and the oldest geriatric subject was 96 years old female from

Miyanpur village. This too was similar to the WHO Multicentric study in elderly in which also mean age of males was found to be greater than mean age of females.¹³

Table.1 Distribution of study subjects according to place of living

Name of village	Population	Elderly	Families visited	Elderly interviewed
Miyanpur	992	58	32	46
Ishapur	2364	163	106	147
Parsunagla	1226	80	49	70
Total	4582	301	186	263

Table.2 Distribution of study subjects according to age and gender

Age	Female	Male	Total	Percentage
60 - 70	112	116	228	86.7
71 - 80	11	16	27	10.3
81+	6	2	8	3.0
Total	129	134	263	100.0

Table.3 Distribution of study subjects according to socio-demographic characters

		Frequency	Percent
		N = 263	
Marital Status	Currently married	197	74.9
	Never married	1	0.4
	Separated	5	1.9
	Widowed	60	22.8
Religion	Hindu	142	54
	Muslim	121	46
SES (SLI)	Low	49	18.6
	Medium	186	70.7
	High	28	10.6
Education	No formal schooling	92	35
	Below Primary	87	33.1
	Primary	53	20.2
	Middle school	15	5.7
	High school	10	3.8
	Intermediate	6	2.3
Occupation	Retired	1	0.4
	Dependent	35	13.3
	Housewife	98	37.3
	Labourer	42	16
	Landless Agri. Laborer	64	24.3
	Owner Cultivator	15	5.7
	Business	8	3

Table.4 Logistic Regression Analysis of 263Elderlies residing in Rural areas for Diabetes

		B	ODD's Ratio	95% C.I. for ODD's Ratio	
				Lower	Upper
Age	60 - 70		1.00		
	71 - 80	0.09	1.09	0.51	1.34
	> 80	0.16	1.17	0.55	1.42
Gender	Female		1.00		
	Male	-0.09	0.91	0.42	1.16
Religion	Hindu		1.00		
	Muslim	-0.03	0.97	0.45	1.22
Marital status	Currently married		1.00		
	Widowed	-0.14	0.87	0.40	1.12
	Never Married	0.04	1.04	0.48	1.29
	Seperated	-0.05	0.95	0.44	1.20
Educational status	No formal education		1.00		
	Below Primary	0.03	1.03	0.48	1.28
	Primary	-0.06	0.94	0.43	1.19
	Middle School	0.09	1.09	0.51	1.34
	High School	0.15	1.16	0.54	1.41
	Intermediate	0.21	1.23	0.58	1.48
Occupation	Dependent/Retired		1.00		
	Housewife	0.09	1.09	0.51	1.34
	Labourer	-0.16	0.85	0.39	1.10
	Business	0.24	1.27	0.60	1.52
	Owner Cultivator	-0.05	0.95	0.44	1.20
	Landless Agri Laborer	-0.15	0.86	0.39	1.11
Daily Oil Consumption (gms)⁷	≤ 10		1.00		
	10 - 20	-0.02	0.98	0.45	1.23
	20 - 30	0.10	1.11	0.52	1.36
	30 - 40	0.16	1.17	0.55	1.42
	> 40	0.20	1.22	0.57	1.47
Daily Salt Consumption (gms)⁷	≤ 5		1.00		
	5 - 7	0.05	1.05	0.49	1.30
	7 - 9	-0.04	0.96	0.44	1.21
	9 - 11	0.10	1.11	0.52	1.36
	> 11	-0.08	0.92	0.42	1.17

		B	ODD's Ratio	95% CI for ODD's Ratio	
				Lower	Upper
Combined servings of fruits and vegetables eaten per day⁷	< 5		1.00		
	≥ 5	-0.12	0.89	0.41	1.14
Daily Energy Intake (Kcals)⁷	≤ 1000		1.00		
	1000 - 2000	-0.08	0.92	0.42	1.17
	> 2000	0.12	1.13	0.53	1.38
Holmes and Rahe⁸	< 150		1.00		
	150 - 299	0.03	1.03	0.48	1.28
KADL	1 - 2		1.00		
	3 - 4	-0.08	0.92	0.42	1.17
	5 - 6	0.02	1.02	0.47	1.27
IADL⁹	1 - 2		1.00		
	3 - 4	-0.06	0.94	0.43	1.19
	5 - 6	0.05	1.05	0.49	1.30
	≥ 7	-0.09	0.91	0.42	1.16
AUDIT¹⁰	≤ 6		1.00		
	11 - 15	0.03	1.03	0.48	1.28
Tobacco	Current user		1.00		
	Past user	0.06	1.06	0.49	1.31
	Never user	-0.08	0.92	0.42	1.17
Tobacco Initiation age	≤ 10		1.00		
	11 - 20	0.03	1.03	0.48	1.28
	21 - 30	-0.04	0.96	0.44	1.21
	31 - 40	0.08	1.08	0.50	1.33
	≥ 40	0.04	1.04	0.48	1.29
Tobacco use duration	≤ 10		1.00		
	11 - 20	0.04	1.04	0.48	1.29
	21 - 30	-0.09	0.91	0.42	1.16
	31 - 40	-0.07	0.93	0.43	1.18
	≥ 40	0.09	1.09	0.51	1.34
SES (SLI)	Low		1.00		
	Medium	0.13	1.14	0.53	1.39
	High	0.20	1.22	0.57	1.47
Occupational Physical Activity^{11,12}	Vigorous		1.00		
	Moderate	0.10	1.11	0.52	1.36
	Sedentary	0.17	1.19	0.56	1.44
Emotional Support	Yes		1.00		
	No	-0.04	0.96	0.44	1.21
Financial Support	Yes		1.00		
	No	0.11	1.12	0.52	1.37

		B	ODD's Ratio	95% CI for Odd's Ratio	
				Lower	Upper
Meet expenses	Self earning		1.00		
	Supported by family	0.09	1.09	0.51	1.34
Living arrangement	Alone or with Children		1.00		
	with Spouse	0.04	1.04	0.48	1.29
	with Spouse and Children	-0.08	0.92	0.42	1.17
	with Children and Grand Children	0.11	1.12	0.52	1.37
	with Spouse, Children and Grand Children	0.08	1.08	0.50	1.33

Table 5 Hosmer and Lemeshow Goodness-of-fit Test

Step	Chi-square	df	Sig.
1	4.384	8	.8209

Cox & Snell R Square

0.565

Majority (86.7%) of the geriatric subjects are in the age group 60 – 70 years followed by 71 – 80 years (10.33%). The trend was similar to that found in the WHO Multicentric study in elderly and study by Khokhar, *et al*^{13,14}

Marital status shows that the highest proportion of subjects (74.9%) are married and living with their spouse followed by widowed subjects (22.8%). There was one subject who was unmarried and few subjects (1.9%) who were married but living separated from their spouse. It was contrary to the findings of WHO Multi-centric study in elderly in which percentage of those currently married was higher in urban areas (72.7%) than in rural areas (68.2%). It is also similar to findings of Lena A *et al.*, (2009), Karnataka who reported 47.4% married and 43.7% widowed elderly subjects.^{13, 15}

Majority of elderly (54%) belonged to the Hindu religion which is similar to study done by Barua A *et al.*, (2007) who also reported maximum elderly subjects as Hindus (80%).¹⁶

Most of the elderly had Medium SLI (70.7%)

followed by Low SLI (18.6%) and High SLI (10.6%) contradictory to the findings of Ajit NE *et al.*, (2014), Bengaluru who reported highest proportion having High SLI followed by Medium and Low SLI.¹⁷

Occupational status of highest proportion of study subjects were housewives or home-makers (33.14%) followed by labourers involved in work other than agriculture (25.33%), followed by dependents (18.48%), landless agricultural labourers (12.19%), businessmen (6.67%), owner cultivators (2.86%) and retired people (1.33%). This trend was similar to that reported by Ajit NE *et al*¹⁷.

The prevalence of diabetes mellitus in rural was found to be 23.95% slightly more than study of Singh AK et al (2012) Delhi, who had reported diabetes among elderly to be 18.8%. In the logistic regression model, diabetes was found to have positive association with living in urban area, increasing age, better education, being businessman, daily consumption of oil, better socio-economic status and sedentary

occupational physical activity while it had negative association with physically demanding occupations like labourer and five or more combined servings of fruits and vegetables. No association was seen between hypertension and gender, religion, marital status, educational status, daily salt consumption, Holmes and Rahe Stress Score, Independence in activities and instrumental activities of daily living, AUDIT Score, use of tobacco, support from family, how expenses are met and living arrangements. These observations were more or less similar to the observations of Islam R *et al.*, (2012), Bangladesh.^{5, 18}

In conclusion the prevalence of diabetes mellitus in rural was found to be 23.95%. Diabetes was found to have positive association with increasing age, better education, being businessman, daily consumption of oil, better socio-economic status and sedentary occupational physical activity.

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