

Original Research Article

A prospective study of complications in newly diagnosed type 2 diabetes mellitus patients of lower socioeconomic group with special reference to microvascular complication and metabolic syndrome

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ABSTRACT

Background: All these metabolic derangements exist for many years in the asymptomatic phase of type 2 diabetes and they predispose to development of complications even before clinical diagnosis. Metabolic syndrome is considered to be a precursor of type 2 diabetes. Present study is primarily aimed to study the prevalence of microvascular complications and metabolic syndrome in newly diagnosed type 2 diabetes mellitus patients of low socioeconomic group.

Methods: This is a cross sectional prospective study conducted in the dept. of general medicine Konaseema institute of medical science Amalapuram, Andhra Pradesh, India from November 2016 to October 2018. Based on exclusion and inclusion criteria 103 patients were enrolled for this study. Various parameters like age, sex, body mass index, waist circumference, lipid profile, systolic and diastolic blood pressure, neuropathy, nephropathy and retinopathy was measured.

Results: The mean age of the patient was 48±10.0 years. Fasting and 2 hours OGTT was 174.6±46.8 mg/dl and 255.6±75.6 mg/dl. The mean of total cholesterol was 204.7±41.9 (mg/dl), Triglycerides was 218±83.4 (mg/dl) and HDL was 44±5.3 (mg/dl). Symptomatic neuropathy constituted 35.6% in 51-60 age group and 27.1% in 31-40 and 41-50 age groups. Objective neuropathy constituted highest (36.6%) in 51-60 age group. Retinopathy constituted highest (60%) in 51-60 age group and nephropathy constituted 26.3 % in 21-30 and 51-60 age groups.

Conclusions: Prevalence of microvascular complications in newly diagnosed diabetics of low socioeconomic group were as follows: symptomatic neuropathy-57.3%, objective neuropathy-39.8%, retinopathy-4.9%, nephropathy-18.4%. These were similar to published studies from general population from the same geographical area.

Keywords: Lower socioeconomic group, Microvascular complication, Metabolic syndrome, Type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes mellitus is associated with metabolic syndrome and specific microvascular complications namely diabetic retinopathy, diabetic nephropathy and diabetic neuropathy. Many studies had proven that persistent hyperglycemia and associated metabolic

syndrome features like hypertension, dyslipidemia and obesity contribute to the development of microvascular complications.¹ All these metabolic derangements exist for many years in the asymptomatic phase of type 2 diabetes and they predispose to development of complications even before clinical diagnosis. Metabolic syndrome is considered to be a precursor of type 2

diabetes.² There are very few studies in India about the prevalence of microvascular complications and metabolic syndrome in low socio-economic group population particularly in early stages of type 2 diabetes.³ There is lacuna of knowledge about the disease characteristics in this target group. This study aims to address this issue.

Present study is primarily aimed to study the prevalence of micro vascular complications and metabolic syndrome in newly diagnosed type 2 diabetes mellitus patients of low socio-economic group.

Secondarily to evaluate the average duration of early presentation of diabetes in subsequent generations (generation gap of onset of diabetes) in subjects belonging to low socio-economic group.

METHODS

This is a cross sectional prospective study conducted in the dept. of general medicine Konaseema institute of medical science Amalapuram, Andhra Pradesh, India from November 2016 to October 2018.

Before start of study a written informed consent was taken from all patients. This study was approved by institutional ethics committee. Based on exclusion and inclusion criteria 103 patients were enrolled for this study.

Inclusion Criteria

Newly diagnosed type 2 diabetic adult patients greater than 20 years of age belonging to low socio-economic group (as per modified Kuppuswamy scale²) who gave voluntary consent were include.

Exclusion Criteria

- Type 1 diabetes
- Pregnancy
- Patients on steroid therapy
- Patients on Angiotensin Converting Enzyme (ACE) inhibitors
- Patients on Angiotensin Receptor Blockers (ARB)
- Patients with urinary tract infections, fever, severely ill patients
- Alcoholics
- Smokers

Various parameters like age, sex, body mass index, waist circumference, lipid profile, systolic and diastolic blood pressure, neuropathy, nephropathy and retinopathy was measured.

Diabetic Neuropathy: Symptomatic neuropathy:

Positive symptoms (as compiled by consensus committee that examined end points for painful neuropathy 101)

painful sensations like burning, prickling, tingling, squeezing, constricting, hurting, freezing, throbbing, allodynia, hyperalgesia was considered.

Negative symptoms -hypoesthesia, total loss of sensation.

Quantitative sensory testing

Diabetic neuropathy was tested objectively by biothesiometry. It was used for measuring vibration perception threshold (VPT). Patients having VPT of < 10 were considered as normal, 11-15 were considered as having mild, 16-20 as having moderate, >20 as having severe neuropathy.

Diabetic retinopathy

Presence of at least one micro aneurysm was taken as the minimum criteria for diagnosing diabetic retinopathy. Also, other features such as venous changes (dilatations, beading, looping), hard exudates, dot or blot hemorrhages, intraretinal microvascular abnormalities, proliferative changes in retinal vessels were considered for diagnosis.

Diabetic nephropathy

Presence of microproteinuria (protein creatinine ratio ≥ 0.2 or 24 hours urine protein $\geq 150\text{mg}$) or macroproteinuria (protein creatinine ratio ≥ 3.0 or 24 hours urine protein $\geq 500\text{mg}$) in the absence of other obvious renal diseases. Patients with fever, cardiac failure, renal failure, urinary tract infection (by urine culture and sensitivity) were excluded for the diagnosis of albumunuria.

RESULTS

There were 103 participants in the study group. Their characteristics are provided below. The most common age group affected in this study is 41-50 (36.8%) and females more affected than males (53.6%).

Table 1: Age, characteristics and sex wise distribution of the study group.

	Years	Number	Percentage
Age	21-30	5	4.8
	31-40	22	21.3
	41-50	38	36.8
	51-60	28	27.1
	>60	10	9.7
Sex	M/F	48/55	46.3/53.6

As per Table 2 mean age of the patient was 48 ± 10.0 years. Fasting and 2 hours OGTT was 174.6 ± 46.8 mg/dl and 255.6 ± 75.6 mg/dl. The mean of total cholesterol was 204.7 ± 41.9 (mg/dl), triglycerides was 218 ± 83.4 (mg/dl) and HDL was 44 ± 5.3 (mg/dl).

Table 2: Biochemical parameters.

Characteristics	Mean ± SD
Age (years)	48±10.0
Fasting Plasma glucose(mg/dl)	174.6±46.8
2 hrs OGTT (mg/dl)	255.6±75.6
Total cholesterol (mg/dl)	204.7±41.9
Triglycerides (mg/dl)	218±83.4
HDL (mg/dl)	44±5.3
Systolic BP (mm Hg)	118±18
Diastolic BP (mm Hg)	78±8
Waist circumference (cm)	90.6±8.7
Body Mass Index (Kg/m ²)	25.9±4.5

Table 3: Microvascular complications.

Characteristics	Number (103)	%
Symptomatic Neuropathy	59	57.3
Asymptomatic Neuropathy	11	10.7
Objective Neuropathy	41	39.8
Retinopathy	5	4.9
Nephropathy	19	18.4

Table 4: Characteristics of metabolic syndrome positive study subject.

Metabolic syndrome positive subjects (n=79)	Number	Percentage
Age Group (years)		
21-30	3	4
31-40	18	23
41-50	30	38
51-60	23	29
>60	5	6
Complications of diabetes		
Symptomatic neuropathy	50	63
Objective neuropathy	28	35
Retinopathy	4	5
Nephropathy	12	15
Family history of diabetes	45	57
Sedentary lifestyle	47	60
Sex		
Male	31	64.6
Female	48	87.3

Table 5: Age group wise prevalence of microvascular complications.

Age group	Symptomatic neuropathy		Objective neuropathy		Retinopathy		Nephropathy	
	Number (59)	%	Number (41)	%	Number (5)	%	Number (19)	%
21-30	2	3.4	0	0	0	0	0	0
31-40	16	27.1	7	17	1	20	5	26.3
41-50	16	27.1	10	24.3	0	0	6	31.6
51-60	21	35.6	15	36.6	3	60	5	26.3
>60	4	6.8	9	21.2	1	20	3	15.8

Table 6: Metabolic syndrome in relation to characteristics.

Variables	P value
MS and age	0.226 ^{NS}
MS and sex	0.007**
MS and symptomatic neuropathy	0.195 ^{NS}
MS and objective neuropathy	0.101 ^{NS}
MS and retinopathy	0.858 ^{NS}
MS and nephropathy	0.122 ^{NS}
MS and fasting glucose	0.238 ^{NS}
MS and 2 hours OGTT	0.164 ^{NS}
MS and total cholesterol	0.225 ^{NS}
MS and Triglycerides	0.383 ^{NS}
MS and HDL	0.020**
MS and systolic BP	0.441 ^{NS}
MS and diastolic BP	0.027**
MS and waist circumference	0.000**
MS and body mass index	0.000**
MS and lifestyle	0.919 ^{NS}
MS and family history	0.477 ^{NS}

**Significant NS-not significant, MS-metabolic syndrome, OGTT-oral glucose tolerance test, HDL-high density lipoprotein, BP-blood pressure

The most common microvascular complication among study subjects is symptomatic neuropathy (57.3%) followed by objective neuropathy. Both symptomatic and objective neuropathies have an increasing trend with age while retinopathy and nephropathy does not have a similar relationship. The most common microvascular complication among study subjects is symptomatic neuropathy (57.3%) (Table 3).

Symptomatic neuropathy (63%) and prevalence of metabolic syndrome is more among females (87.3%). The most common age group affected is 41-50(38%) most common complication is symptomatic neuropathy(63%) and prevalence of metabolic syndrome is more among females (87.3%) (Table 4).

Symptomatic neuropathy constituted 35.6% in 51-60 age group and 27.1% in 31-40 and 41-50 age groups. Objective neuropathy constituted highest (36.6%) in 51-60 age group. Retinopathy constituted highest (60%) in 51-60 age group and nephropathy constituted 26.3 % in 21-30 and 51-60 age groups (Table 5).

There is significant relationship between metabolic syndrome and sex HDL, diastolic BP, waist circumference and body mass index. Family history of diabetes was present in 55.3%. Among the total subjects, 34.9% had family history of diabetes in either their parents or children. 20.4% of subjects had family history of diabetes only in their sibling (Table 6).

DISCUSSION

Various studies had been published regarding the prevalence of microvascular complications in diabetic population from different parts of India and the world involving different ethnicity. However very few studies had been published regarding the prevalence of microvascular complications in newly diagnosed type 2 diabetes as mentioned in Table. In this study the sample population had fairly equal representation between males (46.6%) and females (53.5%).

Symptomatic neuropathy includes patients with positive and negative symptoms. Among the symptomatic patients, majority (93.2%) had positive symptoms and only 6.7% had negative symptoms. The hoorn screening study done in newly diagnosed diabetics coming to general practitioners by Annemieke MW et al, in Netherlands showed a prevalence of diabetic neuropathy as 48.3% by 10 gram monofilament testing.⁷ Another study done in United States using secondary analysis of the data from the National Health and Nutrition Examination Survey (NHANES) by Koopman RJ et al, showed a prevalence of diabetic neuropathy as 21.5% by 10 gram monofilament testing. The prevalence of symptomatic neuropathy in this study was 57.3% which is substantial. The prevalence of diabetic retinopathy in the present study was 4.9%.

Table 7: comparison of prevalence of microvascular complication by various author.

Author	Number of subjects	Prevalence of microvascular complications					
		Objective Neuropathy		Retinopathy		Nephropathy	
		Method used	%	Method used	%	Type of albuminuria	%
Kohner EM, et al ⁴	2964			Fundus photography (ETDRS Protocol)	37.3		
Rema M, et al ⁵	351			Fundus Photography (ETDRS Protocol)	5.1		
Dowse GK, et al ⁶	358			Fundus photography	14.8		
Annemieke MW, Spijkerman, et al ⁷	60	10 gram Monofilament	48.3	Fundus photography	1.9	Microalbuminuria	26.7
Koopman RJ, et al ⁸	132	10gram Monofilament	21.5			Microalbuminuria	21.5
Unnikrishnan RI, et al ⁹	353					Microalbuminuria	23.8
Collins VR, et al ¹⁰	138					Microalbuminuria	26.0

Compared to a relatively older study 105 with a large sample, done in United Kingdom as part of the UKPDS study in newly diagnosed diabetics (which showed a very high prevalence of 37.3%), almost all studies in the past 12 years showed a prevalence of retinopathy in the range between 1.9% and 15%.¹¹ In the present study, the prevalence of retinopathy was 4.9% in low socioeconomic group. The prevalence of

microalbuminuria among newly diagnosed diabetics in different ethnic studies range between 20% and 30%. In

the CURES study done in the same geographical area the prevalence of microalbuminuria was 23.8%. Present study which used micro-proteinuria as the method for diagnosis of diabetic nephropathy had shown a prevalence of 18.4%.¹²

Metabolic syndrome (MS) which is considered as an important forerunner for both diabetes and cardiovascular disease (CVD) was analyzed in detail in this study among low socioeconomic group subjects. The prevalence of MS in this study was 76.6% among low socioeconomic group.¹³ This finding is important in the context that MS is considered a disorder related to high calorie intake and sedentary activity. The target population in this study was generally expected to involve in jobs which require substantially high physical activity. But this study showed that sedentary lifestyle among low socioeconomic group was present in 60% of the MS positive subjects. The high prevalence of MS along with sedentary lifestyle in this study proves the fact that even the low socioeconomic group population are at increased risk for both diabetes and CVD. The prevalence of MS in this study was 76.6% among low socioeconomic group.

CONCLUSION

Prevalence of microvascular complications in newly diagnosed diabetics of low socioeconomic group were as follows: symptomatic neuropathy - 57.3%, objective neuropathy - 39.8%, retinopathy - 4.9%, nephropathy - 18.4%. These were similar to published studies from general population from the same geographical area. Prevalence of metabolic syndrome (76.6%) and measures of obesity in newly diagnosed diabetics in an unexpected manner had a similar trend in low socioeconomic group when compared to data from various studies among general population. Average generation gap for onset of diabetes based on clinical diagnosis was 16 years in low socioeconomic group.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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