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Original Research Article

Prevalence of microalbuminuria among type II diabetes mellitus patients in urban Chidambaram

A Viknesh Ambayiram[1], P Kalyani[2], AJW Felix[3], P K Govindarajan[4]
[1]Post graduate*,[2] Reader cum epidemiologist, [3] Reader cum statistician, [4]Professor and Head of the department.
Department of community medicine, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamilnadu, India

***Corresponding Author:**
Dr. A.Viknesh Ambayiram.
Email: vikneshambayiram@yahoo.com

Abstract: Diabetes is one of the largest health emergencies of the 21st century. In future there will not only be increase in the incidence and prevalence of diabetes but also there will be an increase in economic burden, disability and life years lost due to disease. Microalbuminuria is used as predictor for early micro and macrovascular changes in diabetes. The objectives were to find out the prevalence of microalbuminuria among type II diabetes mellitus patients in urban Chidambaram and to find out the association between albuminuria and age, sex, duration of diabetes.A descriptive cross sectional study was carried out in the urban field practice area of urban health centre between October 2015 and July 2016, among 200 study participants who had type II diabetes mellitus. The prevalence of microalbuminuria among the study participants was 41.5%. All the three risk factors age, sex and duration of diabetes mellitus were found to have significant association with occurrence of albuminuria. As the age increased the probability of being microalbuminuric also increased (P<0.05). Males had 2.9 times the risk of being microalbuminuric than the females. As the duration of diabetes mellitus increased the chance of being microalbuminuric also increased (P<0.05).Life style modifications and other measures which can postpone the age of onset of type II diabetes mellitus can aid in decreasing the mean duration of diabetes mellitus with age.Studies with analytical designs should be performed in the same area for deeper understanding of the role of risk factors for the occurrence of microalbuminuria in the indigenous population.
Keywords: Microalbuminuria, Type II diabetes mellitus, Prevalence, duration of diabetes.

INTRODUCTION

Diabetes is a metabolic disease characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action or both [1]. It is one of the largest global health emergencies of the 21st century [2]. One in eleven adults was having diabetes in 2015 and the future predictions say that it will become one in ten in the year 2040 [2]. Diabetes is an important disease not only in terms of the number of persons affected but also the considerable associated morbidity and early mortality [3]. In future there will not only be increase in the incidence and prevalence of diabetes but also there will be an increase in economic burden, disability and life years lost due to the disease [4].

This had initiated a need for methods that would aid in early identification of risk leading to possibility of intervention before diabetic complications had occurred [5]. This had led to a surge of research taking various inflammatory mediators like microalbuminuria, C-reactive protein as either risk factor or risk marker to the diabetic complications [6]. American Diabetic Association had recommended annual screening for microalbuminuria to all type 2 diabetes patients irrespective of duration of diabetes mellitus [7].

Microalbuminuria signifies minor quantity of albumin ranging between 30 mg / 24 hours to 300 mg / 24 hours to pass out of renal filtration barrier to appear in urine [8]. In diabetics, increased glucose levels leads indirectly, through various metabolic pathways cause endothelial damage including glycocalyx disruption [6]. This endothelial damage is reflected by microalbuminuria [8, 5, 9, 10]. Microalbuminuria is used as predictor for early micro and macrovascular changes in diabetes especially nephropathy and neuropathy complications [6, 11]. It is an independent risk factor for cardiovascular risk in both diabetic and non-diabetic sub-groups of the population [12].

The prevalence of microalbuminuria in the general population was found to be about 14-16% and that of the high risk cohorts was found to be 30-40% [7]. Microalbuminuria is likely to be found in one-third or more of diabetic patients [13]. In diabetic patients

with proteinuria the relative mortality is 40 times higher than in diabetics without proteinuria [5]. Microalbuminuria represents the simplest and most sensitive prognostic factor to evaluate the risk of overt nephropathy in diabetes, representing the first stage of progressive diabetic renal disease [14]. After identification of microalbuminuria, the interventions like controlling the blood glucose, hypertension and starting on Angiotensin receptor blockers or Angiotensin converting enzyme inhibitors had aided in the reversal of microalbuminuria [7, 4, 11]. Thus helping in improving the quality of life in diabetics.

The study was done with the objective to find out the prevalence of microalbuminuria among type II diabetes mellitus patients in urban Chidambaram and to find out the association between age, sex and duration of diabetes with albuminuria.

METHODOLOGY

This was a descriptive cross sectional study carried out in Chidambaram town between October 2015 and July 2016, particularly among people aged more than 30 years, who had type II diabetes mellitus and resided in the field practice area of Urban health centre, under the division of Rajah Muthiah Medical College and Hospital, Annamalai university. The field practice area constituted of 23 streets and 12,525 populations.

Sample size

Sample size for the study was calculated using the formulae $n = z^2 pq / e^2$
Where $z = 1.96$ (Table value for $\alpha = 0.05$), p = prevalence=0.4 (Based on the pilot study done in the same area), $q = 1-p = 0.6$, e = absolute precision (fixed as 7%).

By applying the above values, the sample size was calculated to be 188, which was then rounded to 200.

Sampling technique

Convenient sampling was done in which the left first house of the first street was taken as the starting point and subsequent houses were surveyed till the first house on the right side was reached, then the second street was selected. Those houses that were locked during the first visit were noted down and subsequently covered in next visits. The survey was stopped when 200 study participants were enumerated.

The exclusion criteria consisted of

- ✓ Age less than 30 years.
- ✓ Non diabetics age more than 30 years.
- ✓ Those who does exercise daily.
- ✓ Those having fever on the day of data collection.
- ✓ Those who were already diagnosed with rheumatoid arthiritis.
- ✓ Those who were pregnant.

Data collection was done using a pre-tested semi structured interview schedule. Proforma was prepared in English and local dialect, was used during interview to make it convenient for the participants. Details regarding socio-demographic variables like age, sex, marital status, educational status and income were collected.

The information regarding diabetes was collected which included details on the duration of diabetes, whether they were taking their anti-diabetic medications regularly and the drugs that they were taking to treat the conditions.

In order to prevent the recall bias, durations of diabetes was ascertained after asking whether they had occurred before or after certain important events of life. In order to ensure the regularity of treatment the following questions like whether you had taken the drug today? Whether you had taken the drug every day for the past one month? Whether you remember any day where you had missed the drug? Whether you have the habit of carrying drugs along with you while going out of station? Were asked. If they answered negatively for anyone of the above questions, then the participant was assigned as taking drugs irregularly.

A sterile container for the collection of urine sample was provided. Instructions regarding the collection of mid-stream urine was also provided. After collection the urine samples were sent to the laboratory within 20 minutes for the estimation of urine albumin and urine creatinine values.

In the laboratory, urine albumin estimation were done using immunometric assays and urine creatinine estimations were done using Jaffe-kinetic method. After obtaining the albumin and creatinine values, Albumin creatinine ratio was calculated using the formula-

$$\text{Urine Albumin Creatinine Ratio (UACR) in mg/g} = \frac{\text{Urine albumin (mg/dL)}}{\text{Urine Creatinine (g/dL)}}$$

Where, UACR in mg/g is equivalent to albumin excretion in mg/day.
Since UACR is the ratio between two substances, it is unaffected by variations in urine concentrations.

Operational definitions

Urban area: Field practice area of urban health centre, under division of community medicine, Rajah Muthiah Medical College and Hospital, Chidambaram.

Type II diabetes mellitus patients: Persons already diagnosed with type 2 diabetes mellitus and are taking drugs for the same.

Microalbuminuria: Urine albumin creatinine ratio is ≥30 mg/g ≤ 300 mg/g.

Macroalbuminuria: Urine albumin creatinine ratio is more than 300 mg/g.

Data Analysis

Data collected was entered in Microsoft 2013 excel spread sheet, compiled and analyzed using IBM SPSS Version 21 statistical package. Pearson chi-square test was performed to find out association between microalbuminuria and selected risk factors.

RESULTS

Out of the 200 type II diabetes mellitus study participants, 59.5% belonged to the age group of 51-70 years. The mean age of the study participants was 57.34±10.87 years. 55% of the study participants were females (Table 1).

50.5% were having diabetes for 2-5 years. 79.5% were taking their drugs regularly. 93% were treated by hypoglycaemic agents only and 7% were treated by both hypoglycaemic agents and insulin. 96.5% were consuming biguanides and 59% were consuming sulfonylureas (Table2).

Of the 200 study participants, 41.5% (83) had albumin creatinine ratio above 30 mg/g. None had albumin creatinine ratio above 300mg/g. The prevalence of microalbuminuria among the study participants was 41.5% (fig 1).All the three risk factors age, sex and duration of diabetes mellitus were found to have significant association with occurrence of albuminuria. As the age increased the probability of being microalbuminuric also increased (P<0.05). Males had 2.9 times the risk of being microalbuminuric than the females. As the duration of diabetes mellitus increased the chance of being microalbuminuric also increased (P<0.05) (table3).

Table-1: Distribution of the study participants according to age and sex

Variables		N	%
Age	**31-40**	19	9.5
	41-50	38	19
	51-60	67	33.5
	61-70	52	26
	>70	24	12
Sex	**Male**	90	45
	Female	110	55
Total		200	100

Table-2: Diabetic profile of the study participants.

Variables	N	%
		Duration of diabetes mellitus. (years)
≤ 1	33	16.5
2-5	101	50.5
6-10	32	16
11-20	17	8.5
>20	17	8.5
		Regularity
Regular	159	79.5
Irregular	41	20.5
		Mode of management
Hypoglycaemic agents alone	186	93
Both hypoglycaemic agents and insulin	14	7
		Hypoglycaemic agent
Biguanides	193	96.5*
Sulfonylureas	118	59*
Thiazolidinediones	11	5.5*
α – glucosidase inhibitor	4	2*
Dipeptidyl peptidase-4 inhibitor	3	1.5*

*the variables are described in proportion.

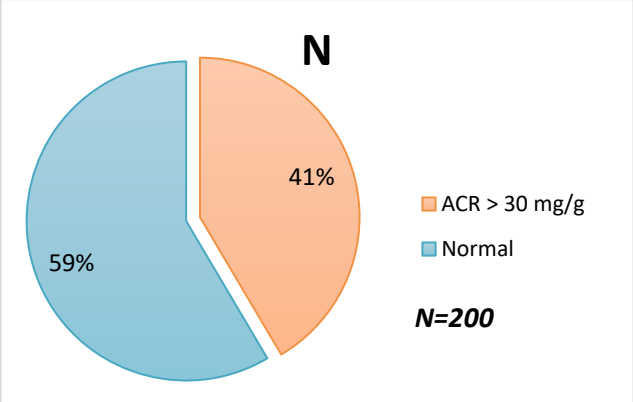

Fig-1: Prevalence of microalbuminuria among type II diabetes mellitus patients.

Table-3: Association between the occurrence of albuminuria and age, sex, duration of diabetes mellitus

Variables		Microalbuminurics		Normoalbuminurics		X^2	P-value
		N	N	%	%		
Age	**31-40**	0	0	19	100	33.52[&]	<0.05
	41-50	9	23.7	29	76.3		
	51-60	26	38.8	41	61.2		
	61-70	31	59.6	21	40.4		
	>70	17	70.8	7	29.2		
Sex	**Male**	50	55.6	40	44.4	13.32	<0.05
	Female	33	30	77	70		
Duration of diabetes mellitus (years)	**≤ 1**	11	33.3	22	66.7	47.91[&]	<0.05
	2-5	19	18.8	82	81.2		
	6-10	22	68.8	10	31.2		
	11-20	15	88.2	2	11.8		
	>20	16	94.1	1	5.9		
Treatment regularity	**Irregular**	23	56.1	18	43.9	4.52	<0.05
	Regular	60	37.7	99	62.3		

[&]linear by linear association was applied.

DISCUSSION

Prevalence of microalbuminuria

The prevalence of microalbuminuria among the type 2 diabetes mellitus patients in urban Chidambaram was found to be 41%. A systematic review had also stated that the prevalence of ACR>30 mg/g among the high risk cohorts to be 45.3% (42.8-47.9) among the south East Asians which is identical to the present study(15).Similar prevalence was also reported by A.Al-Adsani (43.5%), Chowta NK *et al* (37%), Dixon AN *et al* (31%), Kong NCT *et al.* (39.7%) in their studies [16-19]. Hall V *et al*. in their systematic review stated that the prevalence of microalbuminuria among type 2 diabetes mellitus varied from10% in Tanzania to 83% in Nigeria [20].

An Iranian study and a study done in Chennai reported a lower prevalence of 20% and 18.6% respectively [21, 22]. The prevalence of microalbuminuria was found to be 1.2% in a study done in Saudi Arabia in 2014, which is also in contrast to the present study [23]. In current study the prevalence of microalbuminuria is 41% which can be attributed to the place of the study as various other studies also indicated similar prevalence in south Asian population.

Age and microalbuminuria

Among the study participants belonging to > 70 years age group, 70.8% had microalbuminuria while in those belonging to age groups 31 to 40, the prevalence was nil. As the age increased, the probability of being microalbuminuric also increased and the association is also statistically significant.Similar associations between age and microalbuminuria were reported by Lampropoulou I *et al*., in 2014, Rani P *et al* in 2011., Chowta PK, Pant and Chowta MN in 2009, Tam TKW et al in 2004 and Parving *et al*. [24, 17, 25, 26]. In contrast Zakkerkrish *et al* in his study reported there is no association between age and microalbuminuria [21].

Sex and microalbuminuria:

Among the study participants 55.6% of males had microalbuminuria. Sex is found to influence microalbuminuria independently devoid of other factors. Males were found to have three times the increased risk of having microalbuminuria than females.

The findings of the present study are in correlation with other study done in Hong Kong in 2007 [27]. In contrast Zakkerkrish et al in in 2013 and Rani et al in 2011, Chowta NK, Pant P and Chowta MN in 2009 reported that being male or female had no role to play in developing microalbuminuria [21, 22, 17]. Tam TKW *et al*. had observed an exactly opposite association; they stated that females had twice the risk of having microalbuminuria than their male counterparts [25].

Duration of diabetes mellitus and microalbuminuria:

As the duration of diabetes mellitus increased, the probability of being microalbuminuric also increased.Similar association between duration of diabetes mellitus and microalbuminuria was reported by Aggarwal J and Kumar M in their study among the rural north Indian diabetic population [28]. C.Yang *et al*. reported that persons with longer duration of diabetes had 1.04 times the risk of getting increased urinary albumin-creatinine ratio than those with shorter duration [29]. Similar results were obtained by kundu et al., A.Al-adsani *et al*., Rani P *et al*. [14,16,22]. In contrast another study from Hong Kong in 2004 reported no association between duration of type II diabetes mellitus and microalbuminuria [25].

Limitation

The results of the study cannot be generalized because the study was confined to urban population of the field practice area. Recall bias can be present in association with certain variables of the study, where the study participants had to remember past dates. Microalbuminuria has a high biological variability. Though albumin creatinine ratio was used to estimate microalbuminuria in order to overcome this variability, it will not account to the variation fully. Microalbuminuria is an inflammatory marker, only those participants who had diagnosed inflammatory condition or febrile on the day of survey were excluded from the study. There can still be study participants with undiagnosed inflammatory conditions which could influence the prevalence.

CONCLUSION

Life style modifications and other measures which can postpone the age of onset of type II diabetes mellitus can aid in decreasing the mean duration of diabetes mellitus with age.More Studies should be performed in the same area for deeper and better understanding of the role of risk factors for the occurrence of microalbuminuria in the indigenous population.

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