

Original Article

PREVALENCE OF ACUTE CARDIAC AND RENAL COMPLICATIONS IN POORLY CONTROLLED DIABETICS AND ROLE OF CLINICAL PHARMACIST IN MODIFYING DISEASE OUTCOME IN A TERTIARY CARE HOSPITAL

MOUNIKA SOMEPALLI<sup>1</sup>, KEERTHY VINUKONDA<sup>1</sup>, RAMADASU PANUGANDLA<sup>1</sup>, SANAKAYALA B. UDAY SHANKAR<sup>2</sup>, CH. CHAITANYA LAKSHMI<sup>3</sup>

<sup>1</sup>Pharm D, Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India, <sup>2</sup>Asst. Professor, Department of General Medicine, Government General Hospital, Guntur, Andhra Pradesh, India,

<sup>3</sup>Asst. Professor, Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

Email: mounika.somepalli@gmail.com

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ABSTRACT

**Objective:** The main objective is to study the prevalence of acute cardiac and renal complications in poorly controlled diabetics and role of clinical pharmacist in modifying disease outcome by patient counselling in patients attending general medicine department.

**Methods:** It is a non-experimental prospective observational study done for 6 months. Patients admitted with acute cardiac and renal complications are included in the study. Patient's knowledge on the disease was assessed at baseline using a structured KAP questionnaire and then counselled. At baseline and follow-up FBG and RBG levels were recorded.

**Results:** A total of 511 patients were observed. Prevalence of acute renal complications was found to be 9.7% (n=50) and acute cardiac complications were found to be 2.9% (n=15). The prevalence of both acute cardiac and renal complications was found to be 0.97% (n=5). The knowledge of the patients on disease, complications, diet and lifestyle modifications was found to be increased which lead to significant improvement in FBG at baseline and follow-up with a mean of differences of-20.72 and with SD of differences 11.22; p value<0.0001 and for RBG at baseline and follow-up with mean of differences-25.86 and with SD of differences 20.19; p value<0.0001.

**Conclusion:** Uncontrolled diabetes for the first few years can cause acute cardiac and renal complications which are life threatening. Comparison of blood glucose at presenting and follow-up in association with education and counselling led to betterment of disease, outcome.

**Keywords:** Prevalence, Diabetes, Complications, Clinical pharmacist, Questionnaire, Outcome.

INTRODUCTION

Diabetes mellitus is a metabolic disorder of multiple etiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs [1]. The prevalence of diabetes is rapidly increasing throughout the world and particularly in developing countries like India. At present 382 million people have diabetes worldwide; by 2035 this will rise to 592 million. In South- East Asian region 72.1 million people have diabetes, 65.1 million of whom live in India and is estimated to be 109 million by 2035 [2, 3].

Type-2 DM often has a long asymptomatic period of hyperglycaemia, so many individuals with type-2 DM have complications at the time of diagnosis. It is demonstrated that a reduction in chronic hyperglycaemia can prevent or delay the occurrence of these complications [4, 5].

The mode of developing risk for a wide range of cardiovascular diseases (CVD) in diabetics is twice the risk of non-diabetics. The increase in cardiovascular morbidity and mortality rates appears to relate to the synergism of hyperglycemia with other cardiovascular risk factors. The American Heart Association has designated DM as a "CHD risk equivalent." Type 2 diabetes patients without a prior MI have a similar risk for coronary artery-related events as non-diabetic individuals who have had a prior MI [6-8]. Diabetes is one of the common causes of end stage renal disease. Almost one, in three people with Type 2 diabetes develops overt kidney disease [6, 7]. The pathogenesis of diabetic nephropathy is related to chronic hyperglycemia [4, 9, 10].

The appropriate control of diabetes can be achieved not only by the use of pharmacological therapy but also by scientific counselling by a clinical pharmacist on the importance of medication adherence,

awareness of long-term complications, regular blood glucose monitoring, life style changes including dietary modifications, smoking cessation, alcohol abstinence and regular exercise. The disease outcome can be improved and patient lead better quality of life by preventing or delaying the long term complications of the disease [11-17].

The main objective of the present study was to determine the prevalence of acute cardiac and renal complications which are chronic complications of diabetes and are presented acutely due to poorly controlled diabetes. Also the role of the clinical pharmacist in modifying the disease outcome by counselling the patient on various aspects of the disease, importance of medication, adherence and lifestyle modifications is studied.

MATERIALS AND METHODS

A non-experimental prospective observational study was conducted over a period 6 months from April to September of 2014 in the department of general medicine, Government General Hospital-a tertiary care hospital, in Guntur, Andhra Pradesh. Ethical approval was obtained from the institution before the initiation of the study. Patient was informed about the purpose of the study and written consent was taken prior to their participation in the study. Patient consent form was prepared in the vernacular language, Telugu. Paired t test was the statistical method employed to determine the significant difference between baseline and follow-up data. Type-1 and type-2 diabetic patients attending general medicine ward over the age of 18 and with a basal blood glucose level of >160 mg/dl diagnosed with acute renal or cardiac complication or both were included in the study. Critically ill patients who cannot participate in the study, smokers and patients with connective tissue disorders diagnosed earlier were excluded from the study.

Both inpatients and outpatients were screened for the total number of diabetics. Patients diagnosed and admitted with acute renal or cardiac complications by the physician were included. Required data of the patient was collected from the patient case sheet. Family history of the patient, duration of diabetes, medication history, food and life style followed, other diabetic complications, laboratory investigations were recorded. The baseline knowledge of the patients included in the study was determined using a structured questionnaire on knowledge, attitude and practice (KAP) of diabetes which was done under the guidance of the physician in both vernacular (Telugu) and English language. The answers were recorded and the patient is counselled on the disease, complications, importance of regular blood glucose monitoring, diet, life style modifications and medication adherence. The fasting and random blood glucose levels of the patients are noted at the time of discharge. Patients were reviewed after 3 months for follow up. Patients with outcome of death were excluded. The patients were asked to answer the questionnaire again during follow-up and their fasting and random blood glucose levels were recorded.

## RESULTS

A total of 511 diabetic patients were observed over the period of 6 months. Out of the total, 56% (n=282) were women. Among the total

diabetics, 18% had a family history of diabetes. The age of onset of diabetes was found to be 33% (n=167) in 51-60 years age group, followed by 31% (n=157) in 41-50 years age group, 15% (n=78) in 61-70 years age group and 14% (n=72) in 31-40 years age group.

A majority of 53% (n=270) of patients were with duration of diabetes  $\leq$  5 years, followed by 25% (n=129) with 6-10 years of duration, 10% (n=53) patients with DE novo diabetes, 7% (n=36) with 11-15 years of diabetes duration and only 5% (n=23) patients with >15 years in duration. 92% (472) of the diabetic patients were on treatment among which 74% (n=377) were using oral hypoglycemic agents, 11% (n=58) were using insulin preparations and 7% (n=37) of the patients were using both oral hypoglycemic agents and insulin preparations for the management of diabetes. 56% (n=285) were presented with various complications of the disease and 44% (n=226) did not show the presence of any diabetic complications. Neuropathy is the prominent microvascular complication with 25% (n=128), followed by Retinopathy in 22% (n=112) and Nephropathy in 18% (n=93).

Among the macro vascular complications observed, coronary complications were prominent 22% (n=113), followed by vascular complications in 7% (n=36) of diabetic patients. Further information is given in table 1.

**Table 1: Demographic and disease related details of patients**

	Variables	Total number of patients N=511 n (%)
Sex wise distribution	Male	219 (44)
	Female	282 (56)
Family history	Maternal history	51 (10)
	Paternal history	26 (5)
	Both maternal and Paternal history	13 (2.5)
	No history	421 (82)
Age of onset of diabetes	18-30 years	24 (5)
	31-40 years	72 (14)
	41-50 years	157 (31)
	51-60 years	167 (33)
	61-70 years	78 (15)
	$\geq$ 70 years	13 (2)
	DE novo	53 (10)
Duration of DM	<5 years	270 (53)
	6-10 years	129 (25)
	11-15 years	36 (7)
	$\geq$ 15 years	23 (5)
	Using OHA	377 (74)
	Using insulin	58 (11)
	Using both OHA and insulin	37 (7)
Medication history	Not on treatment	39 (8)
	Renal complications	93 (18)
	Neuropathy	128 (25)
	Vascular complications	36 (7)
	Retinopathy	112 (22)
Complications	Coronary	113 (22)
	No complications	226 (44)
	Renal	50 (9.7)
	Cardiac	15 (2.9)
	Both renal and cardiac	5 (0.97)

A total of 30% (n=155) of patients were admitted with renal and cardiac complications among which 13.6% (n=70) of patients were admitted with acute condition. Patients with acute renal complications were 9.7% (n=50), acute cardiac complications were 2.9% (n=15) and with both acute cardiac and renal complications were 0.97% (n=5). The data is graphically represented in fig. 1.

Onset of renal and cardiac complications was found to be 36% (n=56) in patients with 1-5 years of duration of diabetes, followed by 31.6% (n=49) in patients with 6-10 years of duration, then 10.6% (n=16) with 11-15 years of duration of diabetes. 71% (n=40) of the subjects in the duration of 1-5 years of diabetes were not on regular medication. Further detail on duration of diabetes for development of renal and cardiac complications is given in fig. 2.

The number of men and women with acute complications was equally distributed. Further information on mean ages of subjects with acute complications is given in table 2.

Total number of subjects with death as the outcome is 12 (17.4%) among them 66% (8) were men. 91.6% of subjects succumbed to death were with acute renal complication and only 8.4% with acute cardiac complications. Details on mean ages of these subjects are furnished in table 3.

## Knowledge

At baseline approach 87% of the subjects do not know what diabetes mellitus is, which was decreased to 23% after the counselling, 58% think that diabetes can be cured and at follow-up only 9% did not know. 72%

of the subjects were not aware of the normal blood glucose levels but at follow-up 84% were able to tell the normal value. Also there was significant improvement in the knowledge of patients regarding the symptoms of the disease, causes of hypoglycaemia, its symptoms and management. 97% of the subjects have no idea that diabetes could cause various complications which was drastically decreased at the time of follow-up to 20%. Also knowledge on foods to be taken, avoided and life style modifications was found to be improved. Further information regarding the subject's knowledge on disease is furnished in table 4.

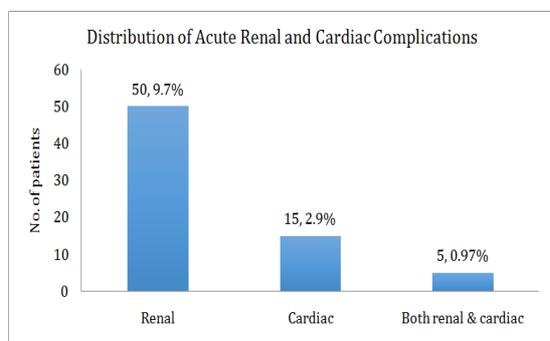


Fig. 1: Distribution of acute renal and cardiac complications

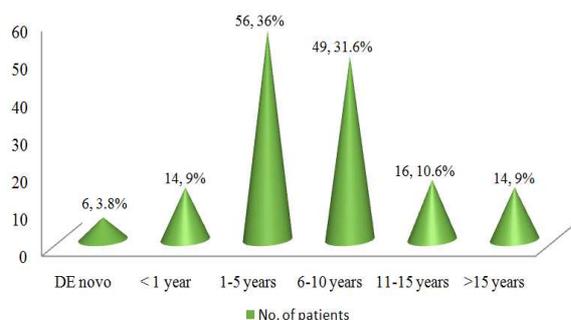


Fig. 2: Duration of diabetes for development of renal and cardiac complications

Table 2: Mean ages of subjects with acute complications

	No. of Men (35) (Mean age)	No. of women (35) Mean age
Cardiac	7 (55.4±5.07)	8 (59.9±8.8)
Renal	26 (56.4±11.9)	24 (55.7±10.8)
Both	2 (59±15.5)	3 (58.6±15.5)

Subjects with acute renal and cardiac complications (70) were evaluated for their knowledge, attitude and practice towards diabetes at baseline and during the follow up.

12 subjects were excluded from evaluation due to the outcome of death. 58 subjects were reviewed after 3 months. It was observed that there is a significant improvement in the knowledge of the subjects on the disease, complications and normal blood glucose levels.

Table 3: Mean ages of subjects with outcome death due to acute complications

	No. of Men (mean age)	No. of women (mean age)
Cardiac	-	1 (75)
Renal	8 (57.25±10.7)	3 (61±3.6)

#### Attitude and Practice

Most of the patients were not sure if they could eat with or without food restrictions if their blood glucose levels are under control, but after counselling at the time of follow-up 77% know they have to follow food restrictions. Also 82% of subjects think they can discontinue medication if they have controlled blood glucose levels which was decreased to 16% at follow-up.

The practice of patients regarding their medication taking behaviour was also improved from baseline to follow-up. Further details are given in table 4. The response of the patients to knowledge, attitude and practice related questions at baseline and follow-up is given in table 4.

Table 4: Response of the subjects to KAP questionnaire at baseline and follow-up

Knowledge	Baseline		Follow-up	
	No. of patients(58)		No. of patients	
	Aware n (%)	Not aware (%)	Aware (%)	Not aware (%)
Do you know what Diabetes Mellitus is?	8 (13)	50 (87)	45 (77)	13 (23)
Do you think that diabetes is a life lasting disease and cannot be cured?	24 (42)	34 (58)	53 (91)	5 (9)
Do you know what the normal blood glucose level is?	16 (28)	42 (72)	49 (84)	9 (16)
Can you recognize the symptom(s) of diabetes?	10 (17)	48 (83)	54 (94)	4 (6)
Do you know that skipping meals after taking medication can cause hypoglycemia?	17 (29)	41 (71)	47 (81)	11 (19)
Can you recognize hypoglycemic symptoms?	3 (5)	55 (95)	51 (87)	7 (13)
Do you know how to manage hypoglycemic symptoms?	3 (5)	55 (95)	49 (84)	11 (16)
Do you know that diabetes can cause complications?	2 (3)	56 (97)	48 (80)	12 (20)
Do you know that diabetic patients should follow a diet modification?	22 (37)	36 (63)	49 (85)	9 (15)
Do you know what food should be avoided?	17 (29)	41 (71)	43 (74)	15 (26)
Do you know lifestyle modifications can control blood glucose	7 (13)	51 (87)	37 (63)	21 (37)
<b>Attitude</b>				
Do you think that a diabetic person with a normal blood glucose level can eat without restriction?	<b>Yes</b> 25 (43)	<b>No</b> 10 <b>Don't know</b> (17) 23 (39)	<b>Yes</b> 5(8)	<b>No</b> 45 (77) <b>Don't know</b> 8 (30)
When your blood glucose levels are under control, do you think you can stop taking medicine?	<b>Yes</b> 47 (82)	<b>No</b> 11 (18)	<b>Yes</b> 9 (16)	<b>No</b> 49 (84)
<b>Practice</b>				
Do you monitor your blood glucose level at home?	<b>Yes</b> 8 (14)	<b>No</b> 50 (86)	<b>Yes</b> 11 (19)	<b>No</b> 47 (81)
Are you following a controlled and planned diet?	16 (27)	42 (73)	52 (90)	6 (10)
When you travel or leave home, do you sometimes forget to carry your	35 (60)	23(40)	48 (82)	10 (18)

medication?									
How often do you get your blood glucose levels check?	<b>Every week</b>	<b>Every 15 days</b>	<b>Every month</b>	<b>Whenever possible</b>	<b>Every week</b>	<b>Every 15 days</b>	<b>Every month</b>	<b>Whenever possible</b>	
	0	12 (21)	10 (17)	35 (62)	3 (5)	29 (50)	21 (36)	5 (9)	
Do you ever forget to take medicines?	Never	Frequent	Occasional	18 (31)	Never	Frequent	Occasional		
	10(17)	30 (52)			27(47)	18 (31)	13 (22)		

The mean FBG level in 58 patients at baseline i.e. at time of discharge is  $140.03 \pm 18.59$  and at follow-up is  $119.31 \pm 13.19$  and mean of differences is  $-20.72$  with SD of differences  $11.22$ ;  $p$  value  $< 0.0001$ . The mean RBG level at baseline i.e. at time of discharge is  $191.43 \pm 29$  and at follow-up is  $165.56 \pm 16.81$  and mean of differences is  $-25.86$  with SD of differences  $20.19$ ;  $p$  value  $< 0.0001$ . The data is graphically represented in fig. 2 and 3 respectively.

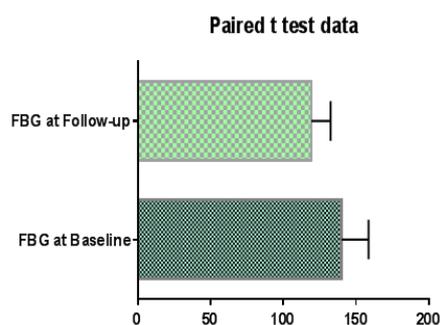


Fig. 3: Paired t test data of FBG levels at baseline and follow-up

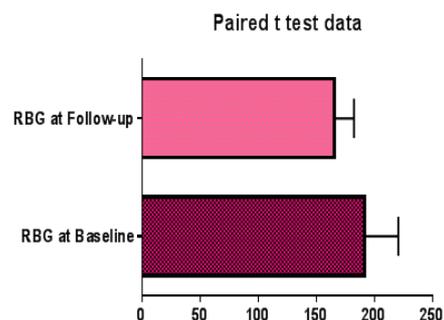


Fig. 4: Paired t test data of RBG levels at baseline and follow-up

## DISCUSSION

The prevalence of diabetes is growing throughout the world, mostly in developing countries like India, recording 65.1 million diabetics which are highest among South East Asian countries [2]. Initially due to urbanisation, the prevalence of diabetes was 4-6 times higher in the urban population than in rural areas from 1971-2001 [18, 19]. Majority of the population in India resides in rural area, it is found that ratio of unknown-to-known diabetes is 3:1 in rural areas (compared to 1:1 in urban areas) which shows that there is decreased awareness on chronic diseases like diabetes mellitus. As the majority of cases go undiagnosed many of the patients present with complications at the time of diagnosis [20, 21].

In the present study, prevalence of diabetes was found to be more in females 56% ( $n=282$ ) than in males 44% ( $n=219$ ) which are similar to that of the literature [4, 8]. Also diabetes was found to be high-33% ( $n=167$ ) in people aged 51-60 years of age with a mean age of 57.1 years followed by 31% ( $n=157$ ) in the age group of 41-50 years with a mean age of 47 years. The maximum number of people with diabetes was observed between 41-60 years of age. The same age group was seen in other studies [22, 23].

In a study conducted in India showed that prevalence of complications in 3010 type-2 diabetic patients was Retinopathy 23.7%, Nephropathy 5.5%, Peri-neuropathy 27.5%, Cardiovascular disease 11.4%, Hypertension 38%, Peripheral vascular disease 4.0, Cerebrovascular accidents 0.9% [18,20]. In our study, we found that among the total diabetics, 56% ( $n=285$ ) were presented with various complications of the disease and 44% ( $n=226$ ) did not show the presence of any diabetic complications. Neuropathy is the prominent micro vascular complication with 25% ( $n=128$ ), followed by retinopathy in 22% ( $n=113$ ) and nephropathy in 18% ( $n=93$ ). Among the macro vascular complications observed, coronary complications were prominent 22% ( $n=112$ ), followed by vascular complications in 7% ( $n=36$ ) of diabetic patients. This shows that neuropathy is the commonest diabetic complication observed followed by retinopathy.

In our study, we found that a total of 30% ( $n=155$ ) of patients were admitted with renal and cardiac complications among which 13.6% ( $n=70$ ) of patients were admitted with acute condition. Onset of renal and cardiac complications was seen mostly in patients between 1-5 years (mean duration 3.03 years) after the diagnosis of diabetes i.e. 36% ( $n=56$ ) which is due to lack of medication adherence and drug use, lack of dietary and lifestyle modifications. Followed by 31.6% ( $n=49$ ) in between 6-10 years (mean duration 8 years). 71% ( $n=40$ ) of the subjects in the duration of 1-5 years of diabetes were not on regular medication and only 29% ( $n=16$ ) are taking their medication properly.

Many studies conducted stated the prevalence of chronic complications of diabetes but not the prevalence of acute onset of chronic complications. In the present study, the prevalence of acute renal complications was estimated and found to be 9.7% ( $n=50$ ) and acute cardiac complications were found to be 2.9% ( $n=15$ ). The prevalence of both acute cardiac and renal complications was found to be 0.97% ( $n=5$ ). It was observed that the acute renal and cardiac complications were equally prevalent in both males (35) and females (35). Mean age of males with acute renal complications was found to be  $56.4 \pm 11.9$  and in females  $55.7 \pm 10.8$ . Mean age of males with acute cardiac complication was found to be less  $55.4 \pm 5.07$  when compared to females  $59.9 \pm 8.8$ . Mean ages of males and females with both acute cardiac and renal complications were found to be  $59 \pm 15.5$  and  $58.6 \pm 15.5$  respectively.

In this study at baseline it was found that patient's knowledge on disease, its complications, dietary modifications, importance of medication adherence and life style modifications, is poor which can be the main cause for the development of complications in the 1<sup>st</sup> decade of disease. After counselling, at the time of follow-up there was a significant improvement of knowledge on maintenance of blood glucose levels, foods to be taken and avoided, importance of medication adherence, identification and management of hypoglycaemia. The significant improvement in FBG levels at baseline and follow-up with a mean of differences of  $-20.72$  and with SD of differences  $11.22$ ;  $p$  value  $< 0.0001$  and for RBG at baseline and follow-up with mean of differences  $-25.86$  and with SD of differences  $20.19$ ;  $p$  value  $< 0.0001$ .

Several other studies also concluded that there is an improvement in knowledge of the disease lead to better glycaemic control and clinical outcome [16, 17, 22, 25]. Hinchageri et. al. showed that there was an improvement in patient's lab parameters such as HbA1c, FBS, PPBS, blood pressure due to increase in their knowledge on diabetes [17]. Ramesh Adepu et. al's study also concluded that a significant ( $p < 0.05$ ) improvement in KAP, mean scores of regimen, was observed in all test group patients after a pharmacist provided structured education to the patient [24].

This study shows that due to lack of knowledge on disease, there is an early onset of chronic complications of diabetes which increases morbidity and mortality, but a proper counselling by a pharmacist can improve knowledge on disease thereby preventing the early onset and recurrence of complications.

#### CONCLUSION

From our study, we conclude that uncontrolled diabetes for the first few years can cause acute cardiac and renal complications where the prevalence was 13.6%, which are life threatening and poorly controlled diabetes can cause long term cardiac and renal complications albeit with mortality rate. Comparison of blood glucose at presenting and follow-up in association with education and counselling by a clinical pharmacist betterment of disease, outcome, decreased hospitalization and improved patient lifestyle. This study was conducted in a government teaching general hospital and needs to be carried out on large scale to extrapolate the results to general populations.

#### ABBREVIATION

CHD-Congestive Heart Disease, CVD-Cardiovascular Disease, DM-Diabetes Mellitus, FBG-Fasting Blood Glucose, KAP-Knowledge Attitude Practice, MI-Myocardial Infarction, OHA-Oral Hypo glycaemic Agents, RBG-Random Blood Glucose, SD-Standard Deviation.

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#### CONFLICT OF INTERESTS

Conflict of interest declared none

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