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Analysis of Therapeutic Outcome of Antidiabetic Medications in a Tertiary Care Hospital-an Observational Study

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Abstract

Background: Diabetes at present appears as a common non communicable disease. It leads to high morbidity and mortality due to the disease itself and its diverse complications like coronary artery disease, hypertension, renal complication, retinal damage, neurological disorders, incidence of stroke at different sites, generalized infections etc. With such multifactorial background of high prevalence , progressive nature of the disease leading to various complications and increase health care cost, availability of multiple therapeutic regimens prescribed on trial and error basis, the treatment is individualized and neither complete nor satisfactory. This study was undertaken to analyze the effect of antidiabetic medications on prognosis of the disease i.e. on glycemic status, lipid profile and on existing co-morbid conditions like hypertension and complications.

Methods: This is a prospective, parallel group, comparative observational study. The enrolled patients were then divided as -Pre obese- categorized into a)New diabetic b)Old diabetic (<3 years duration).Obese similarly divided to a)New diabetic b)Old diabetic(<3 years duration). Each category was further divided into four subgroups according to the treatment received a)Monotherapy-only Metformin b)Combination therapy- Metformin another antidiabetic groups, preferably sulfonylureas, alphaglucosidase inhibitors or DPP 4 inhibitors c)Triple therapy (Metformin+SU +Voglibose or Gliptins or Glitazones) d)Insulin with other oral hypoglycemic drugs.

Results: In primary outcome, reduction in all glycemic parameters were significant and progressive in both old and new diabetic cases at all follow up visits, both in preobese and obese groups. Analysis of secondary outcome revealed significant reduction in SBP, DBP and ACR in all the four groups while only LDL and Cholesterol were significantly reduced in all preobese and obese groups.

Conclusions: The antidiabetic medications prescribed in this hospital, were effective in improving the glycemic status, blood pressure, lipid profile and renal status of all patients under the study.

Keywords: Diabetes; Obese; Pre-obese; FBS; PPBS; HbA1C

Introduction

Diabetes at present appears as a common non communicable disease spreading rapidly all over the world. It leads to high morbidity and mortality due to the disease itself and its diverse complications like coronary artery disease, hypertension, renal complication, retinal damage, neurological disorders, incidence of stroke at different sites, generalized infections etc. This disorder now is recognized as a chronic devastating progressive disease more prevalent among middle and higher economic group due to a change in their life style and food habit. The disease is spreading in an alarming rate and India, very soon (within one or two decade) may become the capital of diabetes. Drug therapy is compulsory because of the chronic and progressive nature of the disease. The total cost of treatment in uncomplicated case is Rupees 15000 per annum and four times more in complicated cases which leads to financial burden to the individual and to the health care system as well [1].

With such multifactorial background of high prevalence, progressive nature of the disease leading to various complications and increase health care cost, availability of multiple therapeutic regimens prescribed on trial and error basis, the treatment is individualized and neither complete nor satisfactory. This study was undertaken to analyze the effect of antidiabetic medications on prognosis of the disease i.e. on glycemic status (Fasting blood sugar, postprandial blood glucose ang HbA1C), lipid profile (VLDL, LDL, Cholesterol, TG) on existing co-morbid conditions like hypertension and complications.

Aims & Objectives

1. To assess the efficacy and safety of the prescribing drugs by estimation of glycemic status(FBS, PPBS, HbA1C) and clinical observations like change in appetite ,nausea, body weight, feeling of wellbeing before and after administration of drugs at 0,1,3,6,9, & 12 month interval.
2. To observe the improvement of various co-morbid conditions commonly associated with type 2 DM like hypertension and dyslipidemia by measurement of BP, Lipid profile at 0, 1,3,6,9 and 12 month intervals.

Patients and Methods

This is a prospective, parallel group, comparative observational study conducted in collaboration with department of Endocrinology KIMS, Bhubaneswar. The study was approved by the Institutional Ethical committee, KIMS, BBSR.

Inclusion criteria

- New cases Type 2 Diabetic patients between 40 to 70 years of age.

- Patients with BMI between 25-34.99(preobese and obese) and sedentary lifestyle.
- Patients already on antidiabetic medications for less than 3 years
- HbA1C levels between 6-9%
- Diabetic patients with co-morbid conditions like hypertension, obesity and dyslipidemia
- Diabetic patients presenting with micro vascular complications like retinopathy, nephropathy (GFR not less than 40 ml/min/ 1.73m^2), and neuropathy

Exclusion criteria

- Patient less than 30 and more than 70 years of age
- BMI<25,BMI ≥ 35,athelets or patients whose work involves heavy exercise
- Diabetic patients with advanced nephropathy whose GFR<40 ml/min/1.73m^2
- Untreated hypo or hyperthyroidism patients
- Patient suffering from acute metabolic disorders like diabetic ketoacidosis or hyperosmolar coma
- Patient on oral contraceptive pills
- Patients suffering from severe liver or kidney disease

Grouping of patients

Treatment Recieved	Preobese(N=168)		Obese(N=52)	
	New Diabetic Cases (N=52)	Old Diabetic Cases (N=116)	New Diabetic Cases (N=12)	Old Diabetic Cases (N=40)
Metformin	11	0	3	2
Dual Therapy	41	86	9	27
Triple Therapy	0	30	0	11
Insulin	0	0	0	0

Table 1: Grouping of enrolled patients.

The enrolled patients were then divided as -A. Pre obese-categorized into a) New diabetic b) Old diabetic (<3 years duration). B Obese similarly divided to a) New diabetic b) Old diabetic (<3 years duration). Each category was further divided into four subgroups according to the treatment received a) Monotherapy-only Metformin b) Combination therapy Metformin another antidiabetic groups, preferably sulfonylureas, alphaglucosidase inhibitors or DPP 4 inhibitors c) Triple therapy(Metformin+SU+Voglibose or Gliptins or Glitazones) d) Insulin with other oral hypoglycemic drugs (Table 1).

For this purpose, the whole result of treatment was divided into two parts

Primary outcome: Reflects the efficacy of treatment measured by observing the glycemic status of patient before as well as 1,3,6,9 & 12 months after receiving medication. For this parameters observed were-HbA1C, FBG and PPBG.

Secondary outcome: To determine the impact of medication on macro vascular and micro vascular complication commonly associated with type 2 DM, measurement of BP (hypertension) and Lipid profile (dyslipidemia) was undertaken. Any improvement in comorbid conditions or complications existing with diabetes also was examined by estimation of Spot ACR, serum creatinine (for nephropathy) and examination of eye for retinal changes (for retinopathy) at every six months interval.

Dietary changes: All the patients were instructed to follow proper diet and do physical exercise, at least 20-30 minutes, four times a week. Calorie restriction was done. For both preobese and obese category, calorie restriction was done up to 20-22 kcal/kg/day. Fried and sweet items were asked to avoid. Small portion of food was advised to be taken at smaller interval of time.

Results

All glycemic parameters i.e. FBS, PPBS & HbA1C exhibited highly significant reduction at all follow up visits starting from 3 months post treatment. Pan reduction in glycemic parameters was significant and progressive in both old and new diabetic cases at all follow up visits (Tables 2 and 3).

Parameters		Baseline	After 3 Months	After 6 Months	After 12 Months
New diabetic	FBS	158.88 ± 16.08	103.63 ± 6.86*	106.32 ± 17.71*	104.69 ± 20.44*
	PPBS	266.71 ± 50.36	154.07 ± 18.9*	166.78 ± 34.78*	164.25 ± 37.30*
	HbA1C	7.48 ± 0.839	7.03 ± 0.55*	6.84 ± 0.33*	6.70 ± 0.243*
Old Diabetic	FBS	125.62 ± 21.17	109.24 ± 16.19*	107.7 ± 18.19*	99.16 ± 5.98*
	PPBS	192.28 ± 44.91	171.34 ± 36.60*	167.34 ± 36.32*	147.99 ± 4.94*
	HbA1C	7.352 ± .708	7.03 ± 0.48*	6.88 ± 0.33*	6.684 ± 0.244*

Table 2: Assessment of therapeutic outcome of antidiabetic medications on glycemic parameters at different time intervals of initiation of treatment in comparison to pretreatment values, in preobese category, both in new (n=52) and old diabetic cases (n=116).All the values are mean ± SD. Data analyzed by paired 't' test. * represents p value <0.05- significant, **p value <0.01- highly significant, ***p value <0.001- very highly significant, and *p value <0.0001- extremely significant.

Parameters		Baseline	After 3 Months	After 6 Months	After 12 Months
New Diabetic	FBS	145.17 ± 16.40	107.66 ± 4.80*	105.25 ± 5.83*	105.42 ± 12.93*
	PPBS	281.92 ± 75.24	168.5 ± 13.07**	161.41 ± 14.6***	163.25 ± 26.26*
	HbA1C	7.233 ± 0.734	6.88 ± 0.50*	6.73 ± 0.38***	6.667 ± 0.326**
Old Diabetic	FBS	134.63 ± 19.04	108.55 ± 8.93*	113.17 ± 19.1*	100.18 ± 6.43*
	PPBS	214.70 ± 60.70	165.42 ± 13.5*	176.05 ± 45.9*	151.28 ± 19.28*
	HbA1C	7.68 ± 0.774	7.26 ± 0.61*	7.15 ± 0.59*	6.825 ± 0.388*

Table 3: Assessment of therapeutic outcome of antidiabetic medications on glycemic parameters at different time intervals of initiation of treatment in comparison to pretreatment values, in obese category, both in new and old diabetic cases (n=52). All the values are mean ± SD. Statistics applied is paired 't' test. * represents p value <0.05 significant, **p value <0.01 highly significant, ***p value <0.001 very highly significant and * p value <0.0001 extremely significant.

In new diabetic cases, FBS and PPBS were found to decline significantly after 3 months and continued as such up to 6 and 12 months after onset of treatment whereas HbA1C exhibited a significant and progressive decline starting from 3 months onwards. In old diabetic cases, reduction in all glycemic parameters was highly significant at all-time interval of assessment after starting the antidiabetic treatment (Table 4).

Parameters		Follow Up Intervals In Months			
		BASELINE	3 Months	6 Months	12 Months
New Diabetic	SBP	137.31 ± 12.34	132.52 ± 8.42	130.31 ± 8.62***	130.40 ± 6.20*
	DBP	83.08 ± 8.63	76.54 ± 7.60	80 ± 7.53	78.50 ± 5.57*
	ACR	41.243 ± 24.56	39.59 ± 23.68	36.65 ± 22.50*	33.935 ± 20.53*
	CREAT	0.850 ± 0.142	0.855 ± 0.14	0.86 ± 0.11	0.841 ± 0.138
	LDL	115.23 ± 39.30		91.25 ± 30.34*	82.504 ± 23.09*
	HDL	52.46 ± 6.38		52.73 ± 6.71	52.33 ± 6.27
	TG	167.65 ± 68.67		149.67 ± 61.63	147.67 ± 52.73
	VLDL	31.48 ± 12.61		29 ± 12.12	29.51 ± 10.62
	CHO	200.29 ± 49.09		173.03±36.72***	164.37 ± 28.78*
Old Diabetic	SBP	141.41 ± 14.43	132.07 ± 8.92*	131.65 ± 9.37*	130.28 ± 7.17*
	DBP	85.66 ± 9.84	76.70 ± 7.79*	79.93 ± 7.30*	79.10 ± 6.85*
	ACR	51.703± 35.40	49.72 ± 35.04*	51.92± 37.28*	48.42 ± 35.95*
	CREAT	0.8453 ± 0.122	0.84 ± 0.13	0.86 ± 0.13	0.85 ± 0.125
	LDL	119.36 ± 36.31		101.1 ± 33.12*	81.61 ± 25.88*
	HDL	52.51 ± 6.95		52.43 ± 7.53	51.50 ± 6.68
	TG	177.16 ± 67.98		153.85 ± 58.35*	132.52 ± 50.43*
	VLDL	33.701 ± 12.60		30.74 ± 12.02	26.47 ± 10.03*
	CHO	207.39 ± 46.59		184.28 ± 39.81*	159.66 ± 30.37*

Table 4: Assessment of therapeutic outcome of antidiabetic and other specific medications on co-morbid parameters at different time intervals of initiation of treatment in comparison to pretreatment values, in preobese category, both in new diabetic patients (n=52) and old diabetic cases (n=116).All the values are mean ± SD. Data analyzed by paired 't' test. *represents p value <0.05 significant, **p value <0.01 highly significant, ***p value <0.001 very highly significant and *p value <0.0001 extremely significant, when compared with the baseline at 3months, 6 months and 12 months interval.

In new diabetic category, SBP showed a gradual decline which was highly significant at 6 and 12 months post treatment period, while DBP showed significant reduction at 12 months after beginning of treatment. Reduction in creatinine levels was not significant while ACR was reduced gradually and found to be highly significant at 6 and 12 months post treatment in comparison to baseline. Reduction in cholesterol and LDL was progressive and highly significant both at 6 and 12 months interval. Amongst old diabetic cases, SBP, DBP and ACR were found to be significantly declined at 3,6,12 months of post treatment but reduction in creatinine level was not significant. Reduction in LDL and cholesterol was significantly reduced both at 6 and 12 months while TG and VLDL showed significant reduction only after 12 months of initiation of treatment in comparison to their baseline value (Table 5).

Parameters		Follow Up Time Intervals In Months			
		BASELINE	**3 Months**	**6 Months**	**12 Months**
New Diabetic	SBP	137.75 ± 17.70	134.16 ± 9.85	133.25 ± 5.18	130.17 ± 5.01
	DBP	84.83 ± 8.80	82.5 ± 6.38	75.83 ± 5.12	73.50 ± 4.27
	ACR	106.50 ± 69.98	98.5 ± 61.47	96.38 ± 62.04*	93.03 ± 61.25*
	CREAT	0.8225 ± 0.083	0.83 ± 0.07	0.84 ± 0.07	0.8217 ± 0.102
	LDL	110.78 ± 49.20		118.43 ± 30.57	117.06 ± 40.06
	HDL	56.17 ± 6.91		59.91 ± 5.68	53.58 ± 3.99
	TG	160.25 ± 83.44		156.5 ± 43.62	165.33 ± 74.10
	VLDL	32.05 ± 16.68		29.21 ± 6.11	33.067 ± 14.82
	CHO	199.0 ± 66.78		206.66 ± 41.13	175.83 ± 39.73*
Old diabetic	SBP	142.03 ± 14.40	132.17 ± 11.52*	131.72 ± 7.38***	132.03 ± 6.15*
	DBP	85.25 ± 10.35	80.4 ± 8.36*	76.05 ± 7.52**	75.98 ± 5.36*
	ACR	49.52 ± 45.28	45.68 ± 39.76*	43.95 ± 39.02*	41.85 ± 38.22*
	CREAT	0.842 ± 0.137	0.87 ± 0.15	0.88 ± 0.14	0.850 ± 0.138*
	LDL	119.20 ± 36.32		94.11 ± 35.9*	91.16 ± 25.977*
	HDL	53.93 ± 7.18		52.47 ± 6.22	51.28 ± 7.66
	TG	193.18 ± 67.40		148.8 ± 64.15*	154.58 ± 55.59*
	VLDL	32.735 ± 10.49		27.52 ± 11.64	30.753 ± 11.11
	CHO	211.80 ± 47.61		176.37 ± 44.06***	173.35 ± 32.06*

Table 5: Assessment of therapeutic outcome of antidiabetic + specific medications for co-morbid parameters at different time intervals of initiation of treatment in comparison to pretreatment values, in obese category, both in new diabetic patients and old diabetic cases (n=52).All the values are mean ± SD. Data analyzed by paired 't' test. * represents p value <0.05 significant, ** p value <0.01 highly significant, *** p value <0.001 very highly significant and * p value <0.0001 extremely significant, when compared with the baseline at 3months, 6 months and 12 months interval.

Amongst new diabetic patients, ACR was found to be reduced significantly while SBP, DBP as well as lipid profile parameters did not alter significantly. In old diabetic category, ACR was reduced significantly at 3, 6 and 12 months post treatment while creatinine showed a sluggish decline over a period of 12 months. SBP and DBP exhibited progressive decline at 3 and 6 months interval and became extremely significant by the end of 12 months after treatment. LDL, TG and cholesterol also showed progressive reduction and were significant at 6 and 12 months post treatment (Figures 1-3).

Discussion

Primary outcome

The primary outcome of this study is to assess the change in glycemic status taking into consideration of FBS, PPBS and HbA1C level during the course of treatment. All the patients included in the study were advised to undergo routine physical exercise and calorie restriction. As an alternative patient may opt for gymming or swimming as per his/her convenience. Dietary changes were advised with the help of dietician, according to kcal need, as per the requirement including increase intake of Fibre diet. Patients were strictly instructed for the avoidance of substance abuse i.e. alcohol, smoking etc. The glycemic parameters were recorded at the first visit

and were repeated at intervals i.e. 1,3,6,9 and 12 months of follow up visits with modifications as per requirement.

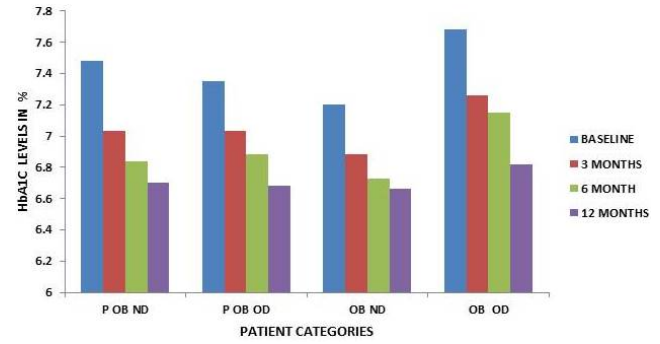

Figure 1: Bar diagram showing the significant decrease in HbA1C in all the four groups at different time intervals of post treatment amongst the whole study population. OB OD- obese old diabetic, OB ND- obese new diabetic, P OB ND- preobese new diabetic, P OB OD- preobese old diabetic.

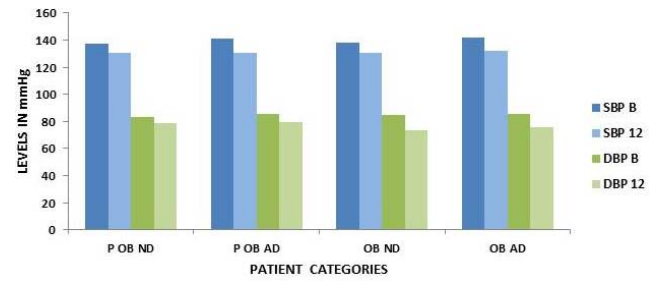

Figure 2: Bar diagram showing the significant decrease in SBP and DBP in all the four groups at different time intervals of post treatment amongst the whole study population. OB OD- obese old diabetic, OB ND- obese new diabetic, P OB ND- preobese new diabetic, P OB OD- preobese old diabetic.

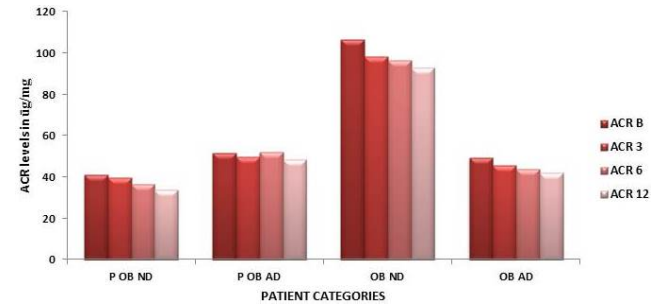

Figure 3: Bar diagram showing the significant decrease in ACR in all the four groups at at different time intervals of post treatment amongst the whole study population. OB OD-obese old diabetic, OB ND- obese new diabetic, P OB ND- preobese new diabetic, P OB OD- preobese old diabetic.

The glycemic parameters of almost all the patients both in preobese and obese category were efficiently controlled by the antidiabetic medications, prescribed by the physician along with advice for diet and exercise. Hence the prescribing pattern followed in this tertiary care hospital is effective, rational, and in accordance with WHO as well as ADA guidelines with significant desirable outcome, within one year of observation.

In selecting treatment for any chronic disease, the mechanism of the disease and the precipitating factors should be considered. Obesity and a sedentary lifestyle, for example, contribute to the risk of hyperglycemia of type 2 diabetes. Obesity is also a factor for development of insulin resistance. Weight reduction and an increase in physical activity improve glycemic control by reducing insulin resistance and lowering fasting blood glucose. Weight loss also lowers risk of cardiovascular disease by reducing hypertension and serum makers of inflammation as well as improving the lipid profile. The Diabetes Prevention Program reports a 58 percent decrease in the incidence of type 2 diabetes among patients who achieved at least a 7 percent weight loss over 2.8 years [2]. Diabetes treatments in general reduce hepatic glucose output, enhance insulin secretion, improve insulin sensitivity, and prolong the effects of glucagon-like peptide-1 (GLP-1). Despite these mechanisms and their abilities to lower blood glucose, pharmacotherapies for diabetes have shown varying effects on glycemic status.

Secondary outcome

The aim is to determine the impact of medication on co-morbid conditions as well as macro and micro vascular complications.
Dyslipidemia was most commonly encountered in both preobese and obese group. In preobese new diabetic category, LDL and total cholesterol was significantly reduced but no significant changes observed in HDL, TG or VLDL. Whereas in preobese old diabetic category, extremely significant reduction was seen in all lipid profiles levels except HDL. Amongst obese group, new diabetic patients, no significant reduction seen in any of the lipid parameters except cholesterol whereas in old diabetic patients, significant reduction is seen in LDL, TG and total cholesterol. This might be the result of a prolonged antidiabetic therapy in old diabetic cases.

Diabetic patients tend to have higher triglyceride, lower high-density lipoprotein cholesterol (HDL), and higher low-density lipoprotein cholesterol (LDL) levels compared with non-diabetic [3]. However, diabetic patients tend to have a higher concentration of small dense LDL particles, which are associated with higher risk of CHD. Current recommendations are for an LDL goal of less than 100 mg/dl (<70 mg/dl in very high-risk patients), for HDL >40 mg/dl for men and >50 mg/dl for women, and a triglyceride goal of <150 mg/dl. Non-pharmacologic interventions (diet and exercise) are first-line therapies with pharmacologic intervention when necessary [4]. Lowering LDL levels is the first priority in treating diabetic dyslipidemia. Statins are the drug of choice, followed by resins or ezetimibe, fenofibrate or niacin. If a single agent is inadequate to achieve lipid goals, combinations of drugs may be used. To control an elevated triglyceride levels, hyperglycemia must be controlled first [5,6]. In this investigation, dyslipidemia patients in obese and preobese category were prescribed statins i.e. either ATORVASTATIN or ROSUVASTATIN and majority of patients responded very well.

Hypertension was the second commonly associated co morbid condition with diabetes seen in this study. Around 35.12% patients in preobese category and 38.46% of patients in obese category were found

hypertensive during their first visit. In both preobese and obese group, SBP and DBP were significantly reduced. This suggests that patients were efficiently controlled by prolonged effective antidiabetic and antihypertensive treatment.

Diabetes increases the risk of coronary events twofold in men and fourfold in women. Part of this increase is due to the frequency of associated cardiovascular risk factors such as hypertension, dyslipidemia, and clotting abnormalities. In observational studies, people with both diabetes and hypertension have approximately twice the risk of cardiovascular disease than non-diabetic people with hypertension [7]. Hypertensive diabetic patients are also at increased risk for complications like retinopathy and nephropathy. In the U.K. Prospective Diabetes Study (UKPDS), each 10-mmHg decrease in mean systolic blood pressure was associated with reductions in risk of 12% for any diabetes related complications, 15% for reduction of deaths related to diabetes, 11% for reduction of myocardial infarction, and 13% for micro vascular complications [8]. Dietary management with moderate sodium restriction has been effective in reducing blood pressure in individuals with essential hypertension. Several controlled studies have emphasized the relationship between weight loss and blood pressure reduction. Weight reduction can reduce blood pressure independent of sodium intake and also can improve blood glucose and lipid levels. The loss of one kilogram in body weight has results in decreases in mean arterial blood pressure of 1 mmHg [9].

There are limited data from trials comparing different classes of drugs in patients with diabetes and hypertension. The UKPDS-Hypertension in Diabetes Study showed no significant difference in outcomes for treatment based on an ACE inhibitor compared to beta - blocker. Some drug withdrawals were required due to side effects and there was more weight gain observed in the beta-blocker group. In post myocardial infarction patients, beta-blockers have been shown to reduce mortality [8]. In this study, primary choice was ARBs followed by CCBs. ACEIs were not much prescribed because of hyperkalemia, renal complication and cough as side effects. ARBs were noticed to be equipotent as ACEIs with a better safety profile and PPAR gamma modulating activity hence was considered to be the first choce in patients with diabetes and CVD associated with hypertension. Some other studies have shown beneficial effect in cardiac events in patients treated with calcium channel blockers (CCBs) compared to ACE inhibitors. Besides, patients were advised salt restriction and low calorie diet with more Fiber intake [10].

Diabetic nephropathy (DN) or diabetic kidney disease is a syndrome characterized by the presence of pathological quantities of urine albumin excretion, glomerular lesions, and loss of glomerular filtration rate (GFR) in diabetics. Not all diabetics develop DN and in those who do, progression is variable. The main modifiable risks are hypertension, glycemic control, and dyslipidemia. Data from the Joslin Diabetes Center, Steno Diabetes Center, and AusDiab studies also strongly implicate smoking as a risk factor for DN [11,12]. Incipient nephropathy is the initial presence of low but abnormal amounts of urine albumin, referred to as micro albuminuria (persistent albuminuria at level 30-299 mg/24 hours). Overt nephropathy or macro albuminuria (persistent albuminuria at level ≥ 300 mg/24 hours) develops after many years in type 1 diabetes but may be present at the time of diagnosis of type 2 diabetes. Patients who progress to macro albuminuria are more likely to develop end stage renal disease [13].

Micro albuminuria is an independent predictor of cardiovascular disease and all-cause mortality in both diabetic [14] and non-diabetic men and women, and may be a stronger indicator for future cardiovascular events [15,16]. According to the American Diabetes Association (ADA), the gold standard for measuring urine albumin excretion is a 24-h urine collection [17]. A more convenient method to detect micro albuminuria is the albumin (mg)/creatinine (mg) ratio (ACR) measured in a random urine specimen. Currently, the National Kidney Foundation recommends the use of spot urine ACR obtained under standardized conditions (first voided, morning, midstream specimen) to detect micro albuminuria. The ACR is a more convenient test for patients and may be less prone to. Errors due to improper collection methods and variations in 24-h protein excretion compared with a random urine specimen. The ADA and the National Kidney Foundation define micro albuminuria as an ACR between 30 to 300 g/mg in both men and women [18,19].

In present study, Nephropathy was assessed by Spot ACR and serum creatinine. No significant reduction was observed in creatinine levels in all of patients except obese old diabetic category. With prescribed antidiabetic medications, appropriate antihypertensive therapy and strict diet control; there was significant reduction in ACR values from baseline to 12 months interval in all patients of preobese and obese group. The data indicate rational effective therapy with favorable outcome.

Good glycemic control is effective in reducing diabetic micro vascular complications. DCCT was a trial involving 1,365 type 1 diabetics and normoalbuminuria. After almost 10 years, patients randomized to intensive glucose control had lower incidences of micro albuminuria and macro albuminuria [20]. In UKPDS trial of 3,867 new diabetic type 2 diabetics, patients receiving intensive antidiabetic treatment were found less likely to develop renal failure [21]. In the ADVANCE trial of 11,140 type 2 diabetics, intensive therapy (mean hemoglobin A1c [HbA1c] ≤ 6.5%) also reduced the incidence of nephropathy compared to control group (mean HbA1c 7.3%). Intensive glucose control reduced the risk of ESRD by 65% [22]. In the VADT study of 1,791 type 2 diabetics, intensive glucose control (median HbA1c 6.9%) was associated with less worsening of albuminuria, less progression to macro albuminuria but no significant difference in GFR at 6 years [23]. The results of the present study are in corroboration with all these above findings. In this study, good glycemic control reduced micro albuminuria and decreased the risk of ESRD.

Diabetic peripheral neuropathy affects up to 50% of older type 2 diabetic patients. Whereas some patients may have extremely painful symptoms, others with a more marked neuropathic deficit which may be asymptomatic. Diagnosis requires careful examination of the lower limbs [24]. Management involves establishing the cause to be diabetes instead of more sinister causes and aiming for optimal glycemic control. Medications, usually tricyclic antidepressants, anticonvulsant agents, gabapentin or pregabalin may be required. Patients with peripheral neuropathy must be considered at risk of insensate foot ulceration and must receive preventive education and podiatric care [25]. In the present study, the ulcer was small and minor in all the three cases without any signs of peripheral nerve dysfunction. Hence it was efficiently controlled by antidiabetic treatment, strict diet control and regular dressing. There were complains of paraesthesia and tingling sensation by some elderly patients who were precribed pregabalin or methylcobalamine, 75 to 150 mg per day .The symptoms reduced eventually.

Diabetic retinopathy is subdivided into non proliferative and proliferative stages, either of which may be associated with macular

edema. Visual impairment is the most feared long-term consequence of diabetes [26]. Several comorbid conditions contribute to the problem of loss of vision in diabetes, including hypertensive retinopathy, increased risks of retinal vascular occlusion, cataract formation and glaucoma. However, development of retinopathy in first five years of the disease is very rare [27]. In present study, no case was reported in new diabetic patients in preobese and obese category but 5 patients from preobese elderly age group and 7 from obese group, both old diabetic cases showed mild signs of non-proliferative diabetic retinopathy (NPDR). These patients were taken care of strict glycemic control and started on telmisartan as well as antioxidant and advised to attend ophthalmology OPD. Follow up was done at 6 months interval. No worsening of retinal condition noticed [28].

Conclusion

Diabetes mellitus at present is encountered as an epidemic in India. The morbidity and mortality due to diabetes and its potential complications are enormous, which impose significant healthcare burdens on both the family and society. Constant migration of people from rural to urban areas, the economic boom, and corresponding change in life-style are all contributing to the steady rise of the disease. The disease is chronic and progressive in spite of the treatment. Drug therapy is not satisfactory yet. Hence research is on all over the world to find out the most suitable cost effective medication. As a result of ongoing research, a variety of regimen has come up for diabetes management which again created a problem for the physician of choosing the best suitable one for a particular patient.

The entire antidiabetic prescribed were from the essential drug list and available in this facility of KIMS. With proper evaluation of glycemic status and suitable rational prescription, significant reduction in all the three glycemic parameters i.e. FBS, PPBS, HbA1C, both in new and old diabetic patients, of obese as well as preobese category was noticed starting from third month of post treatment onwards. Hence the antidiabetic medications prescribed in this tertiary care hospital, were effective in improving the glycemic status to near normal. A sluggish but significant reduction seen in SBP, DBP, ACR and Lipid profile (LDL, TG and Cholesterol) in preobese (both old and new diabetic cases) as well as in obese(old cases) category. Amongst obese new cases, only ACR and cholesterol were significantly reduced. Hence along with antidiabetic medications, administration of the other disease specific drugs like antihypertensive, hypolipidemics, antibiotics, multivitamins etc were found quite effective in controlling the respective parameters.

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