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THE COMPARISON OF SIMVASTATIN AND ATORVASTATIN EFFICACY IN LOWERING LIPID PROFILE AND APOLIPOPROTEIN-B OF DIABETIC DYSLIPIDEMIA PATIENT

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ABSTRAK

*Inhibitor HMG-CoA reduktase (Statin) adalah obat penurun lipid yang efektif untuk terapi dislipidemia pada diabetes mellitus tipe 2 (DMT2). Pasien dianjurkan mencapai target low density lipoprotein (LDL) tertentu untuk mencegah terjadinya coronary heart disease (CHD). Namun pengukuran LDL tidak dapat mengukur risiko kardiovaskular secara efektif karena resistensi insulin menyebabkan perubahan metabolisme lipid sehingga ditemukan dominasi partikel atherogenik yang mengandung apolipoprotein-B (apoB). ApoB harus dipertimbangkan sebagai risiko residual, parameter potensial dalam menentukan efektivitas dan capaian terapi untuk meminimalkan risiko CHD. Tujuan penelitian ini adalah untuk membandingkan efektivitas 2 macam statin yang paling sering digunakan, yaitu simvastatin dan atorvastatin, dalam menurunkan profil lipid dan apoB pasien DMT2 dengan dislipidemia. Penelitian observasional kohort digunakan untuk membandingkan efektivitas simvastatin 20 mg/hari (n=11 pasien) dengan atorvastatin 10 mg/hari (n=7 pasien). Pasien yang memenuhi kriteria (LDL >100 mg/dL, TG> 150 mg/dL) mendapatkan terapi statin selama 6 minggu. Untuk mengevalusi efektivitas terapi, dilakukan pengukuran profil lipid (kolesterol total, LDL, trigliserida/ TG) dan apoB pada minggu ke-6. Kelompok simvastatin pada minggu ke-6 menunjukkan penurunan kadar kolesterol total, TG, apoB serta peningkatan kadar LDL secara tidak bermakna (p <0.05). Kelompok atorvastatin menunjukkan peningkatan kolesterol total, LDL, apoB serta penurunan TG secara tidak bermakna (p < 0.05). Tidak dijumpai perbedaan penurunan profil lipid dan apoB yang bermakna dari kedua kelompok terapi antara yang mendapatkan 6 minggu terapi atorvastatin 20 mg/hari dengan simvastatin 10 mg/hari.**(FMI 2013;49:139-145)***

Kata Kunci: *simvastatin, atorvastatin, lipid, apolipoprotein B, diabetes, dislipidemia*

ABSTRACT

*HMG-CoA reductase inhibitors (Statins) are effective lipid-lowering drugs for the treatment of dyslipidemia patients with type 2 diabetes mellitus (T2DM). These patients are suggested to reach targeted level of low density lipoprotein (LDL) for further coronary heart disease (CHD) prevention. Unfortunately LDL measures may not adequately evaluate cardiovascular risk since insulin resistance drives a number of changes in lipid metabolism which apolipoprotein-B(apoB)-containing atherogenic particles predominate. ApoB should be considered as an index of residual risk, a potential parameter of treatment efficacy and a treatment target to minimize risk of CHD. The aim of the study is to compare the efficacy of the two most given statin, simvastatin and atorvastatin, in lowering lipid profile and apoB of T2DM patient with dyslipidemia. We conducted an observational, cohort study to compare the efficacy of simvastatin 20 mg/day (n=11 patients) and atorvastatin 10 mg/day (n=7 patients). Patients who met criteria (LDL >100 mg/dL, TG >150 mg/dL) were given 6 weeks-treatment of statin. To evaluate the efficacy, lipid profile (total cholesterol, LDL, triglycerides/ TG) and apoB were all measured at week 6. Simvastatin therapy was associated at week 6 with an insignificant increase of LDL and insignificant decreases of total cholesterol, TG, and apoB (p>0.05). Atorvastatin therapy showed an insignificant decrease of TG and insignificant increases of total cholesterol, LDL, and apoB and (p>0.05). No significant difference was observed between six weeks-treatment of simvastatin 20 mg/day and atorvastatin 10 mg/day.**(FMI 2013;49:139-145)***

Keywords: *simvastatin, atorvastatin, lipid, apolipoprotein B, diabetes, dyslipidemia*

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INTRODUCTION

Patients with diabetes mellitus (DM) have an increased risk of cardiovascular disease (CVD) 2-4 times greater than the non-diabetic. Dyslipidemia is a major factor underlying the increased risk of CVD and become more atherogenic in DM conditions. DM conditions encountered on insulin resistance underlie abnormalities of lipoprotein metabolism, which is characterized by elevated levels of triglycerides (TG), decreased high-density lipoprotein (HDL) and increased LDL particles that are smaller and dense (Kumar & Singh 2010), (Betteridge 2011). Changes in lipid fractions in diabetic dyslipidemia conditions are dominated by the

atherogenic lipoproteins can effectively be detected by measuring apoB. One molecule of apoB lipoprotein particles found in each (a), LDL, IDL, VLDL, and remnant TRL. From several studies, apoB also proved superior to LDL and non-HDL in predicting cardiovascular risk (Brunzell et al 2008).

This study will compare the effectiveness of two types of statins are widely used in the management of diabetic dyslipidemia, namely simvastatin with atorvastatin. Simvastatin is a statin is first found and is still widely used. While atorvastatin is a synthetic statin newer with active metabolites that provide inhibition of the HMG-CoA reductase which is equivalent to the parent compound. Consequently atorvastatin has a half-barriers against HMG-CoA reductase longer (20-30 hours) and decrease the synthesis of cholesterol greater when compared with simvastatin (Poli 2007). Several clinical studies showed that administration of atorvastatin lowered total cholesterol, LDL, TG greater when compared with simvastatin (Jones et al 1998, Jones et al 2003). This study is to analyze the differences in the effectiveness of simvastatin or atorvastatin therapy in patients with diabetic dyslipidemia, lipid profile measurement will be done routinely performed and apoB. Until now there has been no research in Indonesia, which examines the effectiveness of statin therapy by measuring apoB that has proven much better at detecting atherogenic lipoproteins and is a predictor of cardiovascular events is more superior than LDL or non-HDL.

MATERIAL AND METHODS

This study is an observational study, a prospective cohort conducted within a period of three months ie May to August 2013. The study population was patients with type 2 diabetes with dyslipidemia who seek treatment at one of the private practice physician Internal Medicine Consultant Endocrine, Metabolic, and Diabetes in Surabaya. Data evaluation of lipid profile (total cholesterol, LDL, TG, ApoB), renal function and liver function of patients diagnosed with type 2 diabetes with dyslipidemia therapy simvastatin 20 mg or atorvastatin 10 mg. In this research, consecutive sampling, all patients who met the inclusion criteria were taken as the sample was then divided into 2 groups:the treatment group receiving simvastatin 20 mg and atorvastatin treatment group receiving 10 mg. The desired sample size was 12 patients for each treatment group.

Study inclusion criteria include patients with a diagnosis of type 2 diabetes and dyslipidemia, men and women, aged ≥ 21-65 years, HbA1c levels of 7.0-10.0%, profiles LDL > 100 mg/dL and/or TG > 150 mg/dL, get therapy of simvastatin 20 mg or atorvastatin 10 mg (maximum 1 month of therapy). Exclusion criteria were studies of patients who have increased the value of liver function tests, severe chronic kidney disease to kidney failure, nephrotic syndrome, taking progestin hormone, corticosteroids, and anti- retroviral drug class protease inhibitors, active smokers. The patients get a sample of 20 mg of simvastatin therapy or atorvastatin 10 mg for 6 weeks. After 6 weeks of statin therapy, patients are advised to return the control. Do the results of the evaluation data retrieval statin therapy, including lipid profile (total cholesterol, LDL, TG, ApoB), kidney function, and liver function. Patients were excluded from the study were patients who were non-compliant in taking medication, medication discontinuation for any reason, does not return control to the doctor, and died during the study period.

The method used for the measurement of lipid profile include total cholesterol by an enzymatic colorimetric method (CHOD-PAP), LDL with homogenous method, enzymatic colorimetric (SEKISUI); TG enzymatic colorimetric method (GPO-PAP), while apoB imunoturbidimetry method. In order to know the reduction in lipid profile (total cholesterol, LDL, TG, and apoB) between before and after simvastatin or atorvastatin therapy used paired t- test. The difference as for knowing decrease lipid profile (total cholesterol, LDL, TG, and apoB) between simvastatin and atorvastatin used independent t-test. If the obtained data were not normally distributed then the statistical test used to test and Wilcoxon rank marked on the Mann-Whitney test.

RESULTS

Table 1. Patient Characteristics of Study Sample

Patients Characteristics		Total Patients (N = 18)	
		Sum	%
Gender	Male	7	38.9
	Female	11	61.1
Age Range	> 21 – 40 years	2	11.1
	> 41 – 60 years	10	55.6
	> 61 years	6	33.3
Host disease*	Hypertension	6	33.3
	CHD	2	11.1

*one patient may have> 1 comorbid

This study samples were taken at one of the private practice physician Internal Medicine Consultant Endocrine, Metabolic, and Diabetes in Surabaya. During the study period on May to August 2013. There were 18 patients who met the inclusion criteria. The

characteristics of the overall study sample patients are listed in Table 1.

During the study period, the study subjects were observed on the lipid profile and apoB both before and after therapy of simvastatin or atorvastatin. Here is the data lipid profile (total cholesterol, LDL, TG) are arranged by category NCEP-ATP III and apoB were prepared based on the achievement of therapeutic targets recommended by ADA/ACCA, presented in Table 2 to Table 5.

Tabel 2. Total Cholesterol Levels of Patients Before and After Therapy Simvastatin or atorvastatin

Total LDL level	Number of Patients							
	Simvastatin Category				Atorvastatin Category			
	Before Tx		After Tx		Before Tx		After Tx	
	Sum	%	Sum	%	Sum	%	Sum	%
Desirable (< 200mg/dL)	5	45.5	8	72.7	6	85.7	5	71.4
Borderline high (200-239 mg/dL)	6	54.5	1	9.1	1	14.3	1	14.3
High (≥ 240 mg/dL)	-	-	2	18.2	-	-	1	14.3
Total	11	100	11	100	7	100	7	100

Table 3. LDL Patients Before and After Therapy Simvastatin or Atorvastatin

LDL level	Number of Patients							
	Simvastatin group				Atorvastatin group			
	Before Tx		After Tx		Before Tx		After Tx	
	Sum	%	Sum	%	Sum	%	Sum	%
Optimal (<100 mg/dL)	3	27.3	4	36.4	4	57.1	2	28.6
Near optimal (100 – 129 mg/dL)	7	63.6	4	36.4	3	42.9	3	42.9
Borderline high (130 – 159 mg/dL)	1	9.1	3	27.3	-	-	1	14.3
High (160 – 189 mg/dL)	-	-	-	-	-	-	1	14.3
Very high (≥ 190 mg/dL)	-	-	-	-	-	-	-	-
Total	11	100	11	100	7	100	7	100

Table 4. Levels of Triglyceride Patients Before and After Therapy Simvastatin or atorvastatin

TG Level	Number of Patients							
	Simvastatin group				Atorvastatin group			
	Before Tx		After Tx		Before Tx		After Tx	
	Sum	%	Sum	%	Sum	%	Sum	%
Normal (< 150 mg/dL)	3	27.3	4	36.4	4	57.1	4	57.1
Borderline high (150-199 mg/dL)	3	27.3	3	27.3	1	14.3	2	28.6
High (200-499 mg/dL)	5	45.5	4	36.4	1	14.3	1	14.3
Very high (≥ 500 mg/dL)	-	-	-	-	1	14.3	-	-
Total	11	100	11	100	7	100	7	100

Table 5. Levels of ApoB Patients Before and After Therapy Simvastatin or Atorvastatin

ApoB Level	Number of Patients							
	Simvastatin Group				Atorvastatin Group			
	BeforeTx		After Tx		Before Tx		After Tx	
	Sum	%	Sum	%	Sum	%	Sum	%
< 80 mg/dL	2	18.2	5	45.5	3	42.9	2	28.6
80-90 mg/dL	1	9.1	1	9.1	1	14.3	-	-
> 90 mg/dL	8	72.7	5	45.5	3	42.9	5	71.4
Total	11	100	11	100	7	100	7	100

Tabel 6. Changes in Lipid Profile and ApoB Pre and Post Simvastatin therapy or atorvastatin

Parameters	The average ± SD		Paired t-test significance (p)
	Pre	Post	
Simvastatin			
Total Cholesterol	193.27 ± 23.83 (154-227)	192.82 ± 8.91 (144-286)	0.969
LDL	107.27±14.20 (80-130)	111.36 ± 27.22 (78-159)	0.584
TG	212.09±97.94 (92-393)	172.91 ± 74.32 (85-343)	0.154
apoB	97.55±15.09 (71-122)	96.09 ± 27.91 (70-153)	0.801
Atorvastatin			
Total Cholesterol	172.29 ± 24.92 (138-210)	183.29 ± 46.81 (118-253)	0.608
LDL	98.43 ± 19.93 (75-126)	110.29 ± 37.81 (64-160)	0.368
TG	195.29 ± 150.56 (84-517)	162.14 ± 50.68 (120-257)	0.528
apoB	83.43 ± 15.51 (61-108)	92.86 ± 23.08 (62-122)	0.352

Table 7. Differences and Changes in Lipid Profile with ApoB between Simvastatin atorvastatin therapy

Parameters	Difference (Δ) ± SD		*Independent t-test* significance (p)
	Simvastatin	Atorvastatin	
Total cholesterol	0.45 ± 8.36	-11.00 ± 53.81	0.635
LDL	-4.09 ± 3.95	-11.86 ± 32.22	0.595
TG	39.18 ± 4.33	33.14 ± 131.05	0.916
apoB	1.45 ± 18.61	-9.43 ± 24.73	0.341

Before the comparison of lipid profiles of pre and post treatment, test Kolmogorov-Smirnov normality with Z and obtained samples are normally distributed (P> 0.05). Furthermore, paired t-test to determine whether there is a significant decrease between pre and post-treatment levels of total cholesterol, LDL, TG, and apoB. After 6 weeks of treatment, the simvastatin group gives a decrease in total cholesterol, TG, and ApoB and LDL levels were not statistically significant (P> 0.05). While in the atorvastatin group, found elevated levels of total cholesterol, LDL, and apoB as well as a decrease in TG levels were not statistically significant (P> 0.05). Furthermore, the data changes in the lipid profiles of pre and post treatment were analyzed by independent t-test and found no difference in reduction in total cholesterol, LDL, TG and apoB were significantly between patients receiving simvastatin compared with atorvastatin therapy (P> 0.05).

To find out if there are other variables that affect the lipid profile and apoB study sample, the statistical analysis with the chi square test to determine the effect of age and BMI and the independent t-test to determine the effect of insulin administration. From the results of statistical tests showed that both age (p = 0.633), BMI (p = 0.324), and insulin (p = 0.41) did not give significant effect on lipid profile and apoB (P> 0.05). The statins are well tolerated, generally few significant side effects were observed in clinical trials and post-marketing reports. During the 6 weeks of observation in patients, found no adverse effects of statins, both clinical and laboratory.

DISCUSSION

The data obtained in total cholesterol, LDL, TG, and apoB in the pre and post- treatment conditions as presented in Table 2 to Table 5. The majority of patients in the simvastatin group encountered borderline high cholesterol (54.5%), near optimal LDL levels (63.6%), high TG levels (45.5%), apoB levels > 90 mg/dL (72.7%), the average 40.64 ± 7.46 HDL mg/dL. While in the atorvastatin group the majority of patients found desirable total cholesterol (85.7%), the optimal LDL levels (57.1%), normal TG levels (57.1%), apoB levels > 90 mg/dL (42.9%), the average levels HDL 7:12 ± 42.00 mg/dL. These results are similar to data from other studies that characterize the lipid profile of patients with diabetes as follows, moderately increased TG levels, decreased levels of HDL, and LDL levels are not much different from patients who did not suffer from type 2 diabetes (UKPDS 1997, Jacobs et al 2005).

In addition to routine examination of lipid profiles as has been recommended by the NCEP-ATP III, the diabetic condition with abnormalities of lipoprotein metabolism are also recommended examination of apoB. Under the ADA/ACC, in diabetic patients the target ApoB < 80 mg/dL, LDL < 70 mg/dL if found DM with CVD or ≥ 1 major risk factors (high risk), and the target ApoB < 90 mg/dL, LDL < 100 mg/dL if diabetes found no other major risk factors (high risk). When the target LDL level has been reached, then the next target is the other lipid risk factors, namely TG < 150 mg/dL; HDL > 40 mg/dL in men and > 50 mg/dL in women (NCEP-Expert-Panel 2002, Grundy et al 2004, Brunzell et al 2008, Perkeni 2012, ADA 2013).

Research data show that most patients had high apoB (> 90 mg/dL) LDL levels even though most of the optimal or near optimal. Levels of apoB and non-HDL is generally superior when compared to the levels of LDL in stratifying patients by baseline cardiovascular risk. ApoB is an essential structural component contained in each atherogenic lipoprotein particles that are, such as LDL, VLDL, IDL, TG -rich remnant particles (Harper & Jacobson 2010). When encountered VLDL cholesterol and TG in excess, such as the condition of insulin resistance and type 2 diabetes, and if there is a microsomal TG transfer protein will occur apoB secretion (Ginsberg et al 2005).

From the pathophysiological perspective, patients with type 2 diabetes have problems hepatic lipoprotein remnant clearance of postprandial lipoproteins is thus more likely to enter and trapped in the artery wall (Twickler et al 2005). Though the process of atherogenesis initiation is theorized that the retention of lipoproteins containing apoB. Local biological response to lipoproteins trapped includes chronic and maladaptive inflammatory response dominated by macrophages and T-cells, subsequently led to the development of atherosclerotic lesions (Tabas et al 2007).

Statins are the first-line lipid-lowering drugs in the treatment of dyslipidemia in diabetes. Statins work competitively inhibiting the enzyme HMG-CoA reductase, an enzyme important in the determining step of cholesterol synthesis, resulting in an increase in LDL receptors and decreased hepatic production of apoB - containing lipoproteins (Ginsberg et al 2005, Poli 2007). This study compared the effectiveness of two kinds of equivalent doses of statins are simvastatin 20 mg and atorvastatin 10 mg. Efficacy of atorvastatin in lowering total and LDL cholesterol greater when compared with other statins (except rosuvastatin), it is more due to atorvastatin has an active metabolite with activity equivalent to the parent compound that gives the duration of the barriers to the enzyme HMG-CoA reductase is longer (Roche 2005, Poli 2007). Atorvastatin also reduce levels of TG 13-32%, greater than for simvastatin. The decrease in TG levels primarily due to a decrease in VLDL production as a result of barriers to the synthesis of apoB-100. Increased LDL receptor along with a decrease in the availability of LDL may increase LDL receptor binding capacity of the particles so that they can reduce levels of VLDL TG (Poli 2007).

Simvastatin therapy after 6 weeks found the majority of patients with desirable total cholesterol (72.7%) and optimal LDL (36.4%) as well as near the optimum (36.4%), had encountered patients with normal TG levels (36.4%), and apoB levels > 90 mg/dL decrease (45.5%) and more patients had levels of apoB < 80 mg/dL (45.5%). In the simvastatin treatment group found a decrease in total cholesterol, TG, and apoB were not significant and non-significant increase in LDL statistically (P> 0.05). While in the atorvastatin treatment group met the majority of patients with desirable total cholesterol (71.4%), LDL near optimal (42.9%), normal TG (57.1%), and apoB levels > 90 mg/dL (71.5%). In the atorvastatin treatment group found an increase in total cholesterol, LDL, and apoB and found a non-significant decrease in TG were not statistically significant (P> 0.05) while the ratio of decrease in lipid profile (total cholesterol, LDL, TG) and apoB in the simvastatin 20 mg group therapy with atorvastatin 10 mg showed no statistically significant difference (P> 0.05).

The simvastatin treatment group found a non-significant reduction in apoB, whereas atorvastatin group showed increased levels of apoB were not significant (P> 0.05).

This can be caused by increased levels of larger LDL and decreased levels of TG smaller in the atorvastatin group compared to simvastatin (although the two are not statistically significant). In general, 90% of apoB in the blood found in LDL (Walldius & Jungner 2005). Based on research conducted by Ballantye et al, during statin therapy found that apoB levels correlated well with the levels of LDL (R2 = 0.77-0.81) (Ballantye et al 2012).

Results of research conducted by the research results of different studies or clinical trials that have been there before as the STELLAR study of curves and administration of atorvastatin 10 mg showed a significant reduction in total cholesterol, LDL, and apoB and significantly greater when compared with simvastatin 20 mg (Jones et al 1998, Jones et al 2004). Another multicenter study conducted by Hunninghake et al, conducted comparative effectiveness of simvastatin (40-80 mg) and atorvastatin (20-80 mg) in patients who meet the criteria for metabolic syndrome, one of them is diagnosed with type 2 diabetes and/or use of antidiabetic therapy and/or a fasting blood glucose level ≥ 110 mg/dL. After 36 weeks found a significant reduction of total cholesterol, LDL, non- HDL, TG, and apo B from the two treatment groups. Atorvastatin provide a reduction in TG is slightly larger, but simvastatin provides increased HDL and apo AI were higher than atorvastatin, especially at high doses. However, both simvastatin and atorvastatin had comparable effects in terms of apoB and the status of metabolic syndrome was significantly modified by both. (Hunninghake et al 2005).

The difference of the results can not be separated from some of the drawbacks found in this study. Cause of the limited time only at least study subjects involved, with a large sample of the simvastatin group (n = 11) greater than atorvastatin (n = 7). Small sample size also resulted in a large standard deviation on several variables. In addition, the study also shorter duration (6 weeks) when compared with some of the existing clinical trials. With good therapy compliance, the maximum reduction in LDL and TG, and increased HDL can generally be achieved after 6 weeks of therapy prefix. It is therefore necessary monitoring again after 6-8 weeks of therapy prefix. If the patient requires a dose increase or addition of other drugs to achieve therapeutic goals, the patient should be monitored again after 6-8 weeks of the start of therapy prefix. Such a process should be initiated to achieve the desired therapeutic sasarn (NCEP-ATP III 2002).

The target is to be achieved generally among others, LDL < 100 mg/dL in patients without CVD or LDL < 70 mg/dL in patients with CVD; TG < 150 mg/dL; ApoB < 80 mg/dL. Percentage achievement of targets of LDL, TG, ApoB, LDL and apoB in the simvastatin group, respectively 27.3%, 36.4%, 45.5%, and 27.3%, while in the atorvastatin group respectively by 28.6%, 57.1%, 28.6%, and 28.6%. Based on research conducted by Querton et al, found patients with type 2 diabetes who have risk factors for dyslipidemia is very high, about one-third failed to achieve its target of three kinds of therapy (LDL < 70mg/dL, non-HDL < 100 mg/dL, apoB < 80mg/dL). From these results, the recommended treatment modality is recommended to change their lifestyle and/or lipid-lowering therapies such as fibrates or ezetimibe combination to achieve the therapeutic target (Querton et al 2012).

One of the important things in the management of diabetic patients is the reduction of cardiovascular risk as much as possible. Based on the NCEP-ATP III, the initial phase should be done is to lower LDL and non-HDL with maximum statin dose that can be tolerated as much. Increased residual risk factors such as apoB can be used to determine whether further treatment is necessary after the target LDL and non-HDL achieved. A study of primary prevention, the JUPITER (Justification for the Use of Statins in Prevention: an Intervention Trial Evaluating Rosuvastatin), showed even at baseline conditions encountered LDL and non-HDL are normal, found a significant increase in apoB and statin therapy can reduce cardiovascular events significantly (43%) (Jacobson 2011).

Statins are the most effective drug therapy in reducing apoB. Decreased levels of apoB, particularly with statin therapy, proven to reduce the incidence of CHD in both primary and secondary prevention. However, based on the mechanism of action, statins lower LDL and non-HDL so as to decrease apoB. Statins inhibit an important enzyme in cholesterol synthesis decisive stage (not apoB), cholesterol content of LDL apoB content itself varies while its fixed. Moreover, hepatocyte LDL receptor has a greater affinity to the IDL and LDL particles are larger and richer in cholesterol than smaller particles and cholesterol deficiency. Though the condition of diabetic dyslipidemia, found that smaller LDL and dense. Therefore, if found elevated levels of ApoB then to further reduce cardiovascular risk, may be added other than statin therapy. The most potent drug therapy in reducing apoB levels include niacin, sekuesteran, and ezetimibe (Jacobson 2011).

CONCLUSION

Based on research conducted in diabetics with dyslipidemia who received 6 weeks of therapy simvastatin 20 mg or atorvastatin 10 mg in one private practice physician Internal Medicine Consultant

Endocrine, Metabolic, and Diabetes can be concluded that there is no difference in reduction in lipid profile (total cholesterol, LDL, TG) and apoB were significantly between diabetic dyslipidemia who received atorvastatin therapy with simvastatin therapy.

REFERENCES

American Diabetes Association (ADA) (2013). Standards of medical care in diabetes--2013. Diabetes Care 36, S11-S66

Betteridge DJ (2011). Lipid control in patients with diabetes mellitus. Nature 8, 278-290

Brunzell JD, Davidson M, Furberg CD, Goldberg RB, Howard BV, Stein JH (2008). Lipoprotein management in patients with cardiometabolic risk, Diabetes Care 31, 811-822

Ginsberg HN, Zhang YL, Hernandez-Ono A (2005). Regulation of plasma triglycerides in insulin resistance and diabetes. Archives of Medical Research 36, 232-240

Grundy SM, Cleeman JI, Merz CN, Brewer HB, Clark LT, Hunninghake DB (2004). Implications of recent clinical trials for the national cholesterol education program adult treatment panel III guidelines. Circulation 110, 227-239

Harper CR and Jacobson TA (2010). Using apolipoprotein B to manage dyslipidemic patients: Time for a change. Mayo Clinic Proceedings 85, 440-445

Hunninghake DB, Ballantyne CM, Maccubbin DL, Shah AK, Gumbiner B, Mitchel YB (2003). Comparative effects of simvastatin and atorvastatin in hypercholesterolemic patients with characteristics of metabolic syndrome. Clinical Therapeutics 25, 1670-1686

Jacobs MJ, Kleisli T, Pio JR, Malik S, L'Italien GJ, Chen RS, Wong ND (2005). Prevalence and control of dyslipidemia among persons with diabetes in the United States. Diabetes Res Clin Pract 70, 263-269

Jacobson TA (2011). Opening a new lipid "Apo-thecary": incorporating apo-lipoproteins as potential risk factors and treatment targets to reduce cardiovascular risk. Mayo Clinic Proceedings 86, 762-780

Jones P, Kafonek S, Laurora I, Hunninghake D (1998). Comparative dose efficacy study of atorvastatin versus simvastatin, pravastatin, lovastatin, and fluvastatin in patients with hypercholesterolemia (The CURVES Study). The American Journal of Cardiology 81, 582-587

Jones PH, Davidson MH, Stein EA, Bays HE, McKenney JM, Miller E (2003). Comparison of the efficacy and safety of rosuvastatin versus atorvastatin, simvastatin, and pravastatin across doses (STELLAR* Trial). The American Journal of Cardiology 93, 152-160

Jones PH, Hunninghake DB, Ferdinand KC (2004). Effects of rosuvastatin versus atorvastatin, simvastatin, and pravastatin on non-high-density lipoprotein cholesterol, apolipoproteins, and lipid ratios in patients with hypercholesterolemia: additional results from the STELLAR trial. Clinical Therapeutics 26, 1388-1399

Kumar A and Singh V (2010). Atherogenic dyslipidemia and diabetes mellitus: what's new in the management area? Vascular Health and Risk Management 6, 665-669

NCEP-Expert-Panel (2002). Third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III). Circulation 106, 3143-3421

Perkumpulan Endokrin Indonesia (Perkeni) (2012). Konsensus Pengelolaan Dislipidemia di Indonesia

Poli A (2007). Atorvastatin: pharmacological characteristics and lipid-lowering effects. Drugs 67, 3-15

Querton L, Buysschaert M, Hermans MP (2012). Hypertriglyceridemia and residual dyslipidemia in statin-treated, patients with diabetes at the highest risk for cardiovascular disease and achieving very-low low-density lipoprotein-cholesterol levels. Journal of Clinical Lipidology 6, 434-442

Roche VF (2005). Antihyperlipidemic statin: a self-contained, clinically relevant medicinal chemistry lesson. American Journal of Pharmaceutical Education 69, 546-558

Tabas I, Williams KJ, Borén J (2007). Subendothelial lipoprotein retention as the initiating process in atherosclerosis: update and therapeutic implications. Circulation 116, 1832-1844

Twickler T, Dallinga-Thie GM, Chapman MJ, Cohn JS (2005). Remnant lipoproteins and atherosclerosis. Curr Atheroscler Rep 7, 140-147

United Kingdom Prospective Diabetes Study (UKPDS) (1997). Plasma lipids and lipoproteins at diagnosis of NIDDM by age and sex (UKPDS 27). Diabetes Care 20, 1683-1687