Original Article

Comparative Study of Olmesartan versus Telmisartan, in Patient with Stage I Hypertension

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ABSTRACT

Background: *Hypertension is one of the most common diseases in the world. It is defined as sustained increase in blood pressure ≥ 140/90 mmHg. The risk of both microvascular & microvascular complications including stroke, coronary artery disease, peripheral vascular disease, retinopathy, nephropathy & possibly neuropathy increases with hypertension. Olmesartan medoxomil is a non-peptide angiotensin II receptor antagonist. The drug acts by selectively blocking angiotensin II type 1 receptor. Telmisartan is angiotensin receptor blocker shows high affinity for the angiotensin II type 1 receptors. Objective of the study is to compare the efficacy of Olmesartan and Telmisartan in Patient with stage –I hypertension.*

Materials and methods: *This was a randomized, open label, parallel group, comparative study conducted in 120 patients of Stage I hypertension carried out from January 2021to June 2022. Patients were recruited from the cardiology outpatient department (OPD) of Shaheed Suhrawardy Medical College hospital.*

Results: *In olmesartan group there were 39 male and 21 female patients and in telmisartan group there were 36 male and 24 female patients. Both Olmesartan and Telmisartan are effective in lowering systolic & diastolic BP at different intervals of 2nd, 4th, 8th and 12th week. There was a statistically significant decrease in mean blood glucose level after 12 weeks of treatment in telmisartan group when compared to baseline. Serum total cholesterol, triglycerides, and low density lipoproteins decreased significantly after 12 week treatment with olmesartan and telmisartan.*

Conclusion: *Olmesartan and telmisartan are equally efficacious in reducing DBP. Olmesartan, when compared to telmisartan is more efficacious in reducing SBP. Whereas Telmisartan shows the most favorable effects on FBG and lipid profile.*

Key Words:
Olmesartan, Telmisartan, Hypertension

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Introduction

Hypertension is one of the most common diseases in the world. The term "essentially hypertonia", i.e. essential hypertension, was first quoted by the German physician Frank E in 1911 and continues to be used today [1]. It is defined as sustained increase in blood pressure ≥ 140/90 mm Hg, a criterion that characterizes a group of patients whose risk of hypertension related cardiovascular disease is high enough to merit medical attention.[2] It is associated with marked morbidity, mortality & places a high burden on health care system. The risk of both microvascular & microvascular complications including

stroke, coronary artery disease, peripheral vascular disease, retinopathy, nephropathy & possibly neuropathy increases with hypertension.[3]

The global prevalence of hypertension is projected to increase from 26% in 2000 to 29.2% by 2025 [4], which will be approximately 29% of the world's population. Hypertension is one of the major non-communicable diseases (NCDs) in the world. In 2019 an estimated 17.9 million people died from CVDs, representing 32% of all global deaths, among them 85% were due to heart attack and stroke [5]. Lowering the BP is prime target to prevent organ damage and consequence of hypertension [6]. It was found that every 2 mm Hg decrease in mean SBP results into 7% reduction in the risk of ischemic heart disease mortality, and a 10% reduction in the risk of stroke mortality.[7] Achieving blood pressure (BP) goals is a continuing challenging task.

Increased blood pressure will leads to acute complications like left ventricular failure, ischemic heart disease, cerebral haemorrhage. Delayed complications like atherosclerosis, tunica intimal damage with inflammation lacunars infarcts in brain, cerebral hemorrhage, chronic kidney disease, and decreased NO production [8,9]. To control blood pressure certain group of drugs are used they are alfa blockers, beta blockers, calcium channel blockers, angiotensin converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB).

Healthy life style is mandatory. The life style modifications include weight reduction in overweight or obese patients (BMI<25kg/m2), dietary salt restriction (<6g/d), adopting DASH (Dietary approaches to stop hypertension), eating plan which is rich in fruits, vegetables, low fat dietary products with reduced content of saturated and total fat, moderation in alcohol consumption and mental relaxation techniques, physical activity with brisk walk for 30 mins daily [10, 11].

Olmesartan medoxomil is a non-peptide angiotensin II receptor antagonist. The drug acts by selectively blocking angiotensin II type 1 receptor sites in vascular smooth muscle, thereby inhibiting the vasoconstrictor effects of angiotensin II.[12] It is a pro-drug that is rapidly hydrolyzed into Olmesartan & absorbed from the gastrointestinal tract into the body. The peak plasma concentration reaches in 1to 2 hrs.

Telmisartan angiotensin receptor blocker (ARB) shows high affinity for the angiotensin II type 1 (AT1) receptors. In addition to blocking these receptors, it acts as a selective modulator of peroxisome proliferator-activated receptor gamma (PPAR-γ), a central regulator of insulin and glucose metabolism.[13] Peak plasma levels are obtained 0.5-1 hour after oral administration and the plasma t1/2 is ~24 hours.

Materials and Methods

This was a randomized, open label, parallel group, comparative study conducted in 120 patients of Stage I hypertension carried out from January 2021to June 2022. Patients were recruited from the cardiology outpatient department (OPD) of Shaheed Suhrawardy Medical College hospital. Newly diagnosed patients of Stage I hypertension of either gender with age >18 years, willing to participate, and ready to give written informed consent were included in the study. After taking a thorough history, clinical examination and biochemical investigations patients were randomly allocated to two age and sex matched groups of 60 cases each. Group I patients were started on Olmesartan at a dose of 20mg/d.

Group II patients were put on Telmisartan at a dose of 40 mg/d. Blood pressure was measured in supine and sitting positions at all the visits. Patients fulfilling the inclusion criteria after verifying exclusion criteria were included. Inclusion and exclusion criteria were as follows:

Inclusion criteria

1) Patients with stage I hypertension.

2) Adult male/ female aged 21 years or older and nonpregnant females not planning for conception.

3) Patient should not be on any other antihypertensive medication.

Exclusion criteria

1) Patient with history of hypersensitivity to Olmesartan or Telmisartan.

2) Pregnant / lactating/ women planning to conceive.

3) Patient with history of refractory, secondary or malignant hypertension.

4) Patient with history of renal and hepatic disease.

5) Patient unwilling or unable to comply with the study proceedings to give informed written consent.

6) Patient with history of stroke, myocardial infarction, cerebral

7) Haemorrhage and hypertensive encephalopathy Blood pressure, both systolic and diastolic was recorded by mercury sphygmomanometer and efficacy assessment was done by measuring blood pressure in supine and sitting positions on right arm after 10 min of rest. Blood pressure was measured at baseline and at every 2 weeks for 16 weeks.

Statistical Analysis

Clinical manifestations were expressed with mean ± SD and percentage. Reduction of BP, FBS and lipid profile before and after treatment in each groups the paired unpaired‘t’ test was used. Statistical analysis was performed using SPSS software version 20.

Result

A total of 120 patients of stage 1 hypertension were enrolled from January 2021 to June 2022 from cardiology outpatient department of Shaheed Suhrawardi Medical College Hospital. Patients were divided into two group. Group I patients were on Tab. Olmesartan 20mg tablet and group II patients were put on tab. Telmisartan at a dose of 40mg / day.

Sl. No	Particular	No of patients	Percentage
1	Chest pain	30	25
2	Fatigue	27	22.5
3	Severe headache	22	18.3
4	Difficulty in breathing	20	16.6
5	Confusion	13	10.8
6	Irregular heart beat	15	12.5
7	Vision problems	10	8.3

Table 1: The clinical manifestations of essential hypertensive patients chest pain 30(25%) fatigue 27(22.5%), severe headache 22(18.3%) difficulty in breathing 20(16.6%) confusion13 (10.8%), irregular heart beat 15(12.5%) and vision problem 10(8.3%)

Characteristics	Olmesartan (n=60)	Telmisartan (n=60)	P
Age	46.1±8.60	48.56±9.55	0.56
Gender Men Women	 39 21	 36 24	
DBP	92.07±2.545	92.53±2.345	.469
SBP	147.67±3.407	149.00±2.545	.092
FBGL	89.85±12.60	93.86±11.65	.072
TC	170.6±6.28	185.9±7.68	.06
TG	165.9±7.82	169.8±8.82	.048
HDL	47.5±5.46	48.64±5.27	.061
LDL	125.64±6,05	138.62±5.27	.016

Table 2: Baseline demographic data and clinical characteristics of hypertensive patients in two groups.

Values are expressed as mean (SD). Age in years, BP measured in mmHg and lipid profile in mg/dl. FBGL=-Fasting blood glucose level, TC=Total cholesterol, TG=Triglycerides, HDL=High density lipoprotein, LDL=Low density lipoprotein, DBP=Diastolic blood pressure, SBP=Systolic blood pressure, SD=Standard deviation, BP=Blood pressure

In our study age of the patients were 46.1±9.55 in Olmesartan and Telmisartan group respectively. Male patients were 39 and 36 and female patients were 21 and 24 in Olmesartan and Telmisartan group. Fasting blood sugar were 89.85±12.60 and 93.80±11.65 mg in group-I and group-II. Serum lipid profiles were almost similar in both group.

Drug	Parameters	Baseline	2 weeks	4 weeks	8 weeks	12 weeks
Olmesartan (n=60)	DBP SBP	92.07±2.545 147.67±3.407	86.60±2.415 141.60±2.749	85.20±2.074 135.87±2.029	81.73±2.016 131.60±1.923	80.30±2.175 127.93±2.993
Telmisartan (n=60)	DBP SBP	92.53±2.345 149.00±2.545	89.93±2.258 143.734±3.139	86.33±2.039 136.80±1.789	82.73±1.779 131.67±1.583	81.13±1.008 127.73±3.0
P value		0.469 0.092	0.031 0.007	0.037 0.064	0.046 0.0878	0.113 0.798

Table 3: Comparison of Olmesartan and Telmisartan on the parameters of DBP and SBP at certain period.

In The study of mean value of base line in DPB 92.07(SD±2.545) in olmesartan, 92.53. (SD±2.345) in Telmisartan, P value (P>0.92) is insignificant. similarly the mean value of SBP was 147.67 (SD±3.407)in olmesartan 149(SD±2.545) in Telmisartan and P value was in significant (P>0.08) In the study of 2nd week, the mean value of olmesartan in DBP was 86.60(SD±2.415), 89.93(SD2.258) in Telmisartan and P value was highly significant (P<0.01) In study of SBP mean value of olmesartan was 141.60(SD±2.74), 143.743(SD±3.139) Telmisartan and P value was highly significant (P<0.01) In the 4th week, the mean value of DBP in the olmesartan was 85.20(SD±2.415) 86.33(SD2.029) Telmisartan and P value was highly significant (P<0.01). in SBP mean value of SBP in olmesartan was 135.87(SD±2.074) 136.80 (SD±1.789) Telmisartan and P value was highly significant (P<0.01). In the study of 8th week comparison olmesartan and telmisartan – Mean value of DBP in olmesartan was 81.73(SD±2.016) 82.73 (SD±1.779) and P value was highly significant (P<0.01). In SBP study mean value of olmesartan 131.60(SD±1.923) 131.67 (SD±1.583) P value was highly significant (P<0.01). In the 12th week of the study the mean value of DBP

80.30(SD±2.175) in olmesartan, 81.13 (SD±1.008)

Telmisartan and P value was highly significant (P<0.01). In SBP study the mean value in Olmesartan patients 127.93(SD±2.993) 127.73 (SD±3,0) Telmisartan and P value was highly significant (P<0.01)

Sl. No.	Particular	Olmesartan	Telmisartan
1	Headache	3(5.0%)	-
1	Dizziness	-	2 (3.33%)

Table 4: The study adverse effects were headache 3(5.0%) observed with olmesartan and dizziness 2(3.33%) observed in telmisartan.

Overall, the study drugs were well tolerated. No serious adverse events related to treatment were reported. The percentage of patients experiencing adverse events considered to be related to treatment was 5% in the olmesartan and 3.3% in telmisartan group

Table 5: Comparison of changes in blood glucose and lipid profile from baseline to 12 weeks in treatment groups

Parameters	Olmesartan	Telmisartan	P value
FBGL	2.65±0.53	3.80±.88	.001
TC	12.65±2.25	8.93±2.75	.001
TG	5.65±0.51	8.82±0.91	.001
HDL	0.65±.08	0.92±0.03	.001
LDL	8.10±1.83	15.60±1.82	.001

There was statistically significant decrease in mean blood glucose level (P < 0.001) after 12 weeks of treatment only in telmisartan group which was not seen in olmesartan group when compared to baseline. However, it was observed that serum total cholesterol (TC), triglycerides (TGs), and low density lipoproteins (LDL) decreased significantly after 12 weeks treatment with olmesartan and telmisartan.

Discussion

The principal finding of our study indicates that in patients with Stage I hypertension, treatment with Olmesartan and telmisartan provided significant antihypertensive effect at 2, 4, 8, and 12 weeks. This is consistent with the findings from previous studies. [14,15,16] In our study, there was significant difference in reduction of cuff DBP, between olmesartan and telmisartan. It indicates that olmesartan and telmisartan is more efficacious in reducing cuff DBP. These observations are in line with the findings of previous studies[17] The characteristic effect of telmisartan in decreasing the diastolic BP may be related to its long half-life.[12] The greater efficacy of olmesartan in reducing trough cuff DBP may be related to its relatively long half-life of 12–18 hrs. [14,18]

The long half-life of drug such as olmesartan may minimize the effect of missed or delayed dosing of medication.[19] McMahon et al. reported that a reduction in DBP of 5 mmHg is associated with reductions of at least 21% in the incidence of CHD and at least 34% in the incidence of stroke.[20] However, there was no significant difference in the reduction of cuff DBP between olmesartan and telmisartan group suggesting that both the drugs are equally efficacious in reducing DBP. Arao et al. found no difference between olmesartan and telmisartan group with respect to the antihypertensive effect on the BP.[21] Olmesartan shows high selectivity and strong binding to AT1 receptors while telmisartan has been reported to have a longer residence time on AT1 receptors that contributes to a more sustained antihypertensive effect.[22] In our study, there was significant difference in reduction of SBP between olmesartan and Telmisartan group. Our findings are consistent with findings from previous studies. [23] In our study, telmisartan significantly reduced the FBGLs at 12 weeks which was not seen with Olmesartan.

Previous studies have also shown that telmisartan (40 mg) once daily results in a significant improvement in glucose metabolism in insulin-resistant subjects with improvement in beta-cell function.[24] Blockade of angiotensin II receptor can promote adipocyte differentiation and this may contribute to the antidiabetic effect.[25] However, among ARBs, only telmisartan has blood glucose-lowering effect, indicating that telmisartan has pleiotropic effect on glucose metabolism independent of the angiotensin II receptor antagonist effect.[26] Recently, telmisartan has been shown to function as a partial agonist of peroxisome proliferator-activated receptor-gamma (PPAR-γ) while other ARBs did not have effect on PPAR-γ activity.[24] Many studies have shown that PPAR-γ plays an important role in regulation of carbohydrate and lipid metabolism and that activation of PPAR-γ can improve insulin sensitivity.[27] Results of our study indicated that telmisartan significantly reduced serum TGs and LDL cholesterol. Telmisartan significantly reduced LDL cholesterol when compared with olmesartan. However, the reduction of serum TG is not signif-

icant in telmisartan group when compared with olmesartan group. Telmisartan activates PPAR-γ, which regulates lipid metabolism.

Conclusion

Olmesartan and telmisartan are equally efficacious in reducing DBP. Olmesartan, when compared to telmisartan is more efficacious in reducing SBP. Whereas Telmisartan shows the most favorable effects on FBG and lipid profile. However, long term studies are needed to confirm are this effect.

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