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SCRUTINIZE STUDY OF TWO DIFFERENT BRANDS OF ATORVASTATIN

Research article

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ABSTRACT

Atorvastatin is used in hyperlipidemia; it is an active inhibitor of HMG-CoA reductase. HMG-CoA reductase is a rate-controlling enzyme of mevalonate pathway, which is responsible for cholesterol synthesis. It is available in several different brands in Pakistan. The purpose of the study is to evaluate the difference in stability or effectiveness of the two brands. In order to study comparison between two brands we have checked several Physico-chemical parameters like weight variation, hardness, thickness, friability, disintegration and dissolution. After getting results or statistical evaluation we have found that there is not much difference in results of weight variation, hardness and thickness of both brands but ATORVA-01 is giving more absorption than ATORVA-02 in dissolution test, friability test for both brands also shows that ATORVA-01 is giving more stability after going into friabilator than ATORVA-02. Both drugs belong to multinational company but there is a little difference in their prices i.e. ATORVA-01 is higher in price than ATORVA-02, so ATORVA-02 is more cost effective than Atorva-01. After studying these parameters we have found that both drugs are following the official standards for quality control specified by British and United state Pharmacopoeia BP/USP but ATORVA-01 is more closely related to standard specifications.

Key words: Atorvastatin, Comparative, Physicochemical

INTRODUCTION

Atorvastatin is an oral lipid-lowering agent which is a structural analog of HMG-CoA (3-hydroxy-3-methylglutaryl-coenzyme A) **(Christians, Jacobsen et al., 1998**). Its chemical structure is (M**ason, Walter et al., 2005**);

It is most effectively used

- In reducing LDL **(Arayne, Sultana et al., 2012).**
- Decrease in oxidative stress and vascular inflammation with an increased stability in deformity of arterial wall (artherosclerotic lesion) **(Mishra and Samanta 2012; De Meyer, Grootaert et al., 2015).**
- Used as reductase inhibitor therapy just after heart attack, irrespective of lipid levels.
- Atorvastatin tablets follows following mechanism of action; It inhibits 3-hydroxy-3-methylglutaryl- coenzyme A (HMG-CoA) reductase. HMG-CoA accelerates the conversion of HMG-CoA to mevalonate (an early and rate limiting step in cholesterol biosynthesis **(Alam, Naveed et al., 2018)**.

Atorvastatin is contraindicated in:

- Patients with active liver disease because amino transferase levels may increase 3 times the normal limit. This effect exaggerates hepatic toxicity; medication should be stopped immediately in these patients and in patients whose amino transferase activity is continuously elevated to more than 3 times than normal.
- During pregnancy and breast-feeding.
- Patients having marked increase in kinase activity, associated with generalized pain or weakness in skeletal muscles. If the drug is not stopped, it may lead to renal breakdown (**Dhiman Kumar et al., 2015**).

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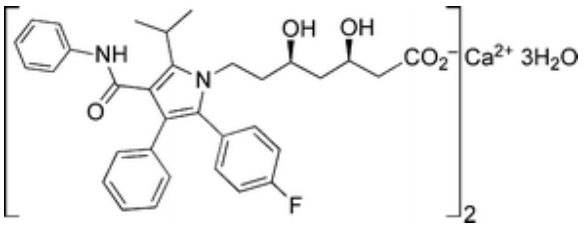

Fig. 1 Structure of atorvastatin calcium **(Sultana, Arayne et al., 2010)**

PARAMETERS	AVAILABILITY
Dose	10-80 mg/d
Absorption	40% to 75%
Extraction	First-pass by liver
Excretion	5%-20% excreted in urine
Plasma half-life	14 hrs

MATERIALS AND METHOD

The considerable use of Atorvastatin requires keeping track of the quality of different brands available in market. The purpose of study is to assess the various physico-chemical parameters of different brands of Atorvastatin (**Akinleye Idris et al., 2012**). Tablets were appraised by the estimation of official and non-official standards like variation in weight, hardness, thickness, friability, disintegration and dissolution with the specifications of USP **(Klancke, 2003**).

MATERIALS

Two contrasting brands of Atorvastatin tablets were acquired from the market in Karachi and examine the Batch number and Manufacturing/Expiry date (**Lennernäs 2003**). Both brands casually marked as ATORVA-01 and ATORVA-02. The labeled active ingredient is 10mg of Atorvastatin **(Yadav Mhaske et al., 2005)**.

METHODS

- **WEIGHT VARIATION TEST**:
  Ten tablets had been taken from both brands and measure the weight one by one by using an Electronic weighing balance (FX-400) and average weight for both brand was performed (**Yadav, Mhaske et al., 2005**) as per official specification and results has been recorded given in table 1 and 2.

- **HARDNESS TEST:**
  Sample of Ten tablets from both brands had been selected and determine the hardness value of each tablet in kg by using Hardness tester (MH-1 Tablet Hardness Tester). Then the average hardness was calculated and results have been recorded (Table 3) **(Ahuja Al-Omairi et al., 2017**).

- **THICKNESS TEST:**
  Ten tablets from both brands has been selected and their thickness was measured by using Vernier caliper. Average thickness of each tablet from both brands was calculated and results have been recorded.

- **DISSOLUTION TEST:**
  The dissolution test had carried out on tablets selected from both brands by using Tablet dissolution apparatus Basket Type (GDT_7L from Galvano Scientific). In this method, we

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make up the volume of 900ml HCL 0.1N dissolution medium in a beaker and equilibrate it at 37˚C. Then place a tablet of both brands in separate beakers and operate the apparatus at 50 rpm on different time interval i.e. 0minute, 15minute, 30minute and 45 minute. Inject 10 ml of a sample at the end at specified time intervals and analyze the sample by using UV visible spectrophotometer at 237nm and note the absorbance of each of withdrawn sample and calculate the concentration of drug in samples as per Atorvastatin dissertation.

- **DISINTEGRATION TEST**

Disintegration Curio apparatus (DS-0702) has been used to perform disintegration test (**Abbas, Hassan et al., 2015**). In these test 5 tablets of both brands has been selected and place them separately in each basket of the apparatus, then put this basket rack in 800ml beaker of water at 37˚C. Run the apparatus and disintegration time had been recorded.

- **FRIABILITY TEST**

Ten tablets from both brands has been selected and taken their initial weight individually then place all ten tablets of each brand in the Friabilator (FB-1004) at 25 rpm for 4min in order to perform friability test then their weight had been taken again and percent of friability has been calculated by the formula.

$$\text{Friability \%} = \frac{(W1-W2)}{W1} \times 100$$

TABLE 1: Statistical weight variation

BRANDS	AVERAGE WEIGHT (gm)	STANDARD DEVIATIION	UPPER LIMIT (X +3S)	LOWER LIMIT (X-3S)
Atorva-01	0.187	0.00175119	0.19245357	0.15787252
Atorva-02	0.151	0.002057507	-0.00350238	-0.004115013

TABLE 2: Weight Variation Chart

BRANDS	RESULT (gm)	BP/USP SPECIFICATION	DEVIATION FROM BP/USP SPECIFICATION
Atorva-01 Atorva-02	0.187 0.151	Deviation should be ±7.5%	Within specified limit

TABLE 3: Hardness Of different Brand

BRANDS	AVERAGE HARDNESS (Kg)	STANDARD DEVIATION	UPPER LIMIT (X+3S)	LOWER LIMIT (X-3S)
Atorva-01	3.755	0.136321	4.16396	-0.2726
Atorva-02	3.773	0.147426	4.21528	-0.2949

TABLE 4: Thickness Test

BRANDS	AVERAGE THICHNESS (mm)	STANDARD DEVIATION	UPPER LIMIT (X+3S)	LOWER LIMIT (X-3S)
Atorva-01	3.557	0.072732	3.7752	-0.1455
Atorva-02	3.484	0.131589	3.87877	-0.2632

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TABLE 5: Absorbance at different time interval at 237 Wavelength

BRANDS	Absorbance in 15min	Absorbance in 30min	Absorbance in 45min	Absorbance in 60min
Atorva-01	0.566	0.531	0.422	0.424
Atorva-02	0.380	0.400	0.397	0.411

TABLE 6: Official limits at 237nm

BRANDS	% Dissolution at 30min	Official Specs.	Deviation limits
Atorva-01	98	Not less than 80%	Within specified limit
Atorva-02	88	Not less than 80%	Within specified limit

TABLE 7: Disintegration time

BRANDS	DISINTEGRATION TIME	LIMITS	RESULT
Atorva-01	1min	Within 3min	Within limits
Atorva-02	10 sec	Within 3min	Within limits

TABLE 8: Friability %

BRANDS	FRIABILITY (%)	LIMITS	RESULT
Atorva-01	0.158	NMT 1%	Within limits
Atorva-02	0.332	NMT 1%	Within limits

RESULTS AND DISCUSSION

The physico-chemical parameters like weight variation, hardness, thickness, friability, dissolution and disintegration have been performed *in vitro* in order to control parameters of two different brands of Atorvastatin 10mg tablets i.e. Atorva-01 and Atorva-02 has been compared with the limits given by IP/USP.

- Weight Variation test has been performed and has found little variation in weights of both brands but in order to calculate whether dispersion of weight is within limits we calculate standard deviation. Both the brands i.e. Atorva-01 and Atorva-02 complies within the official specifications and none of the brands deviate by up to ±7.5 % mean value as shown in Table 1and 2.
- The hardness and Thickness test of both brands has been conducted and found that both brand's hardness and thickness average values lies between 3.91 to 7.85 kg and 0.20 to 0.34mm respectively mentioned in Table 3 and 4 respectively.
- Dissolution test of both brands has been found within official specification of BP and USP, which said that the amount of drug release (Active ingredient) in solution should not be less than 80% of the labeled amount at 30min mentioned in Table 5 and 6.
- Disintegration time is the time taken by the tablets to break up into granules and it should be within 3min. Both the brands had been disintegrated within time limit as shown in Table 7.
- The friability % value should not be more than 1% i.e. official limit and both the brands lies within limit. Atorva-01 has minimum friability i.e. 0.158 and Atorva-02 has maximum friability i.e. 0.332 but both are within limit shown in Table 8.

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CONCLUSION

We have concluded after studying all these parameters for both brands of Atorvastatin that both the brands comply standard limits of official specifications and shows remarkable results.

REFERENCES

Abbas, S. S., F. Hassan, et al. (2015). "Pharmaceutical Equivalent Study of Mefenamic Acid Formulation available in Karachi, Pakistan." RADS Journal of Pharmacy and Pharmaceutical Sciences 3(2): 113-116.

Ahuja, A., S. S. Al-Omairi, et al. (2017). "In-Vitro Pharmaceutical Equivalence Studies for Paracetamol and Atorvastatin Formulations." BAOJ Pharm Sci 3: 045.

Akinleye, M. O., O. Idris, et al. (2012). "Quality of brands of atorvastatin calcium tablets marketed in Lagos, Nigeria."

Alam, S., S. Naveed, et al. (2018). "Comparative Formulation Development of Atorvastatin Calcium Tablets Using Two Different Super Disintegrants." Lat. Am. J. Pharm 37(5): 1028-1034.

Arayne, M. S., N. Sultana, et al. (2012). "Simultaneous LC determination of rosuvastatin, lisinopril, captopril, and enalapril in API, pharmaceutical dosage formulations, and human serum." Medicinal Chemistry Research 21(12): 4542-4548.

Christians, U., W. Jacobsen, et al. (1998). "Metabolism and drug interactions of 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors in transplant patients: are the statins mechanistically similar?" Pharmacology & therapeutics 80(1): 1-34.

De Meyer, G. R., M. O. Grootaert, et al. (2015). "Autophagy in vascular disease." Circulation research 116(3): 468-479.

Dhiman, R., D. Kumar, et al. (2015). "Quantitative Determination of Atorvastatin, Ortho-Hydroxy Atorvastatin, Para-Hydroxy Atorvastatin in Human Plasma Using Rosuvastatin As Internal Standard By LC-MS/MS." Int J Pharma Chemical Sciences 4: 487-500.

Klancke, J. (2003). "Dissolution testing of orally disintegrating tablets." Dissolution technologies 10(2): 6-9.

Lennernäs, H. (2003). "Clinical pharmacokinetics of atorvastatin." Clinical pharmacokinetics 42(13): 1141-1160.

Mason, R. P., M. F. Walter, et al. (2005). "Intermolecular differences of 3-hydroxy-3-methylglutaryl coenzyme a reductase inhibitors contribute to distinct pharmacologic and pleiotropic actions." The American journal of cardiology 96(5): 11-23.

Mishra, P. and L. Samanta (2012). "Oxidative stress and heart failure in altered thyroid states." The Scientific World Journal 2012.

Sultana, N., M. S. Arayne, et al. (2010). "Simultaneous determination of prazosin, atorvastatin, rosuvastatin and simvastatin in API, dosage formulations and human serum by RP-HPLC." Journal of the Chinese Chemical Society 57(6): 1286-1292.

Yadav, S. S., D. V. Mhaske, et al. (2005). "A Simple And Sensitive HPTLC For The Determination Of Content Uniformity Of Atorvastatin Calcium Tablets." Indian journal of pharmaceutical sciences 67(2): 182.

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