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Review Article

A Review On Method Development And Validation Of Telmisartan

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ABSTRACT

Telmisartan is used for the treatment of hypertension. It is an ACE II receptor antagonist. Telmisartan is a potent, long-acting, oral peptide antagonist of the angiotensin II type 1 (AT1) receptor used in the management of hypertension. It selectively inhibits AT1 receptor stimulation by angiotensin II without affecting other receptor systems involved in cardiovascular regulation. The method was validated in terms of linearity, specificity, accuracy and precision, limit of detection (LOD) and limit of quantification (LOQ). The proposed method is simple, sensitive and reliable in terms of reliability and accuracy, and the method is also certain when evaluating commercial formulations without disturbing consumers and other applications. The proposed UV Spectrophotometric method was evaluated in terms of linearity, accuracy, precision, specificity, LOD and LOQ and has been proven suitable and effective for quality control of Telmisartan

INTRODUCTION

Telmisartan is an ACE II receptor antagonist with actions similar to losartan. Telmisartan (TEL) is chemically known as 4 [(1,4-dimethyl-2-propyl(2,6-bi-1H-benzimidazole]-1-yl) methyl][1,1-biphenyl]-2-carboxylic acid (Figure 1). Used in the management of hypertension [1,2]. This drug can be effective for patients who cannot take ACE inhibitors. It works by blocking the binding of angiotensin II to angiotensin II and receptors through selective binding. Angiotensin II is a pressor agent main of the renin-angiotensin system that mediates synthesis, vasoconstriction, and aldosterone, cardiac output. Stimulation of sodium and renal reabsorption [3]. It has the structural formula and given in Fig.-1

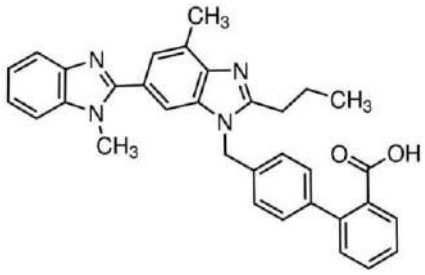

Figure 1: Chemical Structure of Telmisartan

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Diabetes, hypertension and obesity are the most common diseases in this age group. Insulin resistance associated with obesity contributes to the development of cardiovascular risk factors such as dyslipidemia, hypertension, and type 2 diabetes. The risk of type 2 diabetes and hypertension is strongly associated with obesity and central fat distribution [4]. The coexistence of hypertension and diabetes increases the risk of macrovascular and microvascular disease, thus causing cardiac death, heart failure, coronary heart disease, cerebrovascular and peripheral vascular disease, nephropathy and retinopathy [5]. However, achieving and maintaining good glycemic control remains a challenge, suggesting the need for adaptive therapy. Antihypertensive therapy in diabetes reduces cardiovascular mortality and slows the decline of glomerular function [5,6]. Telmisartan is a potent, long-acting, oral peptide antagonist of the angiotensin II type 1 (AT1) receptor used in the management of hypertension. It selectively inhibits AT1 receptor stimulation by angiotensin II without affecting other receptor systems involved in cardiovascular regulation [3]. Recent clinical trials have shown that Telmisartan has a preventive role against ischemic heart disease with diabetes with the same potency as angiotensin-converting enzyme inhibitors. Some recent studies [6] show that the effects of Telmisartan are not limited to blocking ARBs, but also to the activation of the peroxisome proliferator-activated receptor (PPAR-γ), a central regulator of insulin and glucose metabolism. Telmisartan's dual mode of action is believed to provide protective benefits against vascular and renal damage caused by diabetes and cardiovascular disease (CVD) [6].

Table 1: Drug profile (Telmisartan) [7-11]

Summary	Telmisartan is an angiotensin II receptor antagonist (ARB) used to treat hypertension, diabetic nephropathy, and congestive heart failure.
Brand Name	Actelsar Hct, Micardis, Micardis-hct, Pritor, Twynsta
Generic Name	Telmisartan
Chemical Formula	$C_{33}H_{30}N_4O_2$
Molar Mass	514.629 g.mol−1
IUPAC Name	4[(1, 4-dimethyl-2-propyl (2, 6-bi-1H-benzimidazol]-1-yl) methyl] [1, 1- biphenyl]-2-carboxylic acid
Drug Class	Angiotensin II receptor blocker
Indication	Used alone or in combination with other classes of antihypertensives for the treatment of hypertension. Also used in the treatment of diabetic nephropathy in hypertensive patients with type 2 diabetes mellitus, as well as the treatment of congestive heart failure (only in patients who cannot tolerate ACE inhibitors).
Elimination of half life	24 hours
Clearance	Telmisartan has a total plasma clearance of >800 mL/min

MATERIALS AND METHODS [6,12,13]:

Reagents and Materials:

A commercially available solid dosage form of Telmisartan was purchased from the local market. Tri-distilled Milli-Q-water was used throughout this study. In this method, try HPLC-grade acetonitrile, milli-Q-water, analytical-grade phosphoric acid, and ethyl amine.

Chromatographic parameters:

Chromatography was performed on an LC 10 AT vp HPLC instrument (Shimadzu Corporation, Japan) equipped with a SPD-10A vp detector, an SCL-HT Autosampler, and a CTO-AS vp column oven. Data were monitored by LC solution software. Zorbach SB-C18 (150x4.6 mm, 5µ, Agilent Technologies, USA) was used as the

stationary phase. The flow rate was set at 1.2 ml/1 min. An aliquot of 10 µl was used for analysis. The detector was monitored at 234 nm. The temperature of the milk is maintained at 500C. A Sartorius BT 224s analytical balance was used in this research experiment.

Select the mobile phase:

Based on sample resolution, stability and compatibility, different mobile phase compositions were tried to obtain good resolution and sharp peaks. Standard solutions are implemented in different mobile phases. Of the various cell phases tested, the following compositions responded well to the drug solution.

Prepare the buffer solution:

0.5ml of phosphoric acid and 1.0ml of triethylamine are also mixed in 500ml of milled Q-water. Preparation of mobile phase: The mobile phase was prepared by mixing phosphoric acid buffer and acetonitrile in a ratio of 35:65 v/v. The mixture was filtered through a 0.45 µm membrane filter paper and denatured.

Diluent preparation:

The same mobile phase was used as solvent for the preparation of standards and test samples.

Prepare a standard stock solution:

25 mg of standard Telmisartan was accurately weighed, transferred to a 25 ml volumetric flask and initially dissolved in 15 ml of Methanol. This solution is then diluted to a volume of 10ml to obtain a stock solution of 1mg/1ml. A suitable solution is prepared from stock.

Prepare the calibration curve:

0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 ml of standard stock solution (1mg/ml) was transferred to a 10 ml volumetric flask and labeled with the mobile phase to obtain a concentration of 10, 20, 30 done. 40, 50 and 60µg/ml. The determined standard solution was prepared by transferring 3 ml of Telmisartan standard solution to a 10 ml volumetric flask and recorded using the mobile phase to obtain 30 µg/ml of Telmisartan.

Sample Preparation (Tablets):

One Telmisartan tablet was taken and its weight was recorded. Put the tablet in an Agate mortar and weigh it equal to 10 mg of Telmisartan (about 59.5 mg). Transfer to a 10ml volumetric flask and add 5ml of the solution. The bottle was shaken for 15 minutes and diluted to the mark. This solution is then filtered through a 0.45 micron membrane filter and sucked. 3ml of this stock solution was transferred to a 10ml volumetric flask and labeled with the mobile phase..

METHOD DEVELOPMENT:

To develop a simple and stable RP-HPLC method for the determination of telmisartan, several exploratory experiments were carried out with different salts, acid buffers and mobile phase compositions [13,14].

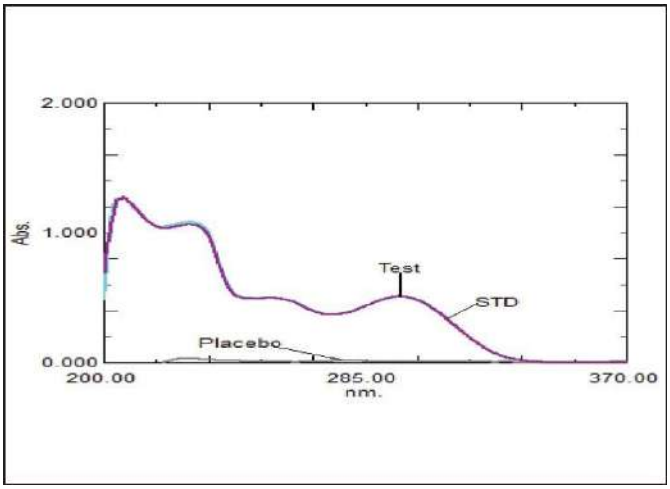

Figure 2: A typical UV Chromatogram Showing Telmisartan at 298 nm

METHOD VALIDATION [14-24]:

The method was validated in terms of linearity, specificity, accuracy, and precision, limit of detection (LOD) and limit of quantitation (LOQ).

Linearity and Calibration standards:

Five different concentrations of a mixture of all three drugs were prepared for linearity studies. The response was measured as peak area. The calibration curve obtained by plotting peak area against concentration showed linearity in the concentration range of 10-50 µg mL-1 of Telmisartan.

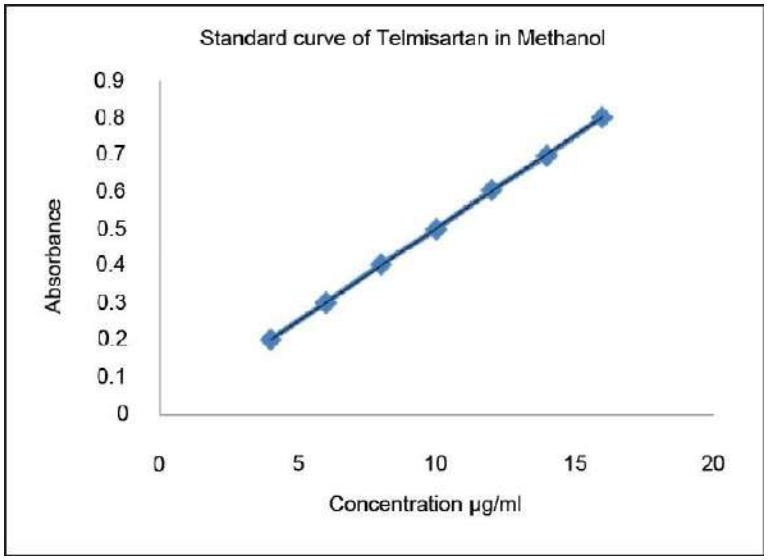

Figure 3: Linearity graph of Telmisartan

Precision:

Daily precision was determined by analyzing samples five times on the same day. A standard solution of telmisartan at 30 µg mL-1 was injected into the chromatographic system, the peak area was determined and the %RSD was calculated. Day-to-day precision is determined by analyzing samples on five different days. A standard solution of telmisartan at 30 µg mL-1 was injected into the chromatographic system, the peak area was determined and the %RSD was calculated.

Accuracy:

For the accuracy of the proposed method, recovery studies were conducted using the standard additive method at five different levels. A certain amount of pure medicine added to the tablet powder was previously analyzed and the sample was analyzed by the proposed method [6].

Recovery:

The accuracy of this method is checked by spraying the sample with a reference compound. Telmisartan concentrations of 80%, 100% and 120% were prepared for the target concentration.

Limit of Detection:

The detection limit is the lowest level of an analyte such as Telmisartan at a concentration of 0.46%, which can be determined using a special method under the required test conditions, but cannot be determined quantitatively and calculated by the signal-to-noise ratio. method.

Limit of Quantification:

The limit of the test is the lowest concentration of an analyte such as Telmisartan with a concentration of 0.239% that can be determined with acceptable accuracy and precision when using the required procedure. It is calculated from the signal-to-noise ratio method [9].

Telmisartan imposes reduction properties in API [19,24]:

All solutions in the degradation study were prepared by dissolving 40 mg of Telmisartan API in a small amount of acetonitrile in 5 different 50

ml volumetric flasks and then adding 5 ml of 3% aqueous hydrogen peroxide, 0.1 M aqueous hydrochloric acid and 0.1 M aqueous sodium M. hydroxide solution.. each bottle is spoiled for about 12 hours. After dilution, the solution was neutralized and diluted with the mobile phase to obtain a final concentration of 30 µg mL-1 (Figure 4). The no stress treatment sample (as control) has been evaluated relative to the standard concentration.

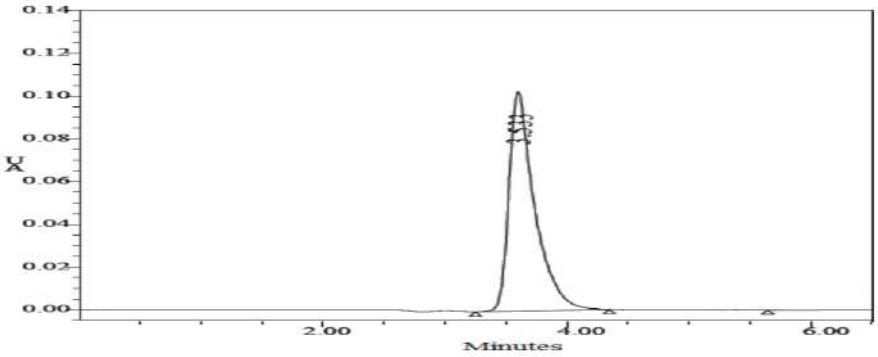

Figure 4: Telmisartan pure drug (API)

CONCLUSION:

The proposed method is simple, sensitive and reliable in terms of reliability and accuracy, and the method is also certain when evaluating commercial formulations without disturbing consumers and other applications. Thus, this method can be used for the continuous determination of Telmisartan in bulk samples and in pharmaceutical manufacturing. The proposed UV Spectrophotometric method was evaluated in terms of linearity, accuracy, precision, specificity, LOD and LOQ and has been proven suitable and effective for quality control of Telmisartan.

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