Validated Area Under Curve UV Spectrophotometric Method for the Determination of Glimepiride in Tablet Formulations

Santosh Karajgi,* Sunayana Mali, Shripad Potdar
Department of Quality Assurance, BLDEA's SSM College of Pharmacy and Research Centre,
Vijayapur 586102, Karnataka, India.
*For Correspondence - santosh.karajgi@gmail.com

Abstract

A novel Area under curve method was developed for the quantification of Glimepiride using analytical grade methanol as solvent. Glimepiride obeys Beer's law in concentration range 20-40 µg/ml in area between 227nm - 233nm.The recovery studies ascertained the accuracy of proposed method and result was validated according to ICH guideline. The result of analysis has been validated statistically by recovery studies. This method was successfully carried out for the estimation of Glimepiride in tablet dosage form without the interference of common excipients.

Keywords: Glimepiride, Area under curve method, Spectrophotometric method, UV determination.

Introduction

Glimepiride is used with a proper diet exercise program to control high blood sugar in people with type 2 diabetes . It may also be used with other diabetes medications. Controlling high blood sugar helps prevent kidney damage, blindness, nerve problems, loss of limbs, and sexual function problems. Proper control of diabetes may also lessen your risk of a heart attack or stroke. Glimepiride belongs to the class of drugs known as sulfonylurea. It lowers blood sugar by causing the release of your body's natural insulin (2).
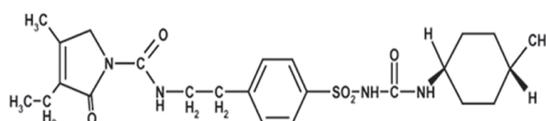
Glimepiride is 1-[[p-[2-[3-ethyl-4-methyl-2-oxo-3-pyrrolinepyrroline-1-carboxamido] ethyl]-phenyl]-sulfonyl]-3-[trans-4-methylcyclohexyl] urea (1)

Review of Literature : Based on the literature survey, it was found that different methods for determination of Glimepiride have been reported. Analysis of Glimepiride by HPLC [3], RP-HPLC method for the determination of Glimepiride [4-7], Estimation by UV spectrophotometric method [8]. However, there is no area under curve found for estimation of Glimepiride. There for a new method was developed and reported.

Materials and Methods

Materials: Shimadzu 1800 spectronic UV Spectrophotometer with 1cm matched quartz cells was used for data collection and analysis. Methanol was used as a solvent for drug substance.

Preparation of standard stock solution: Standard stock solution of Glimepiride was prepared by dissolving accurately weighed quantity of Glimepiride 25mg in 100 ml of methanol and

Current Trends in Biotechnology and Pharmacy
Vol. 11 (4) 376-381 October 2017, ISSN 0973-8916 (Print), 2230-7303 (Online)

377

transferred it to 100ml volumetric flask. Volume was made to the mark with methanol for obtaining stock solution up to 1000µg/ml conc. Further dilution made to get the concentration of 100µg/ml. Dilutions were done to get concentration of 20µg/ml.

Determination of Area Under Curve: The standard solution of Glimepiride (20µg/ml) was scanned in the wavelength from 220 to 250 and absorption maximum was found to be at 230nm. There for, area from 227 to 233nm was selected for the analysis. (Figure 1)

Stability of Drug in Selected Solvent: The stability of drug in selected solvent was determined by measuring the absorbance of the drug solution (20µg/ml) at different time intervals. After every 5 min. of interval the absorbance was measured the solution was found to be stable. (Table 1)

Linearity: From the standard stock solution of Glimepiride, appropriate aliquots were pipette out into 25 ml of volumetric flask & dilutions were made with methanol to produce working standard solution of Glimepiride 20,25,30,35,40 µg/ml. The area under curve of Glimepiride was measured in area between 233 to 227 nm. The calibration plot of the drug Glimepiride was plotted. The concentration range over which the drug followed linearity was chosen as an analytical concentration range i.e. 20 µg/ml to 40µg/ml for Glimepiride. (Table 2 and Figures 2 to 7)

Validation of proposed method : A. Estimation of Drug from Dosage Form (Tablet) (Assay Study) Brand name- GLIMISTAR ◌-1

Standard: From the standard stock solution of Glimepiride, appropriate aliquots were pipette out into 25 ml volumetric flask and dilutions were
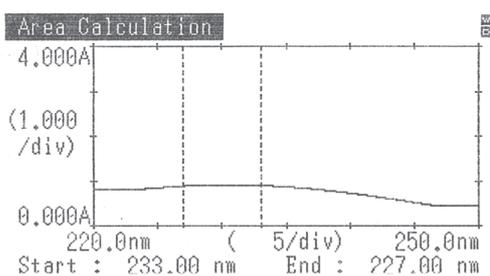

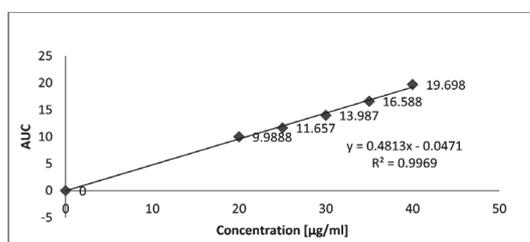**Fig. 1:** Area under curve of Glimepiride in solution of methanol
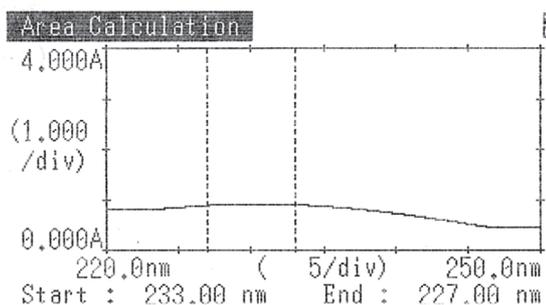

Fig. 2:: Calibration plot for Glimepiride

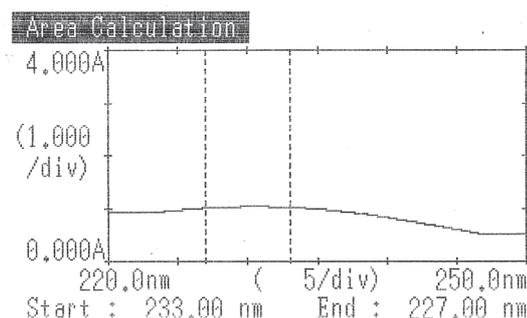**Fig. 3::** Area under curve of Glimepiride 20 µg/ml.

Fig. 4:: Area under curve of Glimepiride 25 µg /ml

Current Trends in Biotechnology and Pharmacy
Vol. 11 (4) 376-381 October 2017, ISSN 0973-8916 (Print), 2230-7303 (Online)
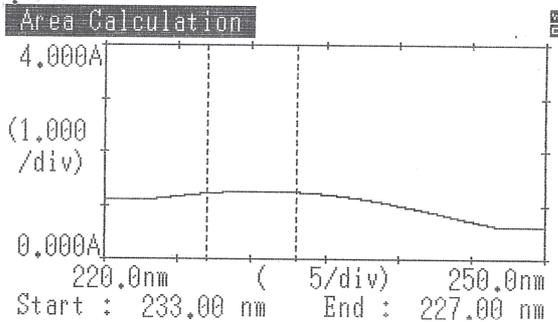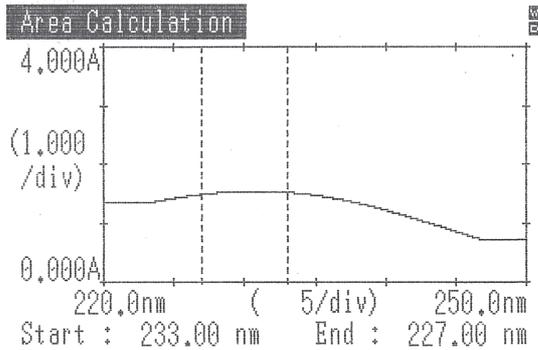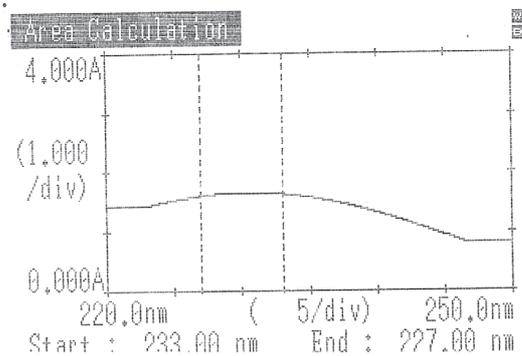
378

Fig. 5:: Area under curve of Glimepiride 30 µg / ml.

Fig. 6:: Area under curve of Glimepiride 35 µg /ml.

Fig. 7:: Area under curve of Glimepiride 40 µg /ml

made with methanol to obtain working standard solution of Glimepiride 40µg/ml. This concentration was scanned between wavelengths of 233nm to 227nm.

Sample: Five tablet contents of brand GLIMISTAR ⁰-1 containing 1 mg of Glimepiride weighed and finally powered with the help of mortar. Each uncoated tablet contains 1 mg of Glimepiride. A quantity of powder sample of equivalent to 5 mg of Glimepiride was taken into volumetric flask. Dilutions were made to get concentration of 40µg/ml. These concentrations were scanned between of 233nm to 227nm. (Table 3)

B. Accuracy (Recovery Study) : Recovery experiments were used for study of accuracy of the method. This study was carried out by adding known amount of bulk sample to tablet and recovery was performed at three levels, 80, 100 and 120% of Glimepiride standard concentration. Samples for recovery studies were prepared according to before mentioned procedure. Three samples were prepared for each recovery level. The solutions of sample were analyzed and %

Table 1: Stability Data for Glimepiride

Sr. No.	Time(min.)	AUC
1	0	9.9838
2	5	9.9888
3	10	9.9995
4	15	10.001
5	20	10.010

Table2: Standard Calibration Table for Glimepiride

Sr. No.	Concentration (µg/ml)	Area Under Curve
1	0	0
2	20	9.9888
3	25	11.657
4	30	13.987
5	35	16.588
6	40	19.698

alidated Area Under Curve UV Spectrophotometric

Current Trends in Biotechnology and Pharmacy
Vol. 11 (4) 376-381 October 2017, ISSN 0973-8916 (Print), 2230-7303 (Online)

379

recoveries were calculated by using fallowing formula.

$$\% \text{ Recovery} = \frac{\text{Observed amount of compound in sample}}{\text{Amount of all compound present in sample}} \times 100$$

The recovery values are summarized in following tables 4.

C. Precision : Four independent samples of Glimepiride were used for the evaluation of precision. The intermediate precision (inter day precision) of the method was also evaluated using four different analysts in the same laboratory. The values obtained by four analysts were summarized in table 6.

Results and Discussion

The standard solutions of Glimepiride in Methanol were subjected to scanning under the area from 227nm to 233nm. For the area under curve method Shimadzu 1800 spectronic UV-Visible spectrophotometer was used. The method is also simple, rapid and economical method which gives reproducible results on the instrument used. The reported method is an economical method in which only Methanol solution is used as the solvent and does not require the use of costly reagents.

The calibration curve of Glimepiride was found to be linear at conc. Range 20 to 40 µg/ml at area between 233to 227 nm. There for, it was clear that Glimepiride can be determined in presence of methanol with no intervention of any irrelevant substance in pharmaceutical products. With the intention of determining the practicability of the developed technique for the assessment of commercially available brand (GLIMISTAR ᵒ-1) of medicinal formulations, the technique was initially

Table 3: Assay for Glimepiride Tablet Formulations

Brand Name	Label Claim (mg/tablet)	Amount Found (mg/tablet)	% of Label Claim	Mean	SD	CV
GLIMISTAR ᵒ-1	1	1.05	105	101.08	0.0311	0.0308
	1	0.99	99			
	1	0.98	98			
	1	1.03	103			
	1	1.04	104			

Table 4: Accuracy parameters of Glimepiride (Brand Name- GLIMISTAR ᵒ-1)

Label % recovery	Amount present (mg/tablet)	Amount of Standard added (mg/tablet)	Amount Recovered (mg/tablet)	Total % recovery	%mean recovery	SD	CV
80	1	80	78.32	97.9	98.58	0.7280	0.0073
80	1	80	79.48	99.35			
80	1	80	78.81	98.51			
100	1	100	99.86	99.86	99.86	0.32	0.0032
100	1	100	99.54	99.54			
100	1	100	100.18	100.18			
120	1	120	120.45	100.37	99.98	0.3453	0.0034
120	1	120	119.64	99.7			
120	1	120	119.87	99.89			

Current Trends in Biotechnology and Pharmacy
Vol. 11 (4) 376-381 October 2017, ISSN 0973-8916 (Print), 2230-7303 (Online)

380

Table 5. Determination of Precision of Glimepiride

Sample Number	Assay of Glimepiride as % of Labelled amount(inter – day precision)			
	Analyst 1	Analyst 2	Analyst 3	Analyst 4
1	99.98	100.08	100.15	99.87
2	100.04	99.89	100.78	99.46
3	99.85	100.20	99.67	100.03
4	99.74	100.09	99.88	100.18
Mean	99.90	100.06	100.12	99.88
SD	0.1342	0.1287	0.4818	0.3103
CV	0.0013	0.0012	0.0048	0.0031

attempted on bulk drugs in their synthetic mixture sample as well as concentrations were estimated.

Then the technique was subjected to the assay of in marketed dosage forms and satisfactory results were attained within the appropriate limits as per the content of the label claim for Glimepiride.

The newly developed method was validated as per the international guidelines and parameters. The novel method for the quantitative investigation of Glimepiride was subjected to different validation parameters like specificity and selectivity in presence of formulation additives and excipients, studied for Linearity and range at different levels of concentrations and calibration standards where the determination range was optimized, accuracy was proved by recovery studies at different concentration levels, precision was established through inter day precision studies, where the samples were subjected to changed conditions other than optimized parameters.

Conclusion

From the above experimental studies it is concluded that area under curve method developed for estimation of Glimepiride was suitable for the routine determination of Glimepiride. The proposed method for the selected drug Glimepiride was found to be precise and accurate. The most important striking features of spectrophotometric methods are their rapidity and simplicity.

The newly developed method is alternative to HPLC methods and zero order UV spectrophotometric methods. Results of validation parameters demonstrate that these performed analytical procedures are suitable for its intended purpose and meet the criteria defined in ICHQ2A/B guidelines.

References

1. Mamdouh, R.R., Safa'a, M.R., Ghada, Y.M. and Abdel-Aziz El Bayoumi Abdel Aleem. (2011). Simultaneous determination of pioglitazone and glimepiride in their pharmaceutical formulations. Der Pharma Chemica, 3 (5): 176-184.

2. http://www.webmd.com/drugs/2/drug-12271/glimepiride

3. Shraddha, P., Gangadhar, M., Rajendra, J., and Yatish, B. (2010). Simultaneous determination of Glimepiride and Metformin hydrochloride impurities in sustained release pharmaceutical drug product by HPLC. Der Pharma Chemica, 2(4): 157-168.

4. Sujatha,S., Sandhya Rani, T., Ciddi Veeresham (2011). Determination of Glimepiride in Rat Serum by RP-HPLC Method. Ame J Anal Chem, 2: 152-157.

5. Nahed, M.E., Amina, A.A., Fathalla, F.B., Yoshinori, I.I. and Mitsuhiro, N.N. (2012). Development and validation of a RP-HPLC method for simultaneous determination of rosiglitazone and glimepiride in combined dosage forms and human plasma. Chem Cent. J, 6(9): 2-10.

6. Gadapa, N. and Upendra M.T. (2013). RP-HPLC Analytical Method Development and Validation for Simultaneous Estimation of Three Drugs: Glimepiride, Pioglitazone, and Metformin and Its Pharmaceutical Dosage Forms. J Chem, 1(2): 1-8.

7. Abdul Bari, M., Krishna, S., Rakesh, G., Prakash, V.D. and Nalini, S. (2014). Development and validation of RP-HPLC method for glimepiride and its application for a novel self-nano emulsifying powder (SNEP) formulation analysis and dissolution study. J Anal Sci Tech, 5(27): 1-8.

8. Sakala, B., Gopisetty, S., Dantu, K.S., Kota, A. and Sreekanth, N. (2013). UV spectrophotometric method for determination of glimepiride in pharmaceutical dosage forms. Int J Pharm Sci Rev Res, 21(2): 131-133.