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Research Article

SPECTROPHOTOMETRIC ESTIMATION OF GLICLAZIDE IN BULK AND PHARMACEUTICAL DOSAGE FORMS

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ABSTRACT
A simple, sensitive and accurate UV spectrophotometric method has been developed for the determination of gliclazide in bulk and pharmaceutical tablet dosage formulations. This method obeys Beer's law in the concentration range of 5 - 30 µg/mL with correlation coefficient of 0.9956 and exhibiting maximum absorption at 224 nm with apparent molar absorptivity of 0.1236×10^3 $Lmol^{-1}cm^{-1}$. The method is accurate and precise and is extended to pharmaceutical tablet dosage forms and there was no interference from any common pharmaceutical additives and excipients. The results of analysis were validated statistically and by recovery studies.

KEYWORDS: Gliclazide, Linearity, Precision, Recovery studies, Correlation coefficient, UV spectrophotometry.

INTRODUCTION
Gliclazide is chemically N-(hexahydrocyclopenta[c]pyrrol-2(1H)-ylcarbamoyl)-4-methylbenzene sulfonamide (Fig 1) used as oral hypoglycemic (Anti-diabetic agent) and is classified as a sulfonyl urea[1]. It is marketed as Diamicron and Dianorm in India. It binds to the beta cell sulfonyl urea receptor. This binding blocks the ATP sensitive potassium channels. This binding results in closure of the channels and leads to a resulting decrease in potassium efflux leads to depolarization of the beta cells. It leads to exo cytosis of insulin containing secretary granules.
The specification for the drug is not official in any pharmacopoeia. A survey of literature has revealed few UV spectrophotometric methods for simultaneous estimation of gliclazide in pharmaceutical formulation[2,3]. Few HPLC determinations are available for the estimation of the drug in human serum[4,5,6,7,8]. There is a need for develop new, simple, economic and rapid method for the estimation of gliclazide alone in bulk and solid dosage forms and can be used for routine analysis.

MATERIALS AND METHODS
Equipment and Reagents
Systronics 2201 double beam UV - visible spectrophotometer with a matched pair of 10mm quartz cells are used for experimental purpose. Freshly prepared 0.1N NaOH (Merck-AR grade) is used. The commercially available two brands containing Gliclazide 80 mg have procured from local market.
Preparation of standard stock solution
Accurately weighed 100 mg of gliclazide pure drug taken in separate 100 mL volumetric flask and dissolved with 70 mL of 0.1 N NaoH and shaken for 30 min and then diluted with 0.1 N NaoH to get 1mg / mL standard stock solution.
Construction of calibration curve
Aliquots of standard stock solution were pipetted out and suitably diluted with 0.1 N NaoH to get the final concentration of 5-30 µg/mL. The solution was scanned in the spectrum mode from 400 nm - 200 nm wavelength range and a sharp peak was obtained at 224 nm (Fig 2). Calibration curve (Fig 3) was

constructed by plotting the absorbance against the concentration and regression equation was computed. The results for linearity study were tabulated (Table 1).

Analysis of formulation

For the estimation of gliclazide from tablets, 20 tablets were weighed separately and their average weight was calculated. Tablets were then crushed separately in motar and pestle and passed through fine sieve separately. A portion of the powder equivalent to 100mg of the drug was accurately weighed and transferred to separate 100 mL volumetric flasks. The drug was dissolved by adding 70 mL of 0.1 N NaOH to the volumetric flask with constant stirring for 15-20 min on a magnetic stirrer. Volumes were made up to the mark with 0.1 N NaOH. Sample solution of 10 ml transferred to 100 mL volumetric flask and diluted up to the mark with 0.1 N NaoH and diluted the supernatant sample solutions to get the concentration of 5-30 µg/mL of gliclazide. Evaluation was performed with double beam spectrophotometer for gliclazide at 224 nm (Table 2).

Validation of proposed method[9,10]

Accuracy of the method was determined by the recovery studies in the tablets formulations of the gliclazide. Recovery studies were carried out by addition of known quantities of standard drug to pre-analyzed sample at three different concentrations. Also the experiment was repeated six times in a day to determine intra-day precision and on six different days to determine inter-day precision. The percentage relative standard deviation was calculated at each concentration level. The values of method validation were given in Table 3.

RESULTS AND DISCUSSION

Beer's law is obeyed over the concentration range of 5-30 µg/mL, using regression analysis the linear equation Y = 0.03564x-0.0114 with correlation coefficient of R^2= 0.9956. The sandell's sensitivity and molar absorptivity were fond to be 0.06817 µg/cm²/0.001 and 0.1236 x 10^{3} L mol^{-1} cm^{-1} respectively. The detection limit or LOD is the lowest amount of an analyte in a sample that can be detected, but not necessarily quantified, under the stated experimental conditions. Based on the standard deviation of the response of Y-intercept and slope, the detection limit may be expressed as DL=3.3σ/S. The limit of detection for gliclazide was found to be 0.108 µg/mL. Quantization limit or LOQ is the lowest amount of analyte in a sample that can be determined with acceptable precision and accuracy under the stated experimental conditions. Based on the standard deviation of the response of Y-intercept and slope, the quantization limit may be expressed as QL=10 σ/S. The limit of quantization for gliclazide was found to be 0.328 µg/mL.

Method was validated in terms of accuracy and precision. The accuracy of the method was proved by performing recovery studies in the commercially available formulations. Values greater than 99% indicate that proposed method is accurate for the analysis of drug and there is no interference from the excipients present in the formulations. The precision of the method was checked in terms of Inter-day and Intra-day, where methods were repeated on six different day and also repeated on six different time periods in same day. The results were given in Table 3 and shows % RSD of less than 1% at each level clearly indicate that the method is precise enough for the analysis of the drug.

CONCLUSION

In the above developed method, there was no additional extraction or separation procedure to extract the active ingredient from the formulation. The error in quantifications can be decreased by the elimination of this procedure. Hence, the developed method is, simple, accurate, sensitive and economical for the routine estimation of gliclazide in bulk drug and its pharmaceutical formulations.

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Table 1: Optical Parameters for Gliclazide

S.No	Parameters	Data
1	λ – Max	224 nm
2	Linearity	5-30 µg/ml
3	Regression equation	Y =0.0352X-0.0044
4	Correlation coefficient	R^2 = 0.9987
5	Slope	0.0352
6	Intercept	0.0044
7	LOD	0.108 µg/ml
8	LOQ	0.328 µg/ml
9	Sandell's sensitivity	0.06817 µg/cm²/0.001
10	Molar absorptivity	0.1236 x 10^3 L mol^{-1} cm^{-1}

Table 2: Results of analysis of Gliclazide in pharmaceutical formulation

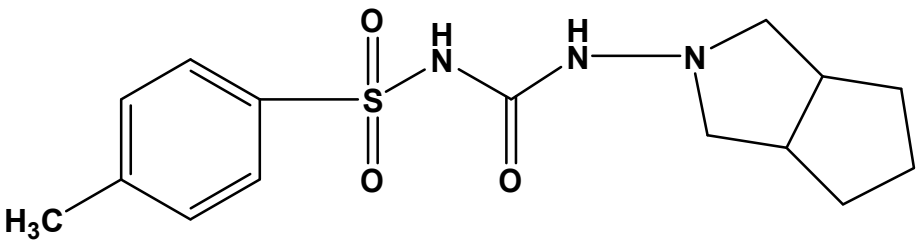
S.No	Drug	Amount found (mg/tab)	% Label claim(%)	S.D*	%RSD*	S.E*	95 % CI	
							Lower	Upper
1	Gliclazide Tablets 80 mg	80.26	100.32	0.5916	0.5890	0.2415	99.82	101.06
2		79.98	99.97					
3		79.85	99.81					
4		80.18	100.22					
5		80.86	101.07					
6		81.01	101.26					

*(n=6), S.D = Standard Deviation, %RSD = Percentage relative Standard Devaition, S.E = Standard Error, C.I = Confidence Interval.

Table 3: Validation data for proposed method

S.No	Formulation	Amount of std drug added (mg)	% Recovery*		%RSD	
			Intra-day	Inter-day	Intra-day	Inter-day
1	Brand A	10 mg 20 mg 30 mg	99.85 100.28 99.49	100.08 99.85 101.46	0.5716 1.2754 0.9853	0.8421 0.5762 1.2050
2	Brand B	10 mg 20 mg 30 mg	101.28 99.57 100.01	100.75 99.75 99.76	0.6485 0.8769 0.7485	1.2010 0.4789 0.6824

*(n=6)



N-(hexahydrocyclopenta[c]pyrrol-2(1H)-ylcarbamoyl)-4-methylbenzenesulfonamide

Fig 1: Chemical structure of Gliclazide

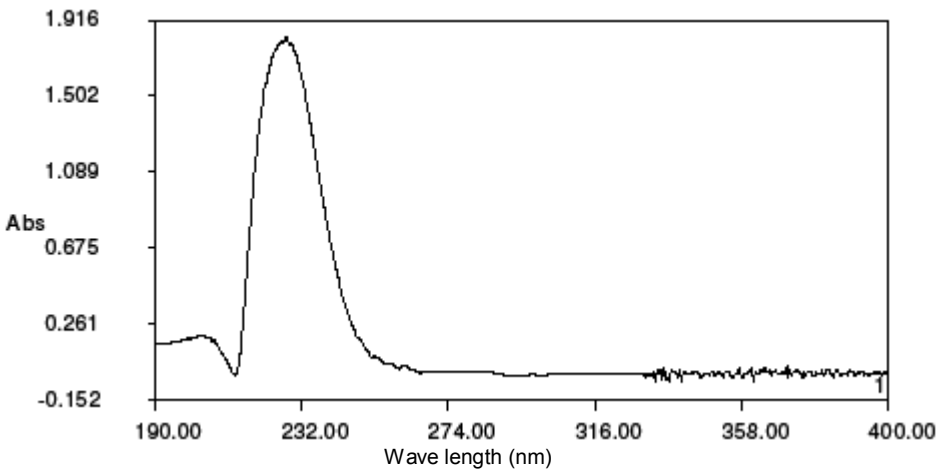


Fig 2: λ max graph for Gliclazide pure drug

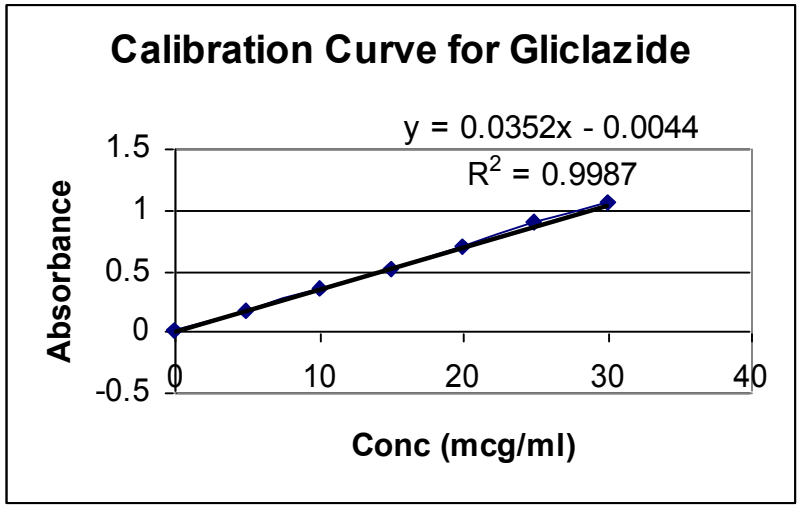


Fig 3: Calibration curve for Gliclazide

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