Research Paper

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A UV-Visible Spectrophotometric Determination of atenolol in Pharmaceutical Formulations

Chemistry

KEYWORDS : Ultraviolet-Visible Spectrophotometry, atenolol, 2,3-dichloro-5,6-dicyano-p-benzoquinone, (DDQ), Formulations

Nagaraja Setty K — Lecturer in Chemistry, Government College for Men, Kurnool.

Chakravarthi I. E — Professor in Chemistry, Rayalaseema University, Kurnool.

ABSTRACT

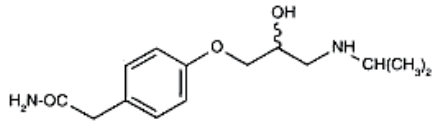
A simple, accurate, rapid and sensitive spectrophotometric method has been developed for the determination of atenolol in pharmaceutical dosage forms. In this method 2,3-dichloro-5,6-dicyano-p-benzoquinone (DDQ) was utilized for determination of atenolol forming charge transfer complex with maximum absorbance at λmax 405 nm. Optimization of the reaction conditions has been investigated. Obediance to Beer's law permitted the assay of atenolol in their dosage form. Statistical analysis of the obtained results showed no significant difference between the proposed method and other official and reported methods as evident from the t-test. The proposed method is simple, rapid accurate, precise, reproducible, and economic and can be used for routine quantitative analysis of atenolol in pure and tablet dosage form.

INTRODUCTION

Generic Name:atenolol

Brand Name: Tenormin

Atenolol,chemically known as 4-(2-hydroxy-3-isopropylamino propoxy)phenyl acetamide is a cardio selective adrenorreceptor antagonistic drug used for anti angina treatment to relieve symptoms,improve tolerance and as an anti arrhythemic to help regulate heart beat and infections.It is also used in management alcohol withdrawal in anxity states ,migrane,prophylaxis.hypertension and tremors. Literature survey reveals that, several spectrophotometric method1-3TLC- densitometry4, UV spectrophotometric and HPLC-DAD methods5, HPLC method6-8 High Performance Thin Layer Chromatography –Densitometry9, have been reported for the estimation of atenolol in pharmaceutical formulations. AFew analytical methods were reported in literature for the determination of atenolol and other combination drugs which include spectrophotometric method10-16, Spectrophotometric and spectrofluorimetric method17.



Molecular Structure of ATENOLOL

MATERIALS AND METHODS

All absorbance measurements were made on a Spectronic 1001 plus spectrophotometer (Milton Roy Company, USA) with 1 cm matched quartz cells**.** Glasswares used in each procedure were soaked overnight in a mixture of chromic acid and sulphuric acid rinsed thoroughly with double distilled water and dried in hot air oven.

Chemicals and Reagents

All the solutions were freshly prepared. All solvents and other chemicals used through this study were of analytical grade. 2,3-dichloro 5,6-dicyano-p-benzoquinone(DDQ; Merck, Schuchardt, Munich, Germany) solution(0.1%) solution was freshly prepared in methanol and it was prepared a fresh daily.

Preparation of standard stock solution

A standard stock solution containing 1 mg/ml was prepared by dissolving 100 mg of atenolol in 100 ml of distilled water. From this, a working standard solution containing 100 µg/ml was prepared for the proposed method.

Assay procedure

Aliquots of standard drug solution of atenolol 0.2-1.0 ml were transferred into a series of 10 ml calibration flasks. To each flask 1.0 ml of the DDQ solution was added, and the reaction was allowed to proceed at room temperature (25±5oC). The reaction was achieved instantaneously. The solutions were diluted up to the mark of the calibration flask with methanol. The absorbance of the resulting solutions was measured at the wavelengths of maximum absorption 405 nm against reagent blanks treated similarly. Beer's law was obeyed in the concentration of 20-100 µg/ml of atenolol. Calibration curve was plotted from absorbance values against concentration of drug (Figure 1).

Preparation of sample solution

Twenty tablets of atenolol were accurately weighed and powdered. Tablet powder equivalent to 100 mg of atenolol was dissolved in 50 ml of methanol, shaked for 15 minutes, filtered and washed with methanol. The filtrate and washings were combined and the final volume was made to 100 ml with methanol. The solution was suitably diluted and analyzed as given under the assay procedure for bulk samples. The results are represented in Table 2.

RESULTS AND DISCUSSION

The method was based on the charge transfer reactions of atenolol as *n*-electron donor with acceptor, 2,5-dichloro-3,6-dihydroxy-1,4-benzoquinone. The absorbance of the highly intensive coloured solution was measured at 405 nm against reagent blank treated similarly. The conditions required for the formation of colored complexes were optimized. Statistical analysis was carried out and the results were found to be satisfactory. The optical characteristics such as absorption maxima, Beer's Law limits, molar absorbtivities and Sandell's sensitivity are presented in Table 1. The regression analysis using the method of least squares was made for slope (b), intercept (a) and correlation obtained from different concentrations and the results are summarized in Table 1. The high molar absorbtivities of the resulting colored complexes indicate the high sensitivity of the methods. The percent relative standard deviation, standard deviation and student's 't' test values calculated from the five measurements of atenolol are presented in Table 2. Relative standard deviation values and standard deviation were low that indicate the reproducibility of the proposed methods. In the student's 't' tests, no significant differences were found between the calculated and theoretical values of both the proposed methods at 95% confidence level. This indicated similar precision and accuracy in the analysis of atenolol in its tablets.

CONCLUSION

The proposed methods are simple, sensitive, accurate and economical for the routine estimation of atenolol in bulk and in its tablet dosage form.

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Table No 1: Optical characteristics of proposed method

Statistical parameters proposed method
λ_{max}, nm 405
Beer's law limit, µg/mL 20-100
Molar absorptivity, l mole^{-1} cm^{-1} 3.75x10^{-4}
Sandell's sensitivity 0.4878x10^{-2} (µg cm^{-2} / 0.001 absorbance unit)
Regression equation (Y = a + bC) Y=0.004x+0.002
Slope (b) 0.004
Intercept (a) 0.002
Correlation coefficient (r) 0.999

Y = a+bC, where Y is the absorbance and C concentration in µg / mL

Table No 2: Assay of atenolol in tablet formulations

Tablets	Labeled amount(mg)	*Amount Found (mg)±S.D*	%RSD*	*t value
Tablet 1	100	100.01±0.23	0.1283	0.1742
Tablet 2	100	100.14±0.24	0.2494	1.2533
Tablet 3	100	100.09±0.39	0.3974	0.5059

*Average of five determinations based on label claim

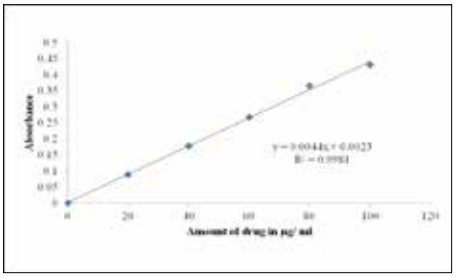

Fig 1: Calibration curve of atenolol

REFERENCE

1. Abdellatef HE. J Pharm Biomed Anal., 2002; 29(5): 835-842. | 2. RajaSekhar K K, Shankarananth V, Sreenivasa Charan A, NagaMall ika L, Narmada D, Padmavathamma M. Journal of Pharmacy Research. 2011,; 4(10):4842-4844. | 3. Rajitha B, Prashanthi S, Ramsubha Reddy K, Tulja Rani, G. International Journal of Pharm Tech Research. 2011;3(1): 114-117. | 4. Sam Solomon WD, Vijai Anand PR, Shukla R, Sivakumar R , Venkatnarayanan R. International Journal of Chem Tech Research. 2010;2(2):1188-1193. | 5. Aysel Kucuk, Yucel Kadıoglu. Il Farmaco, 2005; 60(2):163-169. | 6. Kalra K, Naik S, Jarmal, G and Mishra N. International Journal of Applied Chemistry. 2009: 5(2):73-76. | 7. Yalda HA, Faezeh SH, Aboul-Enein, Alireza. J.Chromatogr. B. 2006, 830(2), 207-211. | 8. Wiwin FK, Tini P, Gunawan I. J. Liq. Chromatogr. Related Tech. 2005; 27, (4): 737-744. | 9. Venkateshwarlu K, Reddy YN, Srisailam K, Rajkumar V, Pai MG. CurrentTrends in Biotech. Pharm. 2008;2(3): 421-425. | 10. Deepali Gharge, Pandurang Dhabale. International Journal of Pharm Tech Research. 2010; 2(2):1119-1123. | 11. Kumar Amit, Nanda Sanju, Chomwal Rajiv. Indian Pharmacist. 2010. 8(11),:85-87. | 12. Vikas Jain, Rajesh Sharma. Stamford Journal of Pharmaceutical Sciences, 2010; 3(1): 28-33.