

A VALIDATED U.V. SPECTROPHOTOMETRIC DETERMINATION OF AN ANTIHYPERTENSIVE DRUG – NEBIVOLOL FROM TABLET FORMULATIONS

Della Grace Thomas Parambi*¹, Dr. Sr. Molly Mathew², Anila Jose³, Dr. K.G. Revikumar⁴

¹ Dept. of Pharmaceutical Analysis, Amrita School of Pharmacy, Amrita Viswavidyapeetham University, AIMS Health Care Campus, AIMS, Ponekkara (P.O.), Kochi, Kerala, India – 682041

² Principal, Malik Deenar College of Pharmacy, Kasaragod, 671321

³ Amrita School of Pharmacy, Amrita Viswavidyapeetham University, AIMS Health Care Campus, AIMS, Ponekkara (P.O.), Kochi, Kerala, India – 682041

⁴ Principal, Amrita School of Pharmacy, Amrita Viswavidyapeetham University, AIMS Health Care Campus, AIMS, Ponekkara (P.O.), Kochi, Kerala, India – 682041

*Email: dellajesto@gmail.com

ABSTRACT

Simple, sensitive and specific spectrophotometric method was developed and validated for quantification of nebivolol in tablet dosage form. Drug showed the absorption maxima in THF at 301nm and was linear for a range of 5-60mcg/ml with a correlation coefficient of 0.9999. The validation of the above method was done by carrying out precision and accuracy studies. The limit of detection and Limit of Quantification for nebivolol was found to be 0.82mcg/ml and 2.76mcg/ml. The percentage recovery was found to be 99.3% and showed good repeatability with relative standard deviation less than 2. So, the proposed method can be applied for the routine analysis of nebivolol from formulations.

Keywords: Spectrophotometric estimation, Nebivolol, THF.

INTRODUCTION

Nebivolol is a beta blocker¹ used to treat high blood pressure with the IUPAC name² 1-(6-fluoro-3,4-dihydro-2H-1-benzopyran-2-yl)-2-[[2-(6-fluoro-3,4-dihydro-2H-1-benzopyran-2-yl)-2-hydroxyethyl]amino]etha-1-ol. It is not official in any pharmacopoeia. Literature survey reveals many analytical methods including HPLC³, HPTLC⁴, UV spectrophotometry⁵. No simple, sensitive work has been reported for the estimation of Nebivolol in tablets. Hence, the present work was an attempt to develop accurate, simple and sensitive and less expensive method for the estimation of Nebivolol in tablets.

MATERIALS AND METHODS

Instrumentation and Materials:

A U.V. visible double beam spectrophotometer 2201 systronics with 1cm U.V. matched quartz cells were used. Nebivolol(RS) was a gift from Torrent Pharmaceuticals, Ahmedabad. Tetrahydrofuran used was of analytical grade purchased from Ranken Laboratories, Newdelhi.

Study of Spectral Characteristics of Nebivolol:

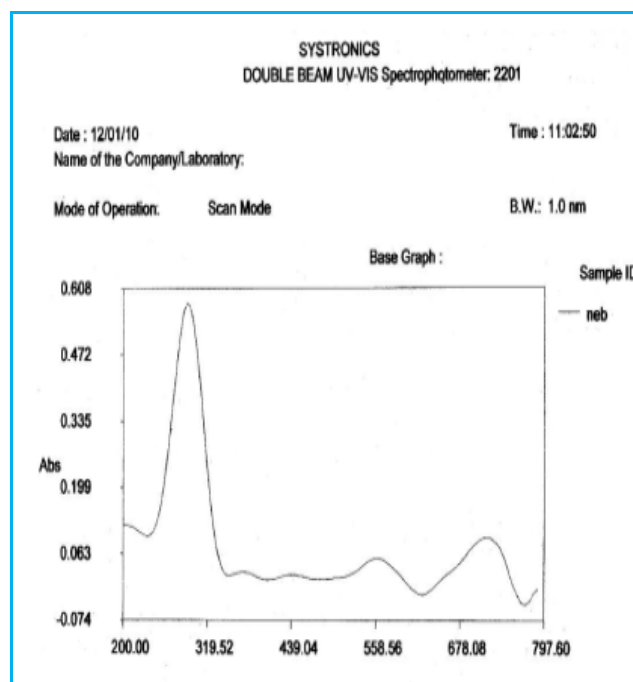
Solubility of Nebivolol was checked in different analytical solvents and the drug gave good spectral characters with the solvent THF. A good spectrum of λ_{max} 301nm was observed which was taken as the λ_{max} for further studies (Figure 1).

Preparation of Standard stock Solution:

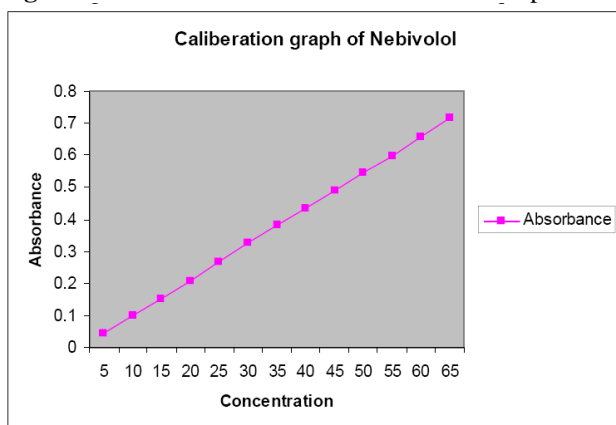
Weighed accurately 100mg of Nebivolol (RS) and transferred to 100ml volumetric flask. It was dissolved in THF (Ar) grade and made up the volume to get a

concentration of 1mg/ml. The absorbance of each solution was scanned at 301nm with THF as the blank. Nebivolol showed a linearity between the range of 5-65mcg/ml. Statistical evaluation of the calibration plot was done and it is shown in figure no. 2

Figure 1: A good spectrum of THF at λ_{max} 301nm.



The statistical evaluation of the calibration plot has been done using the principle of least squares using the equation $Y = 0.011152 X - 0.01192$ and statistical parameters are given in table no.1.

Figure 2: Statistical evaluation of the calibration plot.**Table 1:** Statistical parameters of the calibration plot

Statistical parameters	Observed value
The co-relation coefficient	0.999915
Standard deviation	0.217166
Variance	0.047161
Standard error	0.002961
R ²	0.99983

Table 2: Result of tablet analysis

Brand of Drug	Label Claim	Amount of Drug Estimated	Percentage Label Claim	Standard Deviation
Nebicard	5mg	4.89mg	97.80%	0.02
Nebicip	5mg	4.92mg	98.40%	0.05

Table 3: Result of recovery studies

Brand of Drug	Label Claim	Amount of Pure Drug Added	Percentage Recovery*	Standard Deviation
Nebicard	5mg	50mg	99.37%	0.29
Nebicip	5mg	50mg	99.25%	0.18

*Mean of 3 determinations

Precision:

The reproducibility of the proposed method were determined by performing the tablet assay at different time intervals on the same day (intra-day assay precision) and on three different days (inter-day assay precision). The results of intra-day and inter-day precisions were expressed in %RSD. The %RSD for intra-day assay precision was found to be 0.4 and inter-day assay precision was found to be 0.6.

Limit of Detection and Limit of Quantitation:

The LOD and LOQ were determined based on the standard deviation of the y-intercept and the slope of the calibration curves. LOD and LOQ for Nebivolol were found to be 0.82mcg/ml and 2.76 mcg/ml respectively.

Linearity:

The linearity of the analytical procedure is its ability to obtain the best results which is directly proportional to the concentration of analyte in the sample. The calibration

Assay of Nebivolol in dosage forms:

20 tablets (NEBICARD & NEBICIP) both 5 mg were accurately weighed and average weight of the tablets were calculated. Weight equivalent to 100mg was transferred to 100ml volumetric flask and made up to volume with THF and sonicated for 15minutes. The solution was mixed and centrifuged for excipients to settle down. The resultant 1mg/ml of the solution was further diluted to get a concentration of 100mcg/ml. Accurately pipetted out 1, 1.5 and 2ml of the above solution into three 10ml standard flasks and the volumes were made up using THF. This gave sample solution having concentration 10, 15, and 20mcg/ml. The absorbance of each concentration was measured and the results of analysis of tablet formulations were shown in table No. 2

Validation^{6,7}:

The methods were validated with respect to linearity, accuracy, precision and LOD and LOQ.

Accuracy:

To study the accuracy of the proposed methods, recovery studies were carried out by adding a known amount of drug to the pre analysed tablet powder and percentage recoveries were calculated. The result of recovery studies were satisfactory and are presented in table no 3.

curve of Nebivolol by the proposed method was found to be linear of the range of 5-60mcg/ml.

RESULTS AND DISCUSSION

The method discussed in the present work provides a simple, accurate, economical and convenient method for the analysis of Nebivolol using U.V. spectrophotometry. λ_{max} selected for quantitation was 301nm. In the developed method, the linearity was observed in the concentration of 5-60mcg/ml. Present label claim for the two brands of Nebivolol at concentrations 5mg was found in the range of 97.8-98.4%. Accuracy of the proposed method was ascertained by recovery studies and the results were expressed as percent recovery and were found in the range of 99.25-99.37%. Values of standard deviation and coefficient of variance was satisfactorily low indicating the accuracy of both the methods. Intra-day and Inter-day precision studies were carried out by analyzing the tablet powder at different time interval on the same day and on

three different days respectively. Standard deviation and coefficient of variance for Intra-day and Inter-day precision studies was found to be less than 2 indicating precision of the proposed method. Based on the results obtained, it was found that, the proposed methods were accurate, precise, reproducible and economical and can be employed for routine quality control of Nebivolol in tablet dosage forms.

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