Devolepment and vallidation of spectrophotometric Method of analysis for Atenolol in pharmaceutical dosage form

Abstract:

Objective: In this study, a simple, low cost, sensitive, highly accurate and precise ultraviolet spectrophotometric method has been developed and validated for estimation of Atenolol(ATN) in tablets pharmaceutical dosage form, ATN show maximum absorbance at 274 nm in mixture of methanol water 1:9, the methods was linear in the range 0.06-0.2 mg/mL.

Methods: The method obtained with low cost term by using distilled water (DW) as major solvent 99% ATN absorbance showed linearity in the concentration range of 0.06- 0.2 mg/mL with correlation coefficient 0.999, intercept equal to 0.0015, detection limit was found (0.00375mg/mL), quantification limit was (0.03 mg/ml), which proves suitability of proposed method for determination of ATL in pharmaceutical tablets dosage form according to the statistical analysis of the results due to high accuracy and precession .

Results:The relative standard deviations value for accuracy and precisions were less than 0.095 with repeatability value between103.38-100.89.

Conclusions:The developed method is simple, low cost, sensitive, highly accurate and precise and easily can be used for estimation of Atenolol in pharmaceutical dosage form.

Keywords: *Analytical method, Atenolol ATN, UV-spectroscopy.*

Introductions:

ATN (RS-4-(2hydroxy -3(isopropylamino) propoxy) phenyl)acetamide (Bevinakatti et al, 1992) (UK, PDS (1989).ATN is a selective β1 receptor antagonist drug belonging to the group of beta blockers, a class of drugs used primarily in cardiovascular diseases (Agon, et al,1991). Several methods have been reported for the determination of ATN in pharmaceutical dosage forms, include diffuse reflectance spectroscopy, HPLC (Abdussleem, 2010), high performance thin-layer chromatographic (HPTLC) (Mcpolin,2009).Ultra performance liquid chromatography (UPLC), gas chromatography (GC), Nonsuppressed ion chromatography, flourometry, differential scanning calorimetry (DSC) and thermogravimetry (TG), electrophoresis, voltammetry, ion selective electrode- (ISE-) based potentiometry [, atomic absorption spectrometry (AAS), UV-spectrophotometry, visible spectrophotometry and titrimetry (Kudigeet al.2012), (Alla et al 2005), (panthagada et al,2012).Reported UV spectrophotometric methods, have some limitation such as the use of an expensive chemical, indirect determination, poor sensitivity. In the present work simple and sensitive UV spectrophotometric method has been developed and validated for quantitative estimation of Atenolol in tablets dosage form.
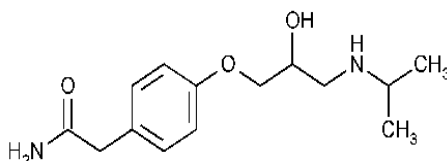
Fig 1: ATN structure obtained from BP2009

Materials and Methods:

Spectrometer, T80 PG, UK, with spectral width of 2 nm, wavelength accuracy of 0.5 nm, pair of 10 mm matched quartz cell was used to measure absorbance of all the solutions. UV Win 5.0 software**,** electronic balance kerns (Germany)**.**

Reagent:

ATN reference standard USP, Mfg. August 2013, Exp. July 2018, and three different brands of ATN tablets 50 mg obtained from local market, DW andMethanol 99.8% (Sharlau, Spain).

Procedure:

Preparation of standard stock solution:

100 mg of ATN standard was weighed and transferred to 100 ml volumetric flasks, dissolved in10 mL methanol. The flasks were shaken and volumes were made up to mark with D.W to give a solution containing 1mg/ml.

Determination of maximum wave length:

An appropriate dilution of standard drug solution With D.W, solution was scanned in the range of 200 – 300 nm to determine the wavelength of maximum absorption for the drug. The absorbance maximum of ATN was found to be 274 nm.

Analysis of ATN tablet:

Twenty tablets of ATN were crushed thoroughly in a mortar, accurately weighted amount equivalent to 100 mg, and then was transferred to 100 mL volumetric flask, and dissolved in 10 mL of methanol and diluted to 100 mL by using D.W, putted in ultra sound bath for 10 minutes, filtered through Whatmanfilter paper 90 mm and diluted quantitatively with D.W to obtain a suitable concentration for the analysis. A convenient aliquot was then subjected to the analysis by using proposed method. The same process repeated for three brands.

Method Validation:

Selectivity:

The study was conducted through UV-absorbance of standard solution, sample solution, Placebo solution and blank to prove that there is no peak interference and the method able to separate Atenolol clearly (ICH, 2005).

Linearity:

The linearity of serial dilutions of the standard drug was prepared in concentrations ranged from 0.2 - 0.06 mg/mL, and the absorbance of each was taken. A linear calibration curve was then obtained at 274 nm with Correlations coefficient R^2 as shown in figure 2.concentrations shown in table (1)

Repeatability:

Accuracy of the method and recovery studies were carried out by one concentrations replicated 9 times as shown in table3. The ICH recommend that repeatability should be assessed using a minimum of nine determinations then RSD of the three replicate are calculated, (ICH, 2005).

Precession:

Three concentration in different days were analyzed for intra and enter day precisions to calculate the recovery% and RSD% .the three selected concentration are (0.07 mg/ml), (0.13 mg/mL) and (0.19 mg/mL, was prepared by Aliquot portions of standard stock solution 7, 13, and 19 mL, taken in100 mL of 3 volumetric flasks, the volume was adjusted to the mark with distilled water to obtain solution of concentration of 0.07, 0.13.and 0.19 mg/mL, respectively.

Robustness:

Robustness study was conducted through changing in maximum wavelength by +/- 2 (ICH, 2005).

Results and Discussion:

ATN has maximum absorbance at 274 nm with linear response to beer Lambert low (fig 2) in the range of 0.06 - 0.2 mg/mL as shown in figure 2.

Table 1: Calibration curve concentration range of 0.2 - 0.06 mg/mL and corresponding absorbance

Absorbance	Concentration mg/mL
0.260	0.06
0.526	0.12
0.605	0.14
0.712	0.16
0.874	0.2
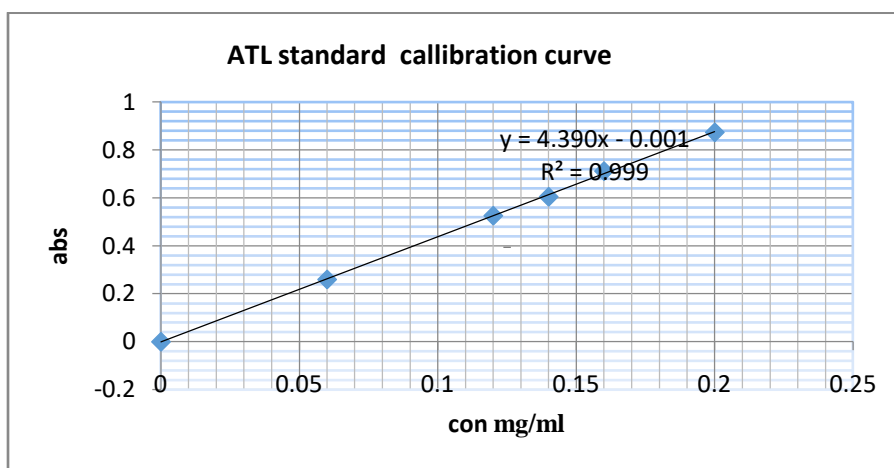
Figure 2:
Show the standard calibration curve of serial concentrations of ATL versus Absorbance response.

Table 2: brands analysis results

Brand No	Concentration	Label Claim	Amount found	Recovery%	RSD%
A	14	25	0.142	101.43	0.056919185
B	14	25	0.1446	103.272	0.090566502
C	14	25	0.1413	100.89	0.091564174

The formulated tablet has been investigated quantitatively, the assay percentage of the overall sample were found to be 100.9-101.43 % while the relative standard deviation (RSD) was in the range of 0.091564174 and 0.056919185 % as shown in table (2).
Method has been found precise and accurate as shown in table 2 with good readability results of RSD, robustness shown in table 3 with RSD less than 0.15 in the three wave length selected to test.

Table3: Regressions data of ATL

Parameter	AB C		
Wave length	274	274	274
LOD	0.03 mg/ml		
LOQ	0.0375 mg/ml		
R^2	0.9996		
Slope	0.43908		
Intercept	0.0015		
Inter day precisions RSD%	0.663327	0.375995	0.237818
Intraday precisions RSD%	0.056919185	0.090566502	0.091564174
Accuracy recovery% (n=9)	0.223945141		

Selectivity of the method was shown by appears of clear absorbance peak in standard solution at 274 nm and doesn't appear in blank and placebo solution which mean that there is no interference with blank or placebo within range 250-300 nm. The methods has been found linear Linearity from concentration of 0.06 mg/mL to 0.2 mg/mL with coefficient R^2= 0.999, 4.3908, which may represent A% value, (A1% = $\Delta A/AC$ = (0.874-.260)/(0.2-0.06)= 4.385714.

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