Development and Validation of UV Spectrophotometric Area under Curve (AUC) method for Dapoxetine HCl in Pharmaceutical Formulation

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ABSTRACT:
Simple, precise and economical UV spectrophotometric methods have been developed for the estimation of Dapoxetine HCl in pharmaceutical dosage form. Area under curve was integrated in the wavelength range of 285-305 nm. Calibration curves were plotted. Beer’s law obeyed in the Concentration range 10-60μg/ml and with correlation coefficient of 0.9981. Accuracy and precision studies were carried out and results were satisfactory. The proposed methods validated as per ICH analytical method development guidelines. The results of the analysis were validated statistically.

KEY WORDS: Dapoxetine HCl, Beer’s law, Area under Curve, Validation, ICH guidelines

INTRODUCTION:
Dapoxetine hydrochloride, a fast-acting serotonin reuptake transporter inhibitor, is generally prescribed for the treatment and management of premature ejaculation and erectile dysfunction in adult male1. Dapoxetine hydrochloride prevents the reuptake of serotonin transporter. The drug binds with the reuptake transporters of norepinephrine and dopamine and inhibits the reuptake2.

Chemically Dapoxetine ((+)-(S)-N, N-dimethyl-(α)[2-(1-naphthalenyl)oxy]ethyl]-benzenemethanamine hydrochloride), Dapoxetine hydrochloride is a water-soluble powder with a molecular weight of 341.88 and has a pKa of 8.63.

The literature study reveals that several spectrometric and HPLC methods available for Dapoxetine in combined tablet formulation [4-9]. No method has been reported for individual Dapoxetine HCl by using water as a solvent.

Figure 1: Chemical structure of Dapoxetine HCl
MATERIAL AND METHODS:

APPARATUS AND INSTRUMENTATION

Shimadzu UV 1800 with matched quartz cells and equipped with UV Probe Software, was used for this work. Single pan electronic balance (Shimadzu, AX 200, Japan) was used for weighing purpose. Sonication of the solutions was carried out using an Ultrasonic Cleaning Bath (Spectra Lab. UCB 40, India). Calibrated volumetric glassware (Borosil) was used in this study.

Chemicals

Active pharmaceutical ingredient (API) Dapoxetine HCl was supplied as a gift sample by Sava Healthcare ltd. Chinchwad, Pune Maharashtra, India. Commercially available tablets (Sustinex) containing 30 mg of Dapoxetine HCl were obtained from local pharmacy. Water has been selected as an analytical media for present research work.

PREPARATION OF STANDARD SOLUTION

The standard stock solution of Dapoxetine HCl was prepared by transferring, accurately weighed, 10 mg of API to 100 ml of volumetric flask. The drug was dissolved with sonication in water and volume was made up to the mark by using water. The standard stock solution (100 μg/ml) was further diluted with water to get the concentration of 10 μg/ml.

SELECTION OF WAVELENGTH RANGE

The standard solution of 10 μg/ml was scanned between 400 nm to 200 nm in UV spectrophotometer against water as blank after baseline correction. Wavelength range was selected around wavelength maxima (236 nm). Different working standards were prepared between 10-60 μg/ml. Various wavelength range were tried and final range between 285-305 nm was selected on the basis of linear relationship between area and corresponding concentration (Figure 2).

PREPARATION OF CALIBRATION CURVE

Working solutions were prepared from standard stock solution by further dilution with water to obtain the Concentration of 10, 20, 30, 40, 50, 60 μg/ml, respectively. These solutions were scanned from 400 to 200 nm and Area under Curve (AUC) was integrated in the range of 285-305 nm. The calibration curve was plotted between Areas against concentration (Fig. 3).

ASSAY OF TABLET FORMULATION

Twenty tablets were weighed and average weight was calculated. These tablets were crushed and powdered in a glass mortar. The tablet powder equivalent to 10 mg of Dapoxetine HCl was accurately weighed and transferred to a 100 ml of volumetric flask and diluted up to mark with water. The solution was filtered with Whatmann filter paper and sonicated for 15 min. This solution was further diluted to obtain 10 μg/ml solution with same solvent and subjected for UV analysis (Table no. 1).

METHOD VALIDATION

Linearity

The linearity of the drug was found to be between 10-60 μg/ml concentrations. The calibration graphs were obtained and treated by linear regression analysis.
Table 1: Results of Samples (ASSAY)

<table>
<thead>
<tr>
<th>Sample solution concentration (μg/ml)</th>
<th>Amount Found (%)</th>
<th>% RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 μg/ml</td>
<td>99.5</td>
<td>0.49</td>
</tr>
</tbody>
</table>

The generated regression equation was \( 305\int_{285} \text{Ad} = y = 0.1473x + 0.0098 \) (\( R^2 = 0.9981 \)) where, 305\int_{285} \text{Ad} \) is Area

under Curve (AUC) between 285 to 305 nm, \( R^2 \) is correlation coefficient. The method can be used for the routine analysis of Dapoxetine HCl in bulk and tablet dosage form (Table 4).

Table 3: Results of Recovery Study

<table>
<thead>
<tr>
<th>Recovery Level</th>
<th>Amount Spiked (μg/mL)</th>
<th>% Mean Recovery</th>
<th>SD*</th>
<th>% RSD*</th>
</tr>
</thead>
<tbody>
<tr>
<td>80%</td>
<td>8</td>
<td>99.46</td>
<td>0.033</td>
<td>0.034</td>
</tr>
<tr>
<td>100%</td>
<td>10</td>
<td>99.49</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>120%</td>
<td>12</td>
<td>99.57</td>
<td>0.029</td>
<td>0.029</td>
</tr>
</tbody>
</table>

CONCLUSION

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