

Quinapril hcl (qui)
and
hydrochlorthiazide
(hctz) literature



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LITERATURE REVIEW

1. Reema jaiswal, Pinak patel *et al.*, (2013) developed and reported a new simple, sensitive, rapid, accurate, precise and economical RP-HPLC method for the simultaneous determination of Quinapril HCl (QUI) and Hydrochlorthiazide (HCTZ) in their combined pharmaceutical dosage form using potassium Dihydrogen Phosphate buffer (pH 4.0 adjusted with Ortho Phosphoric acid): Acetonitrile(70: 30v/v) mobile phase, and C18 column ODS(100 mm x 4.6 mm, 3.0 μ particle size) as stationary phase with detection wavelength of 215 nm. Linearity was obtained in the concentration range of 5-25 μ g/ml for both the drugs. The % recoveries of the both the drugs were found to be 99.50 - 101.50 % and 99.00 - 101.06% respectively. The LOD were found to be 0.014 μ g/ml and 0.013 μ g/ml at 215 nm for QUI and HCTZ respectively. Methods were statistically validated for Accuracy, precision, specificity, LOQ, and robustness according to ICH guidelines and can be used for analysis of combined dosage form.
2. Serkan ALTUNSOY, Burçin BOZAL-PALABIYIK, Bengi USLU *et al.*, (2013) developed and reported a RP-HPLC method for the simultaneous determination of quinapril (QNP) and hydrochlorothiazide (HCZ) in pharmaceutical dosage forms. In this method quinapril, hydrochlorothiazide and perindopril (internal standard) were separated using a reversed phase column (Hichrom C18; 250x4.6 mm i. d.; 10 μ m) with acetonitrile: potassium dihydrogen phosphate (at pH 2.5; 0.067 M) (40: 60 v/v) as a mobile phase using UV detector at 211 nm and flow rate was 1.0 ml/min. The retention times for quinapril,

hydrochlorothiazide and perindopril were 4.391, 3.237 and 3.931 min, respectively. Linearity was obtained in the concentration range of 2-30 µg/mL for QNP and 1.25-18.75 µg/mL for HCZ. The proposed method has been fully validated and method is simple, rapid and suitable for quality control (QC) applications.

3. Khan SA, Kulkarni SS, Biyani KR and Khan BA *et al.*, (2013) developed and reported a simple, sensitive, accurate and reproducible method for simultaneous estimation of Quinapril and Hydrochlorothiazide by the Simultaneous equation method, using methanol as solvent. The two wavelengths 257 nm λ_{max} of Quinapril Hydrochloride (QNA-H) and 271 nm λ_{max} of Hydrochlorothiazide (HCTZ) were selected for the formation of Simultaneous equations. The two drugs follow Beer-Lambert's law over the concentration range of 5-30 µg/ml of QNA-H and 2.5 - 15 µg/ml of HCTZ. Recovery study was performed to confirm the accuracy of the method. The recovery of the Quinapril Hydrochloride and Hydrochlorothiazide were found near to 100%. The Results were found to satisfactory and reproducible. The methods were validated as per ICH guidelines.
4. Reema Jaiswal, Pinak patel *et al.*, (2013) developed and reported a new economical Derivative Spectrophotometric method for the simultaneous determination of Quinapril HCl (QUI) and Hydrochlorothiazide (HCTZ) in their combined pharmaceutical dosage form was developed and the absorbance of the solutions were measured at 242.45 nm (λ_1), and 257.17 nm (λ_2) for the estimation of both the drugs. The linearity was obtained in the concentration

range of 80-240 µg/ml for QUI and 10-50 µg/ml for HCTZ. The mean recovery was 99.93 - 100.33 % and 99.06- 101.25% for QUI and HCTZ respectively. The results of analysis have been validated statistically as per ICH guidelines.

5. Gandhimathi and Ravi *et al.*, (2013) developed and reported an ion-pair HPLC method has been developed and validated for the estimation of quinapril and hydrochlorothiazide simultaneously in combined dosage form. The mobile phase used was a mixture of 0.1% v/v triethylamine (pH 3.5), containing 1M of hexane sulphonic acid: acetonitrile (30:70% v/v). The detection was carried out on photo diode array detector at 220 nm. The proposed method can be successfully used to determine the drug contents of marketed formulation.
6. Girija B. Bhavar, V. A. Chatpalliwar, D. D. Patil and S. J. Surana *et al.*, (2008) developed and reported HPTLC method for simultaneous estimation of Quinapril and Hydrochlorthiazide in pharmaceutical formulations. The drugs were separated on silica gel 60 F 254 plates using suitable combination of solvents as mobile phase. The validation parameters, tested in accordance with the requirements of ICH guidelines, prove the suitability of methods.
7. Mariusz Stolarczyk, Anna Maalanka, Anna Apola *et al.*, (2013) developed spectrophotometric and chromatographic-densitometric methods for determination of losartan potassium, quinapril hydrochloride and hydrochlorothiazide in pharmaceutical preparations. The measurements were carried out at $\lambda = 224.0$ nm for quinapril, $\lambda = 261.0$ nm for hydrochlorothiazide and $\lambda = 270.0$ nm for

losartan when the derivative spectrophotometry was applied and $\lambda = 317.0$ nm when zero order spectrophotometry was applied for the determination of hydrochlorothiazide. In chromatographic-densitometric studies high performance thin layer chromatography (HPTLC) plates were used as stationary phase and a mixture of solvents n-butanol : acetic acid : water (15 : 5 : 1, v/v/v) as mobile phase. Under the established conditions good resolution of examined constituents was obtained. Retardation factor for quinapril hydrochloride was $R_f \sim 0.70$, for losartan potassium $R_f \sim 0.85$ and for hydrochlorothiazide $R_f \sim 0.78$. The developed methods are characterized by high sensitivity and accuracy. For quantitative analysis, densitometric measurements were carried out at $\lambda = 218.0$ nm for quinapril, $\lambda = 275.0$ nm for hydrochlorothiazide and $\lambda = 232.0$ nm for losartan.

8. Kunal Makwana, Reena V Dhamecha, Nilesh Pandya et al., (2011) developed a rugged and economic method for the estimation of quinapril and its metabolite in human serum by lcms/ms detection for clinical trials. Ramipril was used as internal standard for quantitation of Quinapril, and its metabolite from human serum. Linear regression with $1/X^2$ weighting was performed to determine the concentration of the drug from serum. A common solid phase extraction procedure for the isolation of drug and its metabolite was developed from serum samples. The samples were analyzed on API 3200 Triple quadrupole mass spectrometer using Chromolith, RP-18e column in atmospheric pressure electro spray ionization. The mobile phase composition was an isocratic mixture of 0.01% Ammonia in water:

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acetonitrile (30: 70 %v/v). The method was validated over a linear range of 10 - 1000 ng/mL and the limit of quantification was 10 ng/mL. Recoveries were observed above 70% for all the three analytes. The storage stability of Quality control samples was investigated under various conditions

9. Wagh, Hapse. S. A.; Kadaskar, V. S.; Dokhe, P. T.; Shirsath, A. S. et al., (2012) developed a method for the estimation of hydrochlorothiazide in tablet dosage form. This analytical method developed for the estimation of hydrochlorothiazide in bulk fluids showed maximum absorbance at λ_{max} of 272 nm in distilled water and in 0. 01N NAOH between 200 nm and 400 nm of UV scan. The method developed was validated for accuracy, linearity, limit of detection and limit of quantitation studies. The above analytical parameters indicated that the developed UV Spectrophotometric method of hydrochlorothiazide was simple, accurate and reproducible.
10. Neela M Bhatia, Rituraj B Desai and Swapnil D Jadhav et al., (2012) reported a simple spectrophotometric method development for simultaneous estimation of Losartan Potassium (LOS) and Hydrochlorothiazide (HCT) in two component tablet formulation. The method employed is a first order derivative spectroscopy. The wavelengths used for detection were 257 nm for LOS and 243 nm for HCT. Linearity was observed in the range of 10-90 $\mu\text{g/ml}$ for LOS and 2. 5-22. 5 $\mu\text{g/ml}$ for HCT. The recovery studies confirmed accuracy of proposed method and low values of standard deviation confirmed precision of method. The method is validated as per ICH guidelines.

11. R. K. Patel, J. B. Patel et al., (2011) developed accurate, precise and sensitive UV spectrophotometric method for the determination of Nebivolol HCl (NEB-H) and Hydrochlorothiazide (HCTZ) in bulk as well as in the pharmaceutical formulation. Calibration curves were linear in range of 10-80 $\mu\text{g/mL}$ ($r^2 = 0.999$) and 2-16 $\mu\text{g/mL}$ ($r^2 = 0.998$) at λ_{max} of 281 and 271nm for Nebivolol HCl and Hydrochlorothiazide respectively. The method was validated statistically.
12. Monika L. Jadhav, Manoj V. Girase, Shripad K. Tidme et al., (2014) developed two UV spectrophotometric methods and validated for simultaneous estimation of valsartan and hydrochlorothiazide in a tablet dosage form. The first method employed solving of simultaneous equations based on the measurement of absorbance at two wavelengths, 249.4 nm and 272.6 nm, λ_{max} for valsartan and hydrochlorothiazide, respectively. The second method was absorbance ratio method, which involves formation of Q -absorbance equation at 258.4nm (isoabsorptive point) and also at 272.6nm (λ_{max} of hydrochlorothiazide). The methods were found to be linear between the range of 5-30 $\mu\text{g/mL}$ for valsartan and 4-24 $\mu\text{g/mL}$ for hydrochlorothiazide using 0.1N NaOH as solvent. The mean percentage recovery was found to be 100.20% and 100.19% for the simultaneous equation method and 98.56% and 97.96% for the absorbance ratio method, for valsartan and hydrochlorothiazide, respectively, at three different levels of standard additions. The precision (intraday, interday) of methods was found within limits ($\text{RSD} < 2\%$). This method was simple, rapid, accurate, precise and

economical and can be used, successfully, in the quality control of pharmaceutical formulations and other routine laboratory analysis.

13. Shilpa Korti, Channabasavaraj KP, Somashekar PL et al., (2014) reported a new, simple (RP-HPLC) method and validated for simultaneous estimation of Moxonidine (MOX) and Hydrochlorothiazide (HCTZ) in bulk drug and tablet dosage forms. The separation was achieved by using C8 Phenomenex Luna (250 x 4.6 mm, 5 μ m) column with a mobile phase acetonitrile and formic acid solution (0.2% v/v) in the ratio 50:50 by using flow rate of 0.8 ml/min and detection wavelength at 245 nm. The retention times of MOX and HCTZ were found to be 3.0 and 4.8 min and the calibration curves were linear ($r^2 = 0.999$) over a concentration range from 1-35 μ g/mL for MOX and HCTZ respectively. Limit of detection (LOD) and Limit of quantitation (LOQ) were 0.08 μ g/mL and 0.1 μ g/mL for MOX and 0.2 μ g/mL and 0.4 μ g/mL for HCTZ respectively. The developed method was validated as per ICH guidelines and the results were found to be within the limits. So it can be used for the routine quality control of MOX and HCTZ in bulk sample and tablet dosage forms.

14. Vidhya K. Bhusari, Sunil R. Dhaneshwar et al., (2011) reported a new and accurate HPTLC method for simultaneous estimation of Atenolol, Hydrochlorothiazide and Amlodipine Besylate as the bulk drug and in tablet dosage forms by using aluminum plates precoated with silica gel 60 F254 as the stationary phase and chloroform: methanol: acetic acid (8:2:0.2 v/v/v) as mobile phase. Densitometric evaluation of the separated zones was performed at 232 nm. The three

drugs were satisfactorily resolved with RF values 0.22 ± 0.02 and 0.36 ± 0.02 , 0.55 ± 0.02 for Atenolol, Hydrochlorothiazide and Amlodipine Besylate, respectively. The accuracy and reliability of the method was assessed by evaluation of linearity (100-600 ng/spot for Atenolol, Hydrochlorothiazide and Amlodipine Besylate), precision (intra-day % RSD was 0.37-1.19 and inter-day % RSD was 0.69-1.11 for Atenolol, intra-day % RSD was 0.49-1.16 and inter-day % RSD was 0.50-1.23 for Hydrochlorothiazide and intra-day % RSD was 0.59-0.84 and inter-day % RSD was 0.60-0.91 for Amlodipine Besylate), accuracy (99.93 ± 0.43 for Atenolol, 99.92 ± 0.72 for Hydrochlorothiazide and 99.87 ± 0.63 for Amlodipine Besylate), and specificity in accordance with ICH guidelines.

15. Havaladar Freddy H and Vairal Dharmendra L et al., (2010) developed a simple, specific (RP-HPLC) method and validated for the determination of atenolol, hydrochlorothiazide, losartan and valsartan. Separation was achieved with a Nucleodur 100 C-18 column having 250 x 4.6mm i. d. with 5 μ m particle size and potassium dihydrogen phosphate buffer adjusted to pH 3.0 using diluted ortho phosphoric acid and acetonitrile (50: 50 v $\hat{\cdot}$ v) at flow rate of 1.0ml/min using UV detection at 210nm. The retention time of atenolol, hydrochlorothiazide, losartan and valsartan was about 1.99min, 2.90min, 5.92min and 9.42min respectively. The proposed method was validated and successfully used for estimation of atenolol, hydrochlorothiazide, losartan and valsartan in the pharmaceutical dosage form.