A REVIEW STUDY ON NEW VALIDATED METHODS FOR DETERMINATION OF NAPROXEN AND PANTOPRAZOLE IN CAPSULE DOSAGE FORM

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ABSTRACT

Naproxen is a nonsteroidal anti-inflammatory drug, pantoprazole is a proton pump inhibitor. According to the World health statistics 2019 reports., increased blood pressure affects 1.13 billion people worldwide. The administration of anti-hypertensive drug and the combined use of naproxen and pantoprazole drugs have markedly reduced the blood pressure levels in patients. Based on the evidence of the combination drug which have been tested we decided to go on with naproxen and pantoprazole combination for validation. The primary goal of this article is to reduce the blood pressure levels, morbidity, mortality, improve quality of life, restore and preserve its immunological function. so according to that ideology some of the analytical methods like RP-HPLC, ultra violet spectroscopy, spectrophotometric and difference spectrophotometric methods are taken in to consideration which are ideal for analysis of combined drugs simultaneously.

KEYWORDS: Naproxen and pantoprazole, high performance liquid chromatography, ultra violet spectroscopy, spectrophotometry.

INTRODUCTION

Naproxen

Naproxen is a propionic acid derivative related to the aryl acetic acid group of non-steroidal anti-inflammatory drugs. Naproxen is commonly used for the reduction of pain, fever, inflammation, and stiffness caused by conditions including migraine, osteoarthritis, kidney stones, rheumatoid arthritis, psoriatic arthritis, gout, Ankylosing spondylitis, menstrual

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It is also used for the treatment of primary dysmenorrhea. Naproxen works by inhibiting both the COX-1 and COX-2 enzymes.

Pantoprazole
Pantoprazole is a proton pump inhibitor (PPI) that suppresses the final step in gastric acid production by forming a covalent bond to two sites of the (H+,K+)-ATPase enzyme system at the secretory surface of the gastric parietal cell.\(^4,5\) This effect is dose-related and leads to inhibition of both basal and stimulated gastric acid secretion irrespective of the stimulus. Pantoprazole is used for short term treatment of erosion and ulceration of the oesophagus caused by gastro-oesophageal reflux disease.

Methods for validation of Naproxen and Pantoprazole

1. Developed and validated a simple, specific, economical and precise high-performance liquid chromatographic method for the simultaneous determination of Naproxen and Pantoprazole in API (active pharmaceutical ingredient) and formulation. Chromatography was carried out a prepacked Hypercil BDS C-18 column (250×4.6mm, particle size 5μm) with the Methanol: phosphate buffer (70:30v/v) was used as the mobile phase. The UV detection was carried at 259 nm. The results obtained showed good agreement with the declared contents. The retention times of Naproxen and Pantoprazole were 3.033 min and
1.90 min, respectively. The method was linear in the range of 10–50 µg/ml for Naproxen concentration with a correlation co-efficient 0.998 and in the range 10-50 µg/ml for Pantoprazole concentrations having correlation co-efficient 0.999 and the recovery was 99-102%. The method was validated according to ICH guidelines and the acceptance criteria for accuracy, precision, linearity, specificity and system suitability were met in all cases. The proposed method can be used for quantitative determination of Naproxen and pantoprazole.

Fig. 3: naproxen and pantoprazole.

A simple, sensitive, and precise High-performance liquid chromatographic method for the analysis of Naproxen and Pantoprazole has been developed and validated for the determination of compounds in commercial pharmaceutical products. The compounds were well separated on a BDS Hypersil C-18 reversed-phase column by use of a mobile phase consisting of Acetonitrile and Mixed Phosphate buffer (pH 6.92) in 45:55 (V/V%) ratio, at a flow rate of 1.0 mL/min with detection wavelength at 290nm. The linearity ranges were 20-120µg. The correlation coefficient was found to be 0.997 and 0.995 for Naproxen and Pantoprazole respectively. The recovery amount was in the range of 99.67-101.39%. The high recovery and low relative standard deviation confirm the suitability of the method for determination of Naproxen and Pantoprazole in capsule dosage forms.
Fig. 4: naproxen and pantoprazole.

U.V. Spectroscopy
An Ultra-Violet spectrophotometric method has been developed and validated for the simultaneous estimation of Naproxen sodium (NAP) and Pantoprazole sodium (PAN) in bulk and pharmaceutical dosage form. The spectrophotometric method involves the simultaneous equation method at 232.0 and 291.0 nm over the concentration range of 10µg/ml for both by using 0.1M NaOH as solvent. The method was validated for linearity, precision, sensitivity, and specificity. The calibration curves were linear over the range of 2-10 µg/ml for both NAP and PAN, with significant high value of correlation coefficient (>0.995 for both drugs). The percentage recovery value for NAP was 100.03% and for PAN was 100.2%.

Fig. 5: U. V. Spectra for naproxen and pantoprazole.
Spectrophotometric method

Simple but accurate, precise, reproducible without separation and economical procedures for simultaneous estimation of naproxen and pantoprazole in combined capsule dosage form have been developed. One method employs solving of simultaneous equations using 262 nm and 289 nm as two analytical wave lengths for both drugs in methanol. The other method is Q- value analysis based on measurement of absorptivity at 262 nm and at iso absorptive point 310 nm showing linearity in concentration range of 10.0-50.0 µg.ml$^{-1}$ for naproxen and 8.0-18.0 µg.ml$^{-1}$ for pantoprazole. The method was validated with respect to accuracy, precision, limit of detection and limit of quantitation.

The proposed method is recommended for routine analysis since it is rapid, simple, accurate and also sensitive and without need to heat and organic solvent extraction.

![Isobestic point for naproxen and pantoprazole.](image)

Fig. 6: Isobestic point for naproxen and pantoprazole.

Difference spectrophotometric method

A new, simple, accurate and highly sensitive difference spectrophotometric method was proposed for the determination of pantoprazole and naproxen in tablet dosage form. The method is based on the measurement of difference absorbance of pantoprazole and naproxen in 0.1M HCl and 0.1M NaOH. The measured value is the amplitude of the maxima and minima between two equimolar solutions of pantoprazole and naproxen in different chemical forms, which exhibit different spectral characteristic i.e. $\lambda_{\text{max}}$ of 284 nm in 0.1 M HCl and $\lambda_{\text{max}}$ of 295 nm in 0.1M NaOH. The method was linear over the concentration range of 5-50 µg/mL of
the analyte with the correlation coefficient value of 0.995 and regression equation of 
y=0.022x+0.036. The method was also accurate and the percentage recovery of the spiked 
drug was found to be between the ranges of 98.3-102.4%. The results obtained of the proposed 
method was statistically validated as per ICH guideline and successfully applied for the 
analysis of pantoprazole and naproxen in tablet dosage form.

CONCLUSION

According to the research., RP-HPLC, U.V. Spectroscopic and spectrophotometric method 
detections have been used for the estimation of naproxen and pantoprazole in the 
pharmaceutical formulations. Here all these methods are studied to know about its accuracy, 
precision, linearity, specificity and system suitability of naproxen and pantoprazole. As we 
decided to go on with naproxen and pantoprazole combination for validation. RP-HPLC, ultra 
violet spectroscopy, spectrophotometric and difference spectrophotometric methods are taken 
in to consideration which are ideal for analysis of combined drugs simultaneously.

REFERENCES

1. Rubesh Kumar S.*, Usha Sree G., Jayanthi K., Naga Malleswara Babu B., Duganath N., 
Devanna N. A RP-HPLC Method Development and Its Validation for the Simultaneous 
Estimation of Naproxen and Pantoprazole Sodium in Capsule Dosage Form. Asian J. 
Research, 2013; 6(8).
Simultaneous Determination of Naproxen Sodium and Pantoprazole Sodium in Bulk and 
Pharmaceutical Dosage Form by Validated UltraViolet Spectrophotometric Method. 
3. Mahaboob Shubhani Syed. Analytical Method Development and Validation for 
Simultaneous Estimation of Naproxen and Pantoprazole in Capsule Dosage Form. 
Mahaboob Shubhani Syed, et al /international journal of pharmacy and analytical 
6. Code Q2A- Text on Validation of analytical procedures, ICH Harmonised Tripartite 
7. Code Q2B- Validation of Analytical Procedures Methodology, ICH Harmonised 