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RESEARCH ARTICLE

ANALYSIS OF DIURETIC AGENTS BY RP-HPLC: A REVIEW.

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Abstract

Analytical method development and its validation is an important aspect in drug discovery process and the most common analytical method employed for estimation of drug is Reverse phase High Pressure Liquid Chromatography (RP-HPLC) because of its speed and sensitivity. Development and validation of analytical method producing accurate and precise data to ensure the quality and safety of the drug. Many types of analytical methods are available for estimation of diuretic agents including RP-HPLC. This review article briefly discusses about analytical methods available for the estimation of available diuretic agents specially focussing on RP-HPLC

Introduction:-

The technique of high performance liquid chromatography is so called because of its improved performance when compared to classical column chromatography. It is so called as high pressure liquid chromatography since high pressure is used when compared to classical column chromatography. High performance liquid chromatography(HPLC) is a form consist of liquid chromatography to separate compounds that are dissolved in solution.(1)

The phenomenal growth in chromatography is largely due to the introduction of the versatile technique called high-pressure liquid chromatography, which is frequently called high-performance liquid chromatography. Both terms can be abbreviated as HPLC.

Diuretics increase the rate of urine flow and sodium excretion, used to adjust volume or body fluids in a variety of clinical situations. Fluid filtration in human body is 180 litres, and about 1.5 litres of urine is formed. used to adjust the compositions of body fluids in a clinical situations such as including hypertension, renal failure, heart failure. Alternatively, an antidiuretics such as vasopressin, or antidiuretics hormones is an agent or drug which reduces the exretion of water in urine and sodium excretion.

These are drugs which cause a net loss of na^+ and water in urine. Diuretics are among the most widely prescribed drugs. Application of diuretics to the management of hypertension has outstripped their use in edema. Availability of diuretics has also had a major impact on the understanding of renal physiology. (2)

Diuretics are used to treat heart failure, hypertension, inflenza ,water poisoning, and certain kidney disease. Some diuretics, such as acetazolamide, help to make the urine more alkaline and are helpful in increasing excretion of substances such as aspirin in cases of overdose or poisoning.

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Diuretics are often abused by those with eating disorders, especially bulimics, in attempts to lose weight.
That is, the reduction in blood pressure is not due to decreased blood volume resulting from increased urine production, but occurs through other mechanisms and at lower doses than that required to produce diuresis. Indapamide has a larger therapeutic value for hypertension than other diuretics and Antihypertensive actions of thiazide and loop diuretics are independent of their diuretic effect. Analytical method development and validation for newly introduced pharmaceutical is of importance, as drug or drug combination may not be official in pharmacopeia and so analytical method for quantification is not available. To check and ensure the quality standards of drug molecules and their formulation various analytical methods are employed.

Most of the drugs in single or multi component dosage forms can be analyzed by HPLC method. Analytical method of diuretics are associated with most of the drugs, because of advantage like speed, greater sensitivity, accuracy, improved resolution and ease of automation. This review article briefly discuses the RP-HPLC method available for the estimation of diuretic agents in bulk and in various formulations concentrating mainly on stationary phase, mobile phase, detector type.

Table 1:- chromatographic conditions for RP-HPLC methods reported for the estimation of high efficacy diuretics.

Name of diuretics agent	Sample matrix	Chromatographic column	Mobile phase	Type of detector
Furosemide[3]	Oral, solubility	water spherisorb ODS2 C18 250x4.6mm 5µ m	0.01M KH2PO4(ph 5.5) : Methanol (70:30 v/v)	UV detection at 235 nm
Furosemide[4]	Combined tablet dosage form	Inertsil c18 (250x4.6 mm), 5µm	Methanol: water (70:30 v/v), ph 3.20	UV detection at 236 nm

Table 2:- chromatographic conditions for RP-HPLC methods reported for the estimation of medium efficacy diuretics.

Name of diuretics agent	Sample matrix	Chromatographic column	Mobile phase	Types of detector
Benzthiazide[5]	Bezthiazide in tablets	BDS hypersil c18 (250x4.6 m id , 5µ m particle size)	Phosphate buffer :methanol(70:30)	UV detection at 245 nm
Hydrochlorothiazide[6]	Tablet dosage form	Prontosil c18 (4.6x250 mm, 5µ particle size)	(48:12:40 % v/v/v)	UV detection at 232 nm
Hydrochlorothiazide[7]	Bulk drug and pharmaceutical dosage form	Inertsil (ODS3 250 mmx4.6 mm 5 µ m)	(50:50)acetonitrile: water	UV detection at 272 nm
Hydrochlorothiazide[8]	Bulk drug and in synthetic mixture	Zodiac ODS c18 (4.6x 250 mm, 5µ m)	Acetonitrile: water (80:20 v/v)	UV detection at 267 nm
Hydrochlorothiazide[9]	Bulk drug and tablet dosage form	C18 reversed phase(4.6 mm, 5.0 µm)	Phosphate buffer: acetonitrile	UV detection at 215 nm
Triamterene [10]	Triamterene in tablets	BDS hypersil C18 (250mmx4.6mm, 5µm)	Phosphate buffer: Methanol(70:30)	UV detection at 245 nm
chlorthalidone [11]	Chlorthalidone in pharmaceutical dosage form	ODS (250mm, 4.6 mm, 5µ)	Phosphoric acid:acetonitrile (30:70)	UV detection at 230 nm
Chlorthalidone[12]	Irbesarton in pharmaceutical dosage form	C18 (250 mmx4.6mm, 5µ)	Ammonium phosphate buffer,acetonitrile, : methanol (40:40:20, v/v/v)	UV detection at 220nm
Chlorthalidone[13]	Pharmaceutical formulation	Xterra RP8 (150x4.6 mm, 5 µ)	Potassium dihydrogen phosphate buffer solution: methanol (	UV detection at 240 nm

			50:50 v/v ph 3.6)	
Chlorthalidone[14]	Olmesartan in tablet dosage form	C18 (150x4.6 mm, 5 µm)	Buffer :acetonitrile: tea (80:20:0.1 % v/v/v)	UV detection at 248 nm
Metolazone [15]	Metalozone in combined tablet dosage form	C18 column	Acetonitrile: water 70:30, PH-3	UV detection at 220 nm
Metolazone [16]	Bulk drug and formulation	Thermo hypersil BDS-c18 (250 mmx 4.6 mm, 5.0 µm)	Acetonitrile:water (60:40)	UV detection at 237 nm
Indapamide [17]	Tablet dosage form	C18 (250* 4.6, 3.5 µm)	Amonium acetate buffer:methanol (45:55)	UV detection at 226 nm
Indapamide [18]	Indapamide in pharmaceutical dosage forms	Inertsil ODS3V (250 mmx 4.6 mm, i.d, 5µm)	Phosphoric acid : acetonitrile (60:40 v/v)	UV detection at 215 nm
Indapamide [19]	Pharmaceutical tablet dosage form	Xterra c8 (4.6mmx100mm, 5µm)	Potassium di hyrogen phosphate buffer :acetonitrile(40:60 v/v)	UV detection at 240 nm
Indapamide [20]	Indapamide in tablet dosage form	C18 column	Acetonitrile and orthophosphoric acid (70:30,v/v, ph 4.0)	UV detection at 238 nm

Table 3:- chromatographic conditions for RP-HPLC methods reported for the estimation of weak efficacy diuretics.

Name of diuretic agents	**Sample matrix**	**Chromatographic column**	**Mobile phase**	**Type of detector**
Acetazolamide[21]	bulk drug	C8H column (250x4.6mm)	Potassium di hydrogen phosphate buffer: acetonitrile: water (30:20:50)	UV detection at232nm
Amiloride [22]	Tablet formulation	C18 (250x 4.6 mm, 5µm)	Phosphate buffer solution:acetonitrile (50:50 v/v, PH-3.0)	UV detection at 238 nm
Amiloride [23]	Pharmaceutical dosage form	BDS C18 (150x4.6mm,5µm)	Methanol:phosphate buffer PH-3.6 (10:90 %v/v)	UV detection at 288nm
Isosorbide [24]	Bulk drug	C18 (4.6x 150mm, 5 µm)	Methanol:tea (40:60) PH-4.2	UV detection at 272 nm
Isosorbide [25]	Tablet formulation	C18 10 µm (3.9x 300mm)	Methanol:ammonium sulphate (50:50 v/v)	UV detection at 210 nm
Xipamide [26]	Xipamide in pure and dosage form	C18 (150x 4.6 mm ID , 5 µm)	Orthophosphoric acid: acetonitrile (60:40)	UV detecton at 220 nm
Spironolactone[27]	Combined tablet dosage form	Inertsil c18 (250x4.6 mm), 5µm	Methanol: water (70:30 v/v), ph 3.20	UV detection at 236 nm
Caffeine [28]	Pharmaceutical dosage form	C18 (4.5 mmx 250 mm; 5 µm)	Methanol:water (60:40)	UV detection at 272 nm
Theophylline [29]	Combined dosage form	C18 (250 mmx 4.6 mm , 5 µm)	Methanol:tetrabutyl ammonium hydrogen sulphate (50:50 v/v)	UV detection at 274 nm

Conclusion:-

Presented review covers the analytical methods or the development and validation of diuretic agents in various pharmaceutical and biological samples with help of RP-HPLC.

Determination of diuretic agents in sample alone or in combination with other drugs. For quantitative estimation of diuretic agents, RP-HPLC method is the most common.

The proposed HPLC method was applied for the determination of diuretics and validated as per ICH guidelines. In conclusion, the accuracy, reproducibility and high sensitivity of the proposed method is suitable for analytical method of diuretic agents in various pharmaceutical and biological samples with help of RP-HPLC.

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References:-

1. Ravi shankar S. International methods of chemical analysis. 2001: Page no 18.2-18.3.
2. KD Tripathi, Essentials of medical pharmacology sixth edition- Jaypee brothers medical publishers. Page no:561.
3. B.P. Nagori and Renu solanki RP-HPLC method for simultaneous estimation of furosemide in tablet formulation. Indian J. pharm. sci, 2010 :72 (3); 381 - 384.
4. Bhojani maulik, dadhania ketan, faldu shital development and validation of RP-HPLC method for simultaneous estimation of furosemide and spironolactone in their combined tablet dosage form. JPSBR. 2012 : Vol 2;(144-147).
5. VC chauhan, VN shah , development and validation of RP-HPLC method for simultaneous estimation of Benzthiazide in tablets. pharmatutor ISSN : 2347-7881.
6. Deepak kumar jain, Nilesh jain, Ruchi jain development and validation of RP-HPLC method for estimation of hydrochlorthiazide in tablet dosage form. Int.J. Research ayurveda pharm.2014: 5(4).
7. Nidhal S. Mohammed and Ahmed J. Mohammed development and validation of RP-HPLC method for the determination of hydrochlorthiazide in bulk drug and pharmaceutical dosage form. Chromatography research international. Volume 2016:Article ID 1693023; 7 pages.
8. Nagnath S, alekya, priyanka, srivani, pallavi development and validation of RP-HPLC method for simultaneous estimation of hydrochlorthiazide in bulk and in a synthetic mixture. Int. J .of pharmacy and analytical research. 2015:Vol-4
9. Mahesh M, Kumanan. R, Jaya veera.k.n development and validation of isocratic RP-HPLC method for simultaneous estimation of hydrochlorthiazide in tablet dosage form and bulk drug. Int. Journal of current pharmaceutical research. 2011: vol 3.
10. DA shah, PR parmar development and validation of RP-HPLC method for simultaneous estimation of triamterene in tablets. pharmatutor ISSN: 2347-7881.
11. Kalaiselvi P and Lalitha LG development and validation of RP-HPLC method for the estimation of chlorthalidone in pharmaceutical dosage form. Pharmacophore 2014: Vol5(2);279-286.
12. P.Sravani, S.Rubesh kumar, N. Duganath, N.Devanna development and validation for the simultaneous estimation of chlorthalidone by RP-HPLC in pharmaceutical dosage form. Int.J of pharma sci. (2014): 725-729: vol.4;725-729.
13. G.S. Kumar, V. Ramya , Sumanta. Mondal sai pavan kumar development and validation of RP-HPLC method for simultaneous estimation of chlorthalidone from pharmaceutical formulation. Int. Research Journal of Pharmacy. 2012:3(10).
14. Parth R. Nayak, Ankit B chaudhary and nikul M.Rahevar development and validation of RP-HPLC method for simultaneous estimation of chlorthalidone in tablet dosage form. World formal of pharmacy and pharmaceutical science. volume 5;Issue 6.
15. Manzoor ahmed, manohara Y.N, rachana R. Yeilgar development and validation for simultaneous estimation of metolazone in combined tablet dosage form. World journal of pharmacy and pharm.sci. Vol-3;487-497.
16. Ram kumar dubey, vidhya K. Bhusari validated RP-HPLC method for simultaneous quantition of metolazone in bulk drug and formulation. Sci. Pharm.2011:79; 545-554.

17. Rima N. Shan, Deesha B. gandhi and mehul. M.Patel RP-HPLC method for simultaneous estimation of indapamide in tablet dosage form. Asian J. Research chem.2012: 5(5).
18. Juddy joseph, Blessen philip, DR. M.Sun darapandian development and validation for the simultaneous estimation of indapamide by RP-HPLC method in pharmaceutical dosage form. Int. Journal of pharmacy and pharmaceutical sciences.2011:Vol.3.
19. K. Madhvi, K. Deepti, B. harika development and validation of RP-HPLC method for the simultaneous estimation of indapamide in pharmaceutical tablet dosage form. IJPAR.2014: vol-3.
20. Demera vamshi, P. Laxmi madhuri development and validation of indapamide by RP-HPLC method. International journal of research in pharmaceutical and nano sciences.2013: 2(6);798-810.
21. Satish manchanda, pravat K. sahoo and dipak K. Majumdar development and validation of RP-HPLC method for the estimation of acetazolamide in bulk drug and formulation with forced degradation studies. Der pharmacia letter. 2016: 8(1); 338-347.
22. B.P Nagori and Renu solanki RP-HPLC method for simultaneous estimation of amiloride hydrochloride and furosemide in tablet formulation. Indian J. Pharm. sci. 2010: 72(3); 381-384.
23. Krutika J. Bhalodiya, Darsha modiya, Shital faldu analytical development and validation for simultaneous estimation of amiloride and toresemide in their combined pharmaceutical dosage form by RP-HPLC method pharmatutor ISSN : 2347-7881.
24. S. Annapurna priyadarshika, Dr.M.Prasado rao validated RP-HPLC method for simultaneous estimation of isosorbide in bulk and pharmaceutical dosage form. World journal of pharmacy and pharmaceutical science.1930-1936:volume-4.
25. M.Madhu, V. Sreeram, A.V.D. N agendra kumar a newer RP-HPLC method for the estimation of isosorbide in tablet formulation. International journal of pharmatech research.2014-2015:Vol-7.
26. Heba M.EL- Sayed, soad.S. ABD EL-hay development and validation of a stability- indicating RP-HPLC method for the determination of xipamide in pure and dosage form. Int. J. of pharmacy and pharmaceutical sciences. 2016:Vol 8.
27. faldu shital development and validation of RP-HPLC method for simultaneous estimation of spironolactone in their combined tablet dosage form. Journal of pharmaceutical science and bio-scientific research. 2012:Vol 2; (144-147).
28. Sharmin reza chawdhury, Mahfuza maleque, Mahbubul hoque shiba development and validation of a simple RP-HPLC method for determination of caffeine in pharmaceutical dosage form. Asian. J. Pharm. Ana. 2012:vol.2 ; pg 01-04.
29. Sagar suman panda, bera venkateveraha ravi kumar stability- indicating RP-HPLC method for simultaneous estimation of theophylline in combined dosage form. Brazilian Journal of pharmaceutical sciences. 2013:Vol.49.n.3.