FORMULATION DEVELOPMENT AND EVALUATION OF CEFIXIME DISPERSIBLE TABLETS

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ABSTRACT

The present study was aimed towards the formulation and development of cefixime dispersible tablets by direct compression method. Cefixime a third generation cephalosporin has a wide antibacterial spectrum being effective against both gram positive and gram negative bacteria. Major problem with this drug is its solubility in biological fluids, after oral administration. Therefore, dispersible tablet of cefixime was formulated using two super disintegrants in different concentrations of 3%, 6% and 9% of crosscarmellose sodium, Sodium starch glycollate. All the batches were prepared by direct compression method using 10.5 mm round shaped deep concave punch. The prepared tablets were evaluated for hardness, thickness, weight variation, disintegration test, water absorption test, drug content estimation, invitro study, microbiological study and accelerated stability studies.

Formulation (F2) containing 6% crosscarmellose sodium showed the better disintegration time (13 sec) and percentage of drug release (97.82% in 45 min) as compared to other super disintegrating agents.

Keywords : Dispersible tablet, Cefixime, cross carmellose sodium, sodium starch glycollate.

INTRODUCTION

Oral drug delivery has been known for decades as the most widely utilized route of administration among all the routes that have been explored for the systemic delivery of drug via various pharmaceutical products of different dosage form. The reason that the oral route achieved such popularity may be attributed to its ease of administration as well as the traditional belief that by oral administration the drug is well absorbed as the food stuff ingested daily[1].

The oral route of drug administration has been the one used most for both conventional as well as novel drug delivery. The reasons for this preference are obvious because of the ease of administration and widespread acceptance by patients. The common oral dosage forms include: liquid mixtures like solutions, suspensions, solid dosage forms like tablets, capsules and liquid filled capsules etc. Compared to other oral dosage forms, tablets are the manufacturer's dosage form of choice because of their relatively low cost of manufacture, package and shipment; increased stability and virtual tamper resistance.[2]

MATERIALS AND METHODS

Cefixine was generous gift received from covalent laboratories, Hyderabad, Microcrystalline cellulose pH 10.2 was received form kawarlal excipients, crosscarmellose sodium and pregelatinised starch was obtained from Fonterra excipients, USA and Colloidal Silicon dioxide received from FMC Biopolymer, Irelan

Calibration of standard curve[3]

25 mg of Cefiximetrihydrate was accurately weighed and dissolved in 25 ml of methanol in a 25ml standard

flask to obtain stock solution-1 having concentration of 1000µg/ml. From this stock solution aliquots of 0.5ml, 1.0ml, 1.5ml, 2.0ml, 2.5ml and 3.0ml were pipetted out into a series of 10 ml standard volumetric flask and the volume was made upto the mark with 0.05 M potassium phosphate buffer to get the drug concentration in the range of 0.5 to 3.0 µg/ml. The absorbance of the resulting solution was then measured at 288 nm using UV Double beam spectrophotometer and represented in table no:1.

Table : No. 1. Standard Curve Data of Cefixime

S.NO	COCENTRATION (µg/ml)	ABSORBANCE at 288nm
1.	0.5	0.0261
2.	1.0	0.0485
3.	1.5	0.0743
4.	2.0	0.1010
5.	2.5	0.1242
6.	3.0	0.1500

Evaluation of active pharmaceutical ingredient :

The selected drug Cefixime was subjected for investigation of physical characterization such as,

4.6.1. Organoleptic Properties :

Organoleptic properties like color, odor and taste of Cefixime were noticed.

4.6.2. Particle Size Analysis[4]

Particle size distribution of the drug was estimated by sieving method. The sieves are stacked on top of one another in ascending degrees of coarseness. The test powder, for example 50g, was placed on the top sieve. The nest of sieves was subjected to a standard period of agitation. The weight of material retained on each sieve was accurately determined. Percentage of powder retained on each sieve was calculated by using the following formula,

$$\text{Percent retained} = \frac{\text{Mass retained on each sieve} \times 100}{\text{Total weight}}$$

4.6.3. Solubility Analysis[5]

Solubility is defined as the number of gram substance which will dissolve in 100 grams of solvent at a stated temperature. The solubility of drug was studied in different solvents such as water, acetone, ethanol, sodium hydroxide, hydrochloric acid by measuring how many parts of solvent is required for one part of solid.

4.6.4. Drug: Excipients Compatibility Studies[6]

Compatibility studies were performed by preparing blend of different excipients with drug and stored at 40oC/75%RH for one month. The initial state of the mixtures was noted and further evaluation for the possible occurrence of any interactions was performed after the15th and 30th day. The drug: excipients compatibility protocol was presented in table no:2.

Table : No. 2. Drug: Excipients Compatibility Protocol

S.No	Composition	Quantity(g)	Ratio
1.	Cefixime	1.0	1:0
2.	Cefixime+Microcrystalline cellulose	2.0	1:1
3.	Cefixime+ Croscarmellose sodium.	2.0	1:1
4.	Cefixime + sodium starch glycolate	2.0	1:1
5.	Cefixime+ Aspartame	1.5	1:0.5
6.	Cefixime+ Sucralose	1.5	1:0.5
7.	Cefixime+ Colloidal Silicon dioxide	1.5	1:0.5
8.	Cefixime+ Magnesium stearate	1.5	1:0.5
9.	Cefixime+ Pineapple flavour	2.0	1:1
10.	Cefixime+ Tartrazine lake color	1.25	1:0.25

4.6.5. Water Content:

The water content was determined titrimetrically by Karl Fischer titration method.

$$\text{Water content} = \frac{\text{Titre volume} \times \text{Mean KF factor}}{10\times \text{ Weight of the sample}}$$

4.6.6. Determination of amount of cefixime to be used in a tablet:

Cefixime is available as Cefiximetrihydrate. Labelled claims are to be expressed in terms of the equivalent amount of Cefixime present in the dosage form. 226.80mg of Cefixime trihydrate should be used in tablet to get 200mg of Cefixime. The total amount of Cefixime to be used in the formulation of a tablet containing 200mg of Cefixime as calculated from the assay value and the water content determined by Karl-Fischer method. The total amount of Cefixime to be used in the formulation can be calculated by using the following formula,

Required dose = Label claim × Conversion factor

$$\text{Conversion factor} = \frac{100}{\text{(\%w/v assay on anhydrous basis)}} \times \frac{100}{\text{(100 - \%w/v of water by KF)}}$$

Direct compression method

Procedure

The specified quantity of the drug was weighed and passed through sieve number 20. All other ingredients were passed through sieve number 40. The drug and other sifted excipients were mixed thoroughly in a polyethylene bag. The tartrazine color and magnesium stearate was added to the blend and thoroughly mixed. The tablets were compressed using 10.5 mm round shaped deep concave punches. The formula was represented in table no:3

Table : No. 3. Formula for Preparation of Cefixime Tablet

S.No	Ingredients (mg)	F1	F2	F3	F4	F5	F6
1.	Cefixime	226.80	226.80	226.80	226.80	226.80	226.80
2.	Microcrystalline cellulose	136.10	122.60	109.10	136.10	122.60	109.10
3.	Pregelatinized starch	22.50	22.50	22.50	22.50	22.50	22.50
4.	Crosscarmellose sodium	13.50	27.00	40.50	_	_	_
5.	Sodium starch glycolate	_	_	_	13.50	27.00	40.50
6.	Sucralose	25.00	25.00	25.00	25.00	25.00	25.00
7.	Colloidal silicon dioxide	2.25	2.25	2.25	2.25	2.25	2.25
8.	Magnesium stearate	4.50	4.50	4.50	4.50	4.50	4.50
9.	Tartrazine lake colour	1.35	1.35	1.35	1.35	1.35	1.35
10.	Pineapple flavour	18.00	18.00	18.00	18.00	18.00	18.00
	Weight of each Tablet	450.00	450.00	450.00	450.00	450.00	450.00

4.8. Evaluation of pre-compression parameters [3,6,7,8,9]

1) Angle of Repose:

This was determined by funnel method. The funnel was fixed at a particular height on a burette stand. The powder sample was passed through the funnel until it forms pile. The radius of the pile was noted down. The same procedure was repeated for three times and average value was taken. The angle of repose was calculated using equation

$\tan\theta = h/r$

$\theta = \tan^{-1}(h/r)$

Where,

h = height of the pile.

r = radius of the pile.

θ = Angle of repose.

2) Bulk Density :[3]

Determination of bulk density: weighed amount of the powder was taken intoa100ccmeasuring cylinder. The volume occupied by the sample was noted.

Bulk density is calculated by using formula,

$$\text{Bulk density } (\rho b) = \frac{\text{Weight of the sample (w)}}{\text{Final volume of powder blend (Vb)}}$$

3) Tapped Density :

Weighed amount of the powder was taken into a 100 ml measuring cylinder. It was tapped using tap density test apparatus USP. The apparatus gives 500 taping initially and then goes for 750 taping. If the percentage deviation in the volume obtained is above 2% then an additional taping of 1250 is given. The tapped density was calculated by using the formula,

$$\text{Tapped density } (\rho t) = \frac{\text{Mass of powder (M)}}{\text{Tapped volume (Vt)}}$$

4) Compressibility Index and Hausner Ratio:

The compressibility index and Hausner ratio are determined by measuring both the bulk volume and tapped volume of the powder.

Hausner Ratio = Tapped density/ Bulk density.

Carr's index (%) = $[(\rho t - \rho b) / \rho t] \times 100$.

4.9. Evaluation of Post Compression Parameters

1) General Appearance :

Tablets from all batches were randomly selected and evaluated. The general appearances involves the measurements of attributes such as tablet size, shape, color, odour, taste, surface textures, physical flows and consistency.

2) Hardness[10]

Hardness or tablet crushing strength is the force required to break a tablet in a diametric compression. Hardness is referred as the tablet crushing strength. Hardness of the tablet was measured by using Monsanto tablet hardness tester. The values were expressed in Kg/cm^2.

3) Thickness

The thickness of five tablets was measured using digital vernier caliper. The extent at which the thickness of each tablet deviated from ± 5% of standard value was determined. The diameter was also determined by vernier calipers. Six tablets were evaluated to determine the average thickness.

4) Weight Variation Test :

To study weight variation 20 tablets of each formulation were selected at a random and average weight was calculated. Then percentage deviation from the average was calculated. According to IP standards, not more than two of the individual weight deviates from the average weight by more than the percentage shown in the table below.

$$\text{Percentage deviation} = \frac{\text{Initial weight (Wo)} - \text{Final weight (W)} \times 100}{\text{Average weight}}$$

5) Friability Test

The friability of tablets was determined by using Roche Friabilator. Twenty tablets were weighed and placed in friabilator and rotated at 25 rpm for 4 minutes. Then the tablets were taken out, dedusted and reweighed. A maximum loss of weight (from

a single test or from the mean of the three tests) not greater than 1.0 per cent is acceptable for most tablets.

The percentage friability of the tablets were calculated by the formula,

$$\text{Percentage friability} = \frac{\text{Initial weight (Wo)} - \text{Final weight (W)} \times 100}{\text{Initial weight (Wo)}}$$

6) Uniformity Of Dispersion[11]

Tablet is placed in a 200ml beaker with about 100ml of water in it. The system is stirred gently to obtain a smooth dispersion and allow to passes through a sieve screen with a nominal mesh aperture of 710 mm (sieve number 22).

7) Wetting Time and Water Absorption Ratio[12, 13]

Wetting time is closely related to the inner structure of the tablets and to the hydrophilicity of the excipients. It is obvious that pores size becomes smaller and wetting time increases with an increase in compression force or a decrease in porosity. A piece of tissue paper was placed in a Petri dish containing 6ml of water. The tablet was placed on the paper and the time for complete wetting of the tablet was measured in seconds.

Water absorption ratio (R) was then determined according to the following equation:

$$\text{Water absorption ratio (R)} = \frac{Wa - Wb}{wb} \times 100$$

Where, Wb- Weight of the tablet before wetting. Wa- Weight of the tablet after wetting.

8) In-Vitro Dispersion Time:

In-vitro dispersion time was measured by dropping a tablet in a 10 ml measuring cylinder containing 6 ml of buffer solution (pH 7.2).

9) Disintegration Test :[14,15]

The in-vitro disintegration time was carried out by using disintegration test apparatus. Tablet was placed in each of the 6 tubes of the apparatus and one disc was added to each tube and run the apparatus using distilled water maintained at 37±20^{0}C as the immersion liquid. The assembly should be raised and lowered between 28-32 cycles per minute in the distilled water maintained at 37±20^{0}C. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured and recorded.

10) Drug Content Estimation

20 tablets were weighed and powdered. An amount of the powder equivalent to 200mg of Cefixime was dissolved in 100 ml of pH 7.2 phosphate buffer, filtered and diluted suitably and analyzed for drug content at 288 nm using UV-Visible spectrophotometer.

11) Invitro Drug Release Studies:

Dissolution parameters :

Medium : 0.05 M Potassium phosphate buffer

Type : Apparatus type 1(basket)

Rpm : 100

Quantity : 900 ml

Temperature : 37^{0}C±0.50^{0}C

Sampling time : 15 min, 30 min, 45 min

IR Spectral Analysis

FTIR studies were done to detect the possible interactions between the drug and excipients. All the prepared samples were subjected to FTIR spectroscopic studies to determine drug-carrier interaction. FTIR spectra were recorded on samples prepared in potassium bromide (KBr) disks using Fourier Transform IR spectrophotometer (Perkin Elmer, RXi FTIR system). Samples were prepared in KBr disks by means of a hydrostatic press. The scanning range was 400 to 400cm-^{1} and the resolution was 2cm-^{1}.

Accelerated Stability Studies[16]

Stability Studies :

The choice of test conditions defined in this guideline is based on an analysis of the effects of climatic conditions in the three regions of the EC, Japan and the United States. The mean kinetic temperature in any part of the world can be derived from climatic data, and the world can be divided into four climatic zones, I, II, III & IV.

This guideline addresses climatic zones I and II. The principle has been established that stability information generated in any one of the three regions of the EC, Japan and the United States would be mutually acceptable to the other two regions, provided the information is consistent with this guideline and the labelling is in according with national/regional requirements.

Testing condition :

Accelerated : $40^0C \pm 2^0C/75\%$ RH±5%RH

Sampling period : 0, 3 and 6 month(s).

Evaluation studies for stability :

1. Color and appearance
2. Hardness
3. Disintegration time
4. In-vitro dissolution time.

Microbiological Assay Of Cefixime[17]

It is based on the comparison of the inhibition of growth of bacteria by measured concentration of antibiotic under test with that produced by known concentration of standard preparation of antibiotics having known activity. So microbiological assay measures the activity of antibiotic.

The antimicrobial susceptibility of Cefixime Dispersible Tablets was tested by **Kirby –Bauer antibiotic sensitivity test.**

In this method filter paper discs of uniform size were impregnated with different concentrations of Cefixime and then placed on the surface of an agar plate that has been seeded with the organism to be tested. The efficacy of drug was determined by measuring the diameter of the zone of inhibition that results from diffusion of the drug into the medium surrounding the disc. The susceptibility of the organism to a drug was determined by the size of the zone.

Media :

Mueller Hinton Agar No- 2: The media consists of Casein acid hydrolysate, Beef heartinfusion, Starch soluble and Agar.

Preparation of media:

Suspend 38 grams of Muller Hinton Agar media in 1000 ml distilled water, mixed well and heated to boiling to dissolve the medium completely. Then it was sterilized by autoclaving at 15 lbs per square inch pressure at 121^0C for 15 minutes.

Organisms :

The test organisms selected were Escherichia coli, Bacillus subtilis and salmonella colony.

Procedure :

Muller Hinton agar plates were prepared and labelled with name of test organism to be inoculated. A sterile cotton swab was dipped into a well mixed saline test culture and excess inoculums was removed by pressing the saturated swab against the inner wall of the Culture tube. Using the swab, the entire agar surface were streaked horizontally, vertically and around the outer edge of the plate to ensure a heavy growth over the entire surface and all culture plates were allowed to dry for about 5 minutes. Using sterile techniques, 3 wells were made in each agar plate for blank (B) and 4 dilutions(10^{-1} to 10^{-4}). Test sample was serially diluted in saline up to 10-4 dilutions. 100 ml of blank and diluted sample was poured into respective wells and incubated at 30-35^0C for 24 hours. After incubation the diameter of inhibition zone was measured and noted.

5. RESULTS

The present study was undertaken to formulate Cefixime dispersible tablets using two superdisintegrants such as Sodium starch glycolate and Croscarmellose sodium prepared by direct compression method with 3 different concentrations (3%, 6%, 9%) of each superdisintegrant. Before compression the blend was subjected to various evaluation studies such as angle of repose, bulk density, tapped density, compressibility index and Hausner ratio. After compression the following studies such as hardness, thickness, weight variation, disintegration test, water absorption test, drug content estimation, in-vitro release studies, microbiological

studies and accelerated stability studies were carried out. All the results were presented in appropriate tables and figures.

5.1. PREFORMULATION STUDIES

The following Preformulation studies were preformed on Cefixime and excipients.

5.1.1. ORGANOLEPTIC PROPERTIES:

The Organoleptic properties like color, odor, and taste of the API were evaluated. The color of Cefixime was found to be white to off white powder, odourless and slightly sour taste.

5.1.2. EVALUATION OF CEFIXIME (API)

a) Physical characteristics of API

The angle of repose was found to be $28^0.89'$. The bulk density and tapped density was determined as 0.689 g/cm^3 and 0.769 g/cm^3. The Hausner ratio and compressibility index was found to be 1.115 and 10.344 %. The above results revealed that the blend evaluation parameters of API were found to be within the limits indicating good flow properties. The results were represented in table no:4

Table : No. 4. Physical Characteristics of Active Pharmaceutical Ingredients

S.NO	TESTS	RESULTS
1.	Bulk Density	0.689 g/cm3
2.	Tapped Density	0.769 g/cm3
3.	Compressibility Index	10.344 %
4.	Hausner Ratio	1.115
5.	Angle of Repose	28o.89'

b) Particle Size distribution of API (PSD) :

Initial weight of powder = 50gm

Final weight of powder = 49.69gm

Percentage of drug passed = Amount of drug passed × 100

$$\text{Initial weight} = \frac{49.69 \times 100}{50} = 99.38\%$$

From the particle size analysis it was concluded that no particle was retained in any sieve. Almost 99.38% of drug passes through all sieves. Thus the particles size of the API was found to be less than 150µm. The results were represented in table no:5.

Table : No. 5. Particle Size Distribution

Sieve No.	Sieve Size (µ)	Quantity Retained(g)	% Retained	Cumulative %Retained
#20	850	0.00	0.00	0.00
#40	425	0.00	0.00	0.00
#60	250	3.98	8.01	8.01
#80	180	20.52	41.29	49.30
#100	150	0.980	1.97	51.27
Pan	-----	24.21	48.72	99.99

5.1.3. SOLUBILITY :

Cefixime was found to be slightly soluble in water, freely soluble in methanol sparingly soluble in ethanol, insoluble in ethyl acetate. Solubility analysis is important because the drug has to dissolve in the solvents and also in the dissolution medium used.

5.1.4. Drug: Excipients Compatibility Studies :

From the drug excipients compatibility study, it was observed that there was no change or interaction between drug and excipients. Thus it was concluded that the excipients selected for the formulation were compatible with Cefixime.the results of the compatibility. The results were represented in table no:6

Table : No. 6. Drug : Excipients Compatibility Studies

S.NO.	COMPOSITION	DESCRIPTION		
		INITIAL PERIOD	2 WEEKS	4 WEEKS
1.	Cefixime	White to off White powder	NCC	NCC
2.	Cefixime+ Microcrystalline cellulose	White to off white powder	NCC	NCC
3.	Cefixime+ Croscarmellose sodium	White to off white powder	NCC	NCC
4.	Cefixime+Sodium Starch Glycolate	White to off white powder	NCC	NCC
5.	Cefixime+Aspartame	White to off white powder	NCC	NCC
6.	Cefixime+Sucralose	White to off white powder	NCC	NCC
7.	Cefixime+Colloidal Silicon dioxide	White to off white powder	NCC	NCC
8.	Cefixime+Magnesium stearate	White to off white powder	NCC	NCC
9.	Cefixime+Pineapple flavour	White to off white powder	NCC	NCC
10.	Cefixime+Tartrazine lake color	Pale yellow coloured powder	NCC	NCC

NCC : No characteristic change

5.1.5. Water content

The water content is determined titrimetrically by Karl Fischer titration. = 11.78%

5.1.6. Determination Of Amount Of Cefixime To Be Used In A Tablet

The actual quantity of Cefixime to be used in preparation of a tablet containing 200 mg of Cefixime DT can be calculated from the assay value of the active ingredient and the water content by Karl-Fischer method.

Assay on anhydrous basis = 100.26% Water content by KF titration = 11.78 %

Conversion factor = 1.134 %

Required dose = Label claim × Conversion factor
= 200×1.13 = 226.80mg

The required amount of Cefixime was calculated using the formula and was found to be 226.80 mg.

5.1.7. Innovator Product Label Specifications:

The angle of repose was found to be between 25.66 (±0.050) and 32.42 (±0.067). The bulk density and tapped density values were found between 0.556 (±0.003) to 0.601(±0.006), and 0.667 (±0.005) to 0.719(±0.004) g/cm3respectively. The

compressibility index was found between 14.705 % (±0.003) and 17.647 %(±0.016) and the Hausner ratio was found to be in range of 1.071 (±0.024) and 1.172 (±0.016). The above results revealed that the blend evaluation parameters were found to be within the limits indicating good flow properties. The results were represented in table no:7

Table : No. 7. Innovator Product Evaluation Report

S.NO	PARAMETER	REPORT
1	Average weight	436 mg
2	Diameter (mm)	1.2 mm
3	Thickness (mm)	4.32 mm
4	Hardness:(Kg/cm2)	10.4 kg/cm2
5	Disintegration (Min)	23 seconds
6	Dispersibility	30 seconds
7	Drug content	95.70%
8	% drug release	
	After 15mts	78.40 ± 0.823
	After 30mts	84.90 ± 0.786
	After 45mts	90.23 ± 0.921

Post Compression Parameters

The formulated tablets were evaluated for Organoleptic characters. All the tablets showed elegance in appearance. The average weight of all the formulations was found to be between 444 (± 2.00) to 454 (±1.5) mg. The thickness of the tablets was in the range of 5.2 (± 0.03) to 5.42 (± 0.06) mm. The prepared tablets in all the trials possessed good mechanical strength with sufficient hardness in the range of 4 (±0.25) to 5(± 0.16) kg/cm^2. The friability of the tablets were found to be within 1%. The disintegration of tablets containing Sodium starch glycolate as superdisintegrant were comparatively slower than the tablets containing Croscarmellose sodium. This may be due to wicking and swelling ability of Croscarmellose sodium. The percentage of drug content was found among different batches of the tablets and ranged from 98.21 (±1.85) to 100.10 (±0.987)% of which was within the acceptable limits. The wetting time of the tablets were reduced in tablets containing Croscarmellose sodium which may due to wicking effect of croscarmellose sodium. Water absorption ratio was found to be between 90 to 110%. In fineness of dispersion test the tablets from all formulations passed through sieve no.22. The post compression parameters were found to be within the pharmacopoeial limits.The results were represented in table no:8.

Table : No. 8. Post Compression Parameters

S.No	PARAMETERS	F1	F2	F3	F4	F5	F6
1.	Average weight (mg)	451 (± 2.08)	449 (±0.57)	444 (±2.00)	445 (±1.00)	453 (±2.54)	454 (±1.5)
2.	Thickness (mm)	5.4 (± 0.01)	5.2 (± 0.03)	5.38 (±0.01)	5.28 (±0.02)	5.26 (±0.05)	5.42 (± 0.06)
3.	Hardness (kg/cm2)	4.6 (± 0.15)	4.8 (± 0.11)	4.4 (± 0.50)	4.0 (± 0.25)	5.0 (± 0.16)	4.2 (± 0.30)
4.	Friability (%)	0.414 (± 0.04)	0.423 (± 0.03)	0.411 (± 0.01)	0.420 (± 0.04)	0.416 (± 0.015)	0.418 (± 0.06)
5.	Disintegration time (sec)	23 (±0.02)	13 (±0.015)	18 (±0.006)	22 (±0.04)	17 (±0.05)	20 (±0.011)
6.	Drug content (%)	99.82 (±1.05)	100.10(±0.987)	99.05 (±0.198)	98.75 (±1.045)	99.45 (±0.997)	98.21 (±1.85)
7.	Wetting time (sec)	25 (±0.824)	15 (±0.324)	22 (±0.188)	24 (±0.623)	19 (±0.214)	21 (±0.126)
8.	Water absorption ratio (%)	99.763(±1.23)	98.75 (±2.06)	107.43 (±1.87)	109.12 (±0.989)	99.45 (±1.02)	101.15 (±2.65
9.	Fineness of dispersion	Passes	Passes	Passes	Passes	Passes	Passes

*All values are expressed as mean ± SD, n=3.

The dissolution study of Cefixime Dispersible tablets were prepared by direct compression method using superdisintegrants like sodium starch glycolate and Croscarmellose sodium and the results were compared. The drug

release of trial F1, F2 and F3 containing 3%, 6% and 9% Crosscarmellose sodium as superdisintegrant was found to be 89.34% (±0.681), 97.82% (±0.503) and 91.44% (±0.610) respectively. The drug release of trial F4, F5 and F6 containing 3%, 6% and 9% sodium starch glycolate as superdisintegrant was found to be 82.84% (±0.506), 90.98% (±0.434) and 88.35% (±0.187) respectively. Among all these six trials , tablets prepared by using 3%, 6% and 9% Croscarmellose sodium showed a rapid drug release than the tablets prepared with sodium starch glycolate as superdisintegrant. It was observed that when Croscarmellose sodium is used as superdisintegrant, the tablet disintegrates rapidly within less time due to easy swelling ability of Croscarmellose sodium when compared to other tablets prepared by using Sodium starch glycolate. Croscarmellose sodium when comes in contact with water gets inflated and immediately burst out thereby releasing the drug in short duration of time. In all the six formulations, trial F2 containing 6% Croscarmellose sodium as disintegrant shows a rapid drug release. From the above results, 6% Croscarmellose sodium was found an optimum concentration in the formulation of Cefixime dispersible tablets by direct compression method. Based on the results trial F2 was considered as optimized formulation. The results were represented in table no:9

Table : No. 9. In Vitro Drug Release of Cefixime from Formulations F1- F6.

Time (mnts)	F1	F2	F3	F4	F5	F6
	3% CCS	**6% CCS**	**9% CCS**	**3% SSG**	**6% SSG**	**9% SSG**
15	79.46 (±1.293)	86.36 (±0.935)	83.12 (±1.263)	76.65 (±0.364)	82.16 (±0.102)	78.68 (±0.745)
30	83.88 (±1.872)	90.54 (±0.240)	86.22 (±0.133)	80.34 (±0.267)	85.32 (±0.348)	84.52 (±0.867)
45	89.34 (±0.681)	97.82 (±0.503)	91.44 (±0.610)	82.84 (±0.506)	90.98 (±0.434)	88.35 (±0.187)

***All the values are expressed as mean ±SD, n=6.**

Comparative Dissolution Study of Optimized Formulation (F2) and Marketed Formulation.

The dissolution profile of Optimized formulation (F2) was compared with marketed Cefixime dispersible tablets. The results are shown in Table: 10.

Table : No. 10. Comparative Dissolution Study of Optimized Formulation (F2) and Marketed Formulation.

S.NO	TIME (MINUTES)	OPTIMIZED FORMULATION	MARKETED FORMULATION
1	15	86.36 (±0.935)	78.40 (± 0.823)
2	30	90.54 (±0.240)	84.90 (±0.786)
3	45	97.82 (±0.503)	90.23 (±0.921)

The percentage drug release of optimized formulation of Cefixime dispersible tablets was found to be greater than that of marketed product. The percentage drug release was found to be increased by 7.96%, 5.64% and 7.59% at 15 minutes, 30 minutes and 45 minutes intervals in optimized formulation compared to the marketed product.

IR spectral analysis :

The FT-IR studies of pure Cefixime and superdisintegrants were carried out to study the interaction between the drug : superdisintegrants used. It was revealed that there was no difference in the position of absorption bands, hence providing evidence for the absence of interaction of drug with superdisintegrants. The results are shown in Table: 11, 12, 13, 14 and 15 .

Table : No. 11. IR Spectrum of Cefixime

S.No	Wave Number (Cm^{-1})	Signal Assignment
1.	3547.09	O-H stretching
2.	3288.63	NH_2 stretching
3.	2927.94	C-H Aliphatic
4.	1762.94	C=O stretching
5.	1658.78	C=N stretching
6.	1593.20	C=C stretching
7.	1382.96	C-N stretching
8.	1219.01	C-H methylene stretching
9.	1091.71	C-N stretching
10.	678.94	CH_2 Rocking

Table : No. 12. IR Spectrum of Cross Carmellose Sodium

S.No	Wave Number (Cm^{-1})	Signal Assignment
1.	3425.58	O-H stretching
2.	2922.16	Aliphatic C-H stretching
3.	1726.29	C=O stretching
4.	1595.13	C=C stretching
5.	1415.75	C=C stretching
6.	1327.03	C-H ethylene stretching
7.	1267.23	CH_2 stretching

Table : No. 13. IR Spectrum of Sodium Starch Glycollate

S.No	Wave Number (Cm^{-1})	Signal Assignment
1.	3163.26	O-H stretching
2.	2926.01	C-H stretching
3.	1595.13	C=C stretching
4.	1415.75	C=C stretching
5.	1328.95	C-H ethylene stretching
6.	1157.29	C-O-C stretching
7.	1082.07	C-O stretching
8.	1018.41	C-O stretching
9.	761.88	CH2 Rocking

Table : No. 14. IR Spectrum of Cefixime – Cross Carmellose Sodium

S.No	Wave Number (Cm^{-1})	Signal Assignment
1.	3549.02	O-H Stretching of Cefixime
2.	3282.84	NH2 stretching of Cefixime
3.	2922.16	CH Aliphatic stretching
4.	1764.87	C=O ketonic group of Cefixime
5.	1658.78	C=N Stretching of Cefixime
6.	1570.06	C=C Stretching
7.	1361.74	C-H ethylene stretching
8.	1087.85	C-O stretching of ether
9.	783.10	CH_2 Rocking of C fixime

Table : No. 15. Spectrum of Cefixime – Sodium Starch Glycollate

S.No	Wave Number (Cm^{-1})	Signal Assignment
1.	3562.52	OH Stretching of Cefixime
2.	3294.42	NH_2 Stretching of Cefixime
3.	2939.52	CH aliphatic stretching
4.	1768.72	C=O ketonic group of Cefixime
5.	1666.50	C=N stretching of Cefixime
6.	1593.20	C=C stretching
7.	1541.12	C=C stretching
8.	1381.03,1338.60	C-H ethylene stretching
9.	1228.66	CH_2 stretching
10.	1089.78	C-O stretching
11.	669.30	CH_2 Rocking of Cefixime

Accelerated Stability Studies:

The Accelerated Stability study was conducted for optimized formulation according to procedure described in the methodology. There was no significant changes in taste, color and odor at storage condition 40^0C/75% RH. There was no significant variation in the in vitro dispersion time, disintegration time, drug content and in vitro dissolution profiles during the period of 3 months at 40^0C/75% RH of the optimized formulation. The results are shown in table:

The stability study of Cefixime dispersible tablets were carried out at 40^0C/75% RH for a period of three months. The result reveals that there was no change in color, disintegration time, drug content and in vitro drug release. The results were represented in table no: 16

Table : No. 16. Stability Study Results of Optimized Formulation

PARAMETERS	STORAGE CONDITION : 40°C/75% RH			
	INITIAL PERIOD	1 MONTH	2 MONTH	3 MONTH
Color	White to off white color	White to off white color	White to off white color	White to off white color
Taste	Sweet	Sweet	Sweet	Sweet
Disintegration Time (sec)	14 (±0.015)	14.20 (±0.004)	14.32 (±0.012)	14.40 (±0.009)
Drug Content (%)	100.10 (±0.987)	100.08 (±0.123)	99.98 (±0.213)	99.95 (±0.186)
In vitro drug release after 45minutes (%)	97.82 (±0.503)	97.78 (±0.645)	96.88 (±0.786)	96.74 (±0.622)

The results show that the zone of inhibition is increases with increase in concentration of Cefixime. The formulation (F2) exhibited good antimicrobial activity against Bacillus subtilis, Salmonella colony & Escherichia coli. The results were represented in table no: 17

Table : No. 17. Antimicrobial Assay of Cefixime Optimized Formulation (F2)

S.NO	ANTIBIOTIC	CONCENTRATION (µ/ml)	ZONE OF INHIBITION DIAMETER (mm)		
			Bacillus subtilis	Escherichia coli	Salmonella colony
1.	Blank	-	-	-	-
2.	Cefixime DT	2	30	-	40
3.	Cefixime DT	20	25	-	34
4.	Cefixime DT	200	-	28	-
5.	Cefixime DT	2000	-	23	-

6. DISCUSSION

Cefixime is a third generation cephalosporin antibiotic. It is widely used in the treatment of typhoid fever, uncomplicated cervical/ urethral gonorrhoea and otitis media. Drug administration for elderly patients and paediatric patients has become more important due to decline in swallowing ability in the form of conventional tablets. The formulation of dispersible tablets was aimed to administer in a more palatable form by dispersed in water to obtain a dosage form especially for paediatric patients, dysphagic patients, mentally ill and nauseated patients, those with motion sickness, sudden episodes of allergic attack or coughing.

- Under the preformulation studies API characterization and drug excipients compatibility studies were carried out.
- Cefixime dispersible tablets were prepared by direct compression method using croscarmellose sodium and sodium starch glycolate as superdisintegrants in different concentrations.
- The prepared powder blend was evaluated for precompression parameters like angle of repose, bulk density, tapped density, Hausner ratio and compressibility index. The results obtained indicates that it has good flow property for direct compression technology.
- The prepared tablets were evaluated for weight variation, hardness, thickness, wetting time, water absorption ratio, friability, drug content, disintegration time and in vitro drug release. All these parameters were found to be within the pharmacopoeial limits.
- The obtained data suggested that the formulation containing croscarmellose sodium as superdisintegrant shows better wetting time, water absorption ratio, disintegration time and dissolution studies compared to sodium starch glycolate as superdisintegrant. The results shows that the dispersible tablets prepared by using croscarmellose sodium was more superior as compared to sodium starch glycolate.
- Out of six formulations, the formulation F2 containing 6% croscarmellose sodium showed 97.82% (±0.503) drug release after 45 minutes. So the trial F2 was considered as the optimized formulation.
- Comparative in vitro dissolution study of optimized formulation (F2) and marketed product shows that the percentage drug release of optimized formulation was rapid (97.82 % ± 0.503) compared to the marketed product (90.23 % ± 0.921) after 45 minutes.
- IR spectroscopic analysis of drug with superdisintegrants were shows that the drug was compatible with superdisintegrants which was used in the formulation.

- The accelerated stability studies of optimized formulation (F2) at 40oC/75% RH for a period of 3 months indicated that there was no sign ificant changes in taste, color, in vitro dispersion time, disintegration time, drug content and in vitro dissolution profiles. The result shows that the formulation (F2) was stable.
- The antimicrobial activity of the optimized formulation (F2) shows good antimicrobial activity against Bacillus subtilis, Salmonella colony & Escherichia coli.

CONCLUSION

From all the above observations it was concluded that the formulation F2 containing 6% Croscarmellose sodium was better one compared to the other formulations. Due to the rapid disintegration of tablets they can be ingested as a solution after dispersing in water especially for administration to paediatric patients. Thus the study concluded that dispersible tablets of Cefixime can be successfully prepared by direct compression technique using selected superdisintegrant for better patient compliance and effective therapy.

SCOPE OF THE FUTURE STUDY

1. To evaluate the stability of the product by using 6 months stability study.
2. To perform the large scale production.
3. Comparison of the effectiveness of Cefixime dispersible tablet formulation with same strength of Cefixime Dry syrup.

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RESEARCH ARTICLE

Impact of Clinical Pharmacist Interventions on Dyslipidemic Patients and its Outcomes in A Multispeciality Teaching Hospital

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ABSTRACT

The primary objective was to assess the effectiveness of patient counseling counseling with respect to medication use and life style modifications such as diet and exercise in dyslipidemia patients by comparing counseled group with usual care group in a multispecialty teaching hospital. Patients were randomly selected into counseled and usual care groups, with hundred patients in each group respectively. The counseled group received counseling with information leaflets during their initial visit and subsequent visits where as usual care group received at the end of the study. A suitably designed KAP questionnaire was given to both the groups on the first day and also at the final follow-up to assess awareness regarding disease management. This study showed a significant effect on lowering LDL-C levels, elevating HDL-C levels along with reducing TC and TG levels in the counseled group. A significant reduction was observed in TC (12.985±2.874), LDL-C (30.9092 ±5.7591), TG (12.985±2.874) and a significant increase in HDL-C (58.148l±21.224) in the counseled group in the final visit than the usual care group. The KAP scores of the counseled group showed a significant improvement in Knowledge (92.45455±3.856518), Attitude (74.75±4.031129), and Practice (28.01722±1.347377)) in the final visit. Improvement of lipid levels and KAP scores was found to be significant in the counseled group than in the usual care group. This shows that Pharmacist provided Patient counseling has impact on better patient outcomes.

INTRODUCTION

One of the most important roles that pharmacists are currently taking on is one of pharmaceutical care. Pharmaceutical care involves taking direct responsibility for patients and their disease states, medications, and the management of each in order to improve the outcome for each individual patient[1]. Patient counseling is considered as an important component of pharmaceutical care services. Increased numbers of drug therapies, ageing but more knowledgeable and demanding populations and deficiencies in other areas of the health care system seem to be driving increased demand for the clinical counseling skills of the pharmacist[2]. The role of pharmacist has changed dramatically over the past 30 years; traditionally pharmacist has been viewed as individuals who dispense medications to the public. The concept of pharmacy practice has gradually changed from a product oriented activity to a patient oriented one[3]. It is well documented that safe and effective drug therapy occurs most frequently when patients are well informed about medications and their use[4]. It is the responsibility of the pharmacists to counsel patients before dispensing medications. Patient counseling refers to the process of providing information, advice and assistance to help patients to use their medications appropriately. It aims to enhance patients understanding of their illness and its treatment so that they can make informed decisions about medication use[5]. Patient counseling would serve to not only help educate patients about their medications, but also serve to open communication lines further between the pharmacist and the patient. This would allow the pharmacist to give better health care as he / she would be better informed of the patients overall health and could further help the patient in leading a healthier life. The risk and burden of cardiovascular disease is now increasing

very rapidly due to life style changes. Pharmacist's play an important role in managing the risk factors associated with cardiovascular disease in a systematic and concentrated approach by educating in an effective way. The main components of pharmacist provided education for Dyslipidemia patients were regarding their medications, diet and physical activity. Various studies have demonstrated that both medication and lifestyle interventions can prevent cardiovascular diseases. According to World Health Report 2002, Cardio-Vascular Diseases (CVDs) will be the largest cause of death and disability by 2020 in India. In 2020 AD, 2.6 million Indians are predicted to die due to Coronary Heart Disease (CHD) which constitutes 54.1 % of all CVD deaths. Nearly half of these deaths are likely to occur in young and middle aged individuals (30-69 years). The Global Burden of Disease (GBD) study estimates that 52% of CVD deaths occur below the age of 70 years in India thereby resulting in a profound adverse impact on its economy. It is an area where major health gains can be made through the implementation of primary care interventions and basic public health measures targeting diet, lifestyles and the environment[6]. Against the backdrop of ongoing and profound changes in health care delivery systems, a paradigm shift in Pharmacy Practice is occurring. Public health interventions, pharmaceutical care, rational medicine use and effective medicines with low cost are key components of an accessible, sustainable, affordable and equitable health care system which ensures the efficacy, safety and quality of medicines[7]. Primary hypercholesterolemia is an established risk factor for CHD and elevated plasma cholesterol levels have been shown to impose a graded and continuous risk for CHD. It has been firmly established that a reduction of total and low-density lipoprotein (LDL) cholesterol concentrations is accompanied by a decrease in the incidence of CHD morbidity and Mortality[8].

MATERIALS & METHODS

A prospective interventional study was conducted at a teaching hospital, which is multispecialty 900 bedded tertiary care hospital located in the south region of Tamilnadu. We selected 200 significant patients for our study. The protocol of the study was submitted to the Institutional Human Ethics Committee and it was approved by the Committee. Patients who were diagnosed as Dyslipidemia were randomly selected from who were willing to participate in the study were enrolled according to the inclusion and exclusion criteria of the study after obtaining printed informed consent in the colloquial language (Tamil). Data Source utilized were Patient history forms, treatment charts, lipid profile and Hospital Information System (HIS). We included patients of age from 20 to 65 years, (According to desirable range of NCEP ATP III - LDL >100mg/dl, HDL <60mg/dl, TC >200mg/dl, TG >150mg/dl), and patients prescribed with Statins as monotherapy. We excluded patients of age <20 and >65 years, pregnancy, lactation, critically ill patients, patients with life style modification alone and patients not willing to repeat lipid profile. The study had a parallel design with the Patients randomly assigned into two groups, either counseled group or usual care group with hundred patients in each group respectively. Patients in the counseled group were provided counseling regarding their disease, medications and life style modification during their initial visit and subsequent visits. Counseling in their regional language was carried out for 20-25 minutes, each visit at 3 months interval over a period of 6 months. For better counseling the counseled group was provided with information leaflets and the usual care group received counseling and patient information leaflets at the end of the study. Patients in both the groups were on lipid lowering drugs and during their subsequent appointments lipid profile were monitored and documented. In initiating any educational program it is appropriate to evaluate the awareness level of the patients understanding by conducting a Knowledge Attitude & Practice (KAP) study. A suitably designed KAP questionnaire was given to both counseled group and usual care group patients on the first day and also at the final follow-up. The questionnaire consisted of 25 questions, out of these 11 were knowledge related questions and 14 were attitude and practice questions. The knowledge questions, each scored as (1) for correct answer and (0) for an incorrect answer. The practice and attitude questions adhering to the guidelines for disease management was scored as (1) and (0) for non-adherence. The effectiveness of pharmacist provided patient counseling was assessed by analyzing the mean changes in lipid values of counseled group and usual care group and also by evaluating the KAP questionnaire. Statistical analysis by using two- tailed unpaired t test using graph pad.

Table : No. 1. Base line Demographic Data of Patients

Demographic factors		Counseled group (N=100)	Usual care group (N=100)
Age	≤ 40	33%	17%
	40 – 60	43%	67%
	≥ 61	24%	16%
Gender	Male	60%	61%
	Female	40%	39%
Education	Middle school	19%	30%
	Secondary school	51%	45%
	Above school	30%	25%
Body mass index Kg/m2	Normal (18.5 – 24.9)	16%	16%
	Overweight(>25 – 29.9)	42%	48%
	Obese (30 – 39.9)	42%	36%
Social habits	Both(Smoker/Alcoholic)		
	Yes	54%	47%
	No	46%	53%
Duration of disease	0 – 1yr	54%	54%
	2 – 5yrs	25%	36%
	≥ 5yrs	21%	10%
No of drugs in prescription	≤ 3	32%	39%
	≥ 4	68%	61%
Co-morbidity	DM	36%	39%
	HTN	54%	47%
	CHD	10%	14%

RESULTS AND DISCUSSION

The risk and burden of cardiovascular disease is now increasing very rapidly due to life style changes. Pharmacist's play an important role in managing the risk factors associated with cardiovascular disease in a systematic and concentrated approach by educating in an effective way. The main components of pharmacist provided education for Dyslipidemia patients were regarding their medications, diet and physical activity. Various studies have demonstrated that both medication and lifestyle interventions can prevent cardiovascular disease. The primary objective of this study, to assess the effectiveness of pharmacist provided patient counseling by analyzing the mean changes in lipid values of counseled group and usual care group and also by evaluating the KAP questionnaire. Statistical analysis by using two-tailed unpaired t test using graph pad.

In this study, patients with the age group of 40-60yrs were more predominant than other age groups. Most of the patients were overweight/ obese, literate and had minimum duration of this disease than other groups. Patients with co-morbid conditions like Diabetes mellitus, Hypertension were more predominant than Coronary artery disease. Prescriptions with more than four drugs were more predominant than prescriptions with less than three drugs. Majority of the patients were alcoholic and smokers. The criteria

for evaluating the effectiveness of counseling were serum lipid profile namely TC (Total cholesterol), HDL-C (High density lipoprotein), LDL-C (Low density lipoprotein) and TG (Triglycerides). In this study the counseled group showed a significant improvement on lowering LDL-C levels, elevating HDL-C levels along with reducing TC and TG levels during their follow up. In the usual care group there was no much difference in lipid values during their subsequent visits. At the final follow up a significant reduction was observed in TC (202.4±21.877) LDL-C, (97.86±23.4029), TG (188.54±84.5933) and a significant increase in HDL-C (57.74±7.825) for the counseled group. In the usual care group at the final follow up the lipid level changes observed were TC (209.45±24.7163), LDL-C (110.01±21.6899), TG (213.59±71.084) and HDL-C (52.99±9.3078). counseled group for all the lipid parameters, the average difference in lipid levels from baseline and second visit was more significant than from baseline and first visit. In the usual care group for all the lipid parameters the differences in lipid levels between the visits were less significant when compared to the counseled group.

The KAP scores for Knowledge, Attitude and practice of counseled group had a significant difference from baseline and second visit than between baseline and first visit. On evaluating the KAP questionnaire a significant difference in scores between baseline and final visit was observed in the counseled group but not in usual care group. The KAP scores of the counseled group showed a significant improvement in Knowledge (92.45455±3.856518)

Table : No. 2 (a) Analysis of Effectiveness of Counseling (Counseled group)

Lipid Parameters	Baseline Mean±Sd	Visit1 Mean±Sd	Visit2 Mean±Sd	%Change Mean±Sd
TC	232.57±23.2388	217.72±22.14	202.4±21.877	12.98±2.874
HDL	37.41±8.17868	47.67±7.820	57.74±7.825	58.14±21.224
LDL	140.32±22.997	119.59±23.127	97.86±23.402	30.90±5.759
TG	208.98±82.864	198.83±83.473	188.54±84.593	10.86±5.555

The percentage reduction in Total cholesterol of the counseled group was higher (12.9853±2.87457) than the usual care group (10.1177±2.548288). The percentage reduction in Low density lipoprotein of the counseled group was higher (30.9092±5.7591) than the usual care group (24.61±4.1563). The percentage reduction in Triglycerides of the counseled group was higher (10.8671±5.555211) than the usual care group (7.5881±4.448). The percentage increase in High density lipoprotein of the counseled group was higher (58.14849±21.2244) than the usual care group (43.25096±17.19253). Effectiveness of counseling improved patient lipid parameters in the counseled group in such a way that a significant decrease in LDL-C followed by Total cholesterol and Triglycerides. Whereas HDL-C showed a significant increase in the final follow up. In the and Attitude (74.75±4.031129) but for Practice (28.01722±1.347377) less improvement in the final visit. The P value was significant for knowledge and Attitude ($p<0.001$) in the final visit and for Practice it was less significant ($p<0.01$). The percentage increase in knowledge score for the counseled group was higher (60.20161±4.174206) than for the usual care group (6.866937±3.934876). The percentage increase in attitude score for the counseled group was higher (51.79018±0.47608) than the usual care group (4.028167±1.260399). The percentage increase in practice score for the counseled group was higher (28.01722 ±1.347377) than usual care group (3.476546±1.017826). The KAP scores for knowledge and attitude of counseled group had a significant difference in the final visit than for practice.

Table : No. 2 (b) Analysis of Effectiveness of Counseling (Usual care group)

Lipid Parameters	Baseline Mean±Sd	Visit1 Mean±Sd	Visit2 Mean±Sd	%Change Mean±Sd
TC	232.86±24.943	221.28±24.677	209.45±24.716	10.11±2.548
HDL	37.84±9.187	44.64±9.1480	52.99±9.307	43.25±17.192
LDL	145.1±21.942	130.73±22.827	110.01±21.689	24.61±4.156
TG	229.25±68.561	221.28±69.709	213.59±71.084	7.58±4.448

CONCLUSION

This study shows the fact that clinical pharmacist intervention has a positive impact in creating awareness about their disease and thereby increasing their knowledge. The main components of patient education were on medication use, diet and physical activity. Patient counseling has improved knowledge, attitude, practice and also life style changes. Life style modifications can reduce the risk of cardiovascular diseases. Improvement of lipid levels and KAP scores was found to be significant in the counseled group than in the usual care group. A significant change in lipid values was observed in counseling group than in the usual care group. In conclusion pharmacist provided counseling has impact on better patient outcomes.

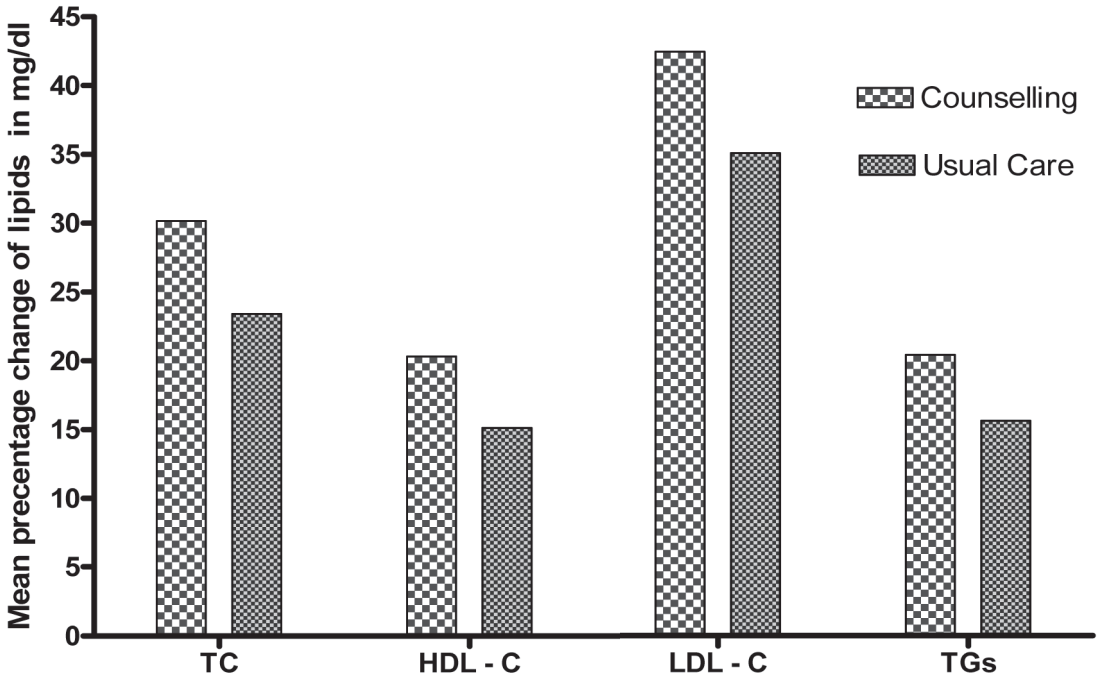
Table : No. 3 (a) KAP Scores for counseled group

Lipid Parameters	Baseline Mean±Sd	First visit Mean±Sd	Second visit Mean±Sd	%Change in Score
Knowledge/11	54.81±11.86	74.18±11.19	89.09±09.06	67.84±30.70
Attitude/04	29.50±4.20	60.75±10.62	85.75±14.36	190.41±23.81
Practice/10	36.30±08.35	43.20±08.74	50.80±06.69	44.08±22.205

Table : No. 3 (b) KAP Scores for usual care group

Lipid Parameters	Baseline Mean±Sd	First visit Mean±Sd	Second visit Mean±Sd	%Change in Score
Knowledge/11	56.90±11.55	60.45±10.92	68.09±11.44	20.83±10.42
Attitude/04	29.50±08.22	32.25±07.41	41.50±06.45	44.91±19.38
Practice/10	34.20±07.59	35.30±08.38	37.40±08.44	09.40±4.02

Fig-1 Comparing mean change in lipids for counseling and usual care group



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The Randomised Observational and Interventional Study on Drug Utilisation Pattern of Xanthene Derivatives in A Multispeciality Hospital

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ABSTRACT

To promote appropriate drug use in multispeciality hospital for xanthene derivatives. A randomised observational and interventional study was carried out for six month period for doxophylline and theophylline. We monitored drug use, drug efficacy and cost effectiveness of each drugs. Study results showed that inappropriateness was high in monitoring adverse events and drug-drug interactions. In contrast dose and medication adherence was found to be appropriate, xanthene derivatives were compared for their efficacy using FEV1 (Forced Expiratory Volume at one second) and found both drugs have almost same bronchodilator activity. Incremental cost effective ratio analysis was done for two drugs; theophylline showed low cost effective ratio which was taken as cost effective drug when compared with doxophylline. The obtained results were disseminated along with criteria to physician; Feedback was obtained from the physician in the form of standard questionnaire. This study proved that drug utilisation studies were effective in improving prescribing practice and reducing treatment errors

Key words : Drug Utilisation; Doxophylline; Theophylline; Forced Expiratory Volume at one second; Incremental cost effective ratio analysis; Physicians Feedback.

INTRODUCTION

Irrational drug use mainly affects the patient safety and efficacy. Coordinated effects between healthcare workers are essential to make rational drug use a reality. Rational drug use (RDU) is conventionally defined as the use of an appropriate, efficacious, safe and cost effective drug given for right indication in right dose, and at right intervals.

Irrational drug use leads to ineffective and unsafe drug treatment, worsening or prolonging of illness and adverse drug reaction. Inappropriate treatment also increases the cost to the patient, government or insurance systems.

Examples of irrational prescribing practices include prescribing drugs of no proven value, prescribing for self–limiting conditions, overdosing and under dosing; prescribing costly drugs and formulations when cheaper are available, using injectable when oral drugs would suffice etc.

The promotion of rational drug use involves a wide range of activities such as adoption of the essential drug concept, training of health professionals in rational drug use and development of evidence based clinical guidelines. Unbiased and independent drug information, continuing education of health professional, consumer education and regulatory strategies are also vital to promote rational drug use.

DUR studies are a time limited investigations that interpret patterns of drug use in relation to predetermined criteria, but do not necessarily assess appropriateness or an attempt to change practice, which is designed to review drug use and prescribing patterns, provide feedback of results to clinicians and other relevant groups, develop criteria and standards which describe optimal drug use and Promote appropriate drug use through developing drug criteria.

METHODOLOGY:

This randomised observational and interventional study was conducted in three phases at Department of Pulmonology of a 900 bedded multi -speciality hospital for about Six months (Feb 2010 – Aug 2011), Phase I includes Literature survey, Pilot study, Drug selection based on FSN analysis, Ethical approval (institutional ethical committee proposal number: 11/048). Phase II involves to develop a criteria for selected drugs based on FDA Guidelines, Preparation of data collection form based on specific drug criteria and Data collection, Phase III involves Cross check the developed criteria and present prescribing pattern, Compare the efficacy of two drugs from same class, Report which drug is cost effective with respect to incremental cost effectiveness ratio, Provide our results to the physician along with predetermined criteria, Collect feedback from physicians in the form of standard questionnaire. The proposed study includes inpatient, narrow therapeutic index, used in most common diagnosis, high-risk patients. This study excludes newly developed drugs, non-formulary drugs, drug given free of cost. The collected data's were analyzed using student't' test.

Drugs were selected based on FSN analysis, FSN analysis was carried out by assessing information from Hospital Information System (HIS) software. Based on our inclusion and exclusion criteria, we selected xanthene derivatives (Doxophylline and Theophylline). A detailed data collection form was prepared which includes patient demographics, social habits, prescriber indicators and consumer indicators. The entire study population (50 patients for each drug) was used for the assessment of rational drug use with respect to predetermined criteria which was prepared using FDA Guidelines for each of four drugs. The prepared drug criteria and present prescribing pattern of selected drugs were cross checked using Prescriber indicators and Consumer indicator.

Efficacy of Theophylline and Doxophylline was compared using FEV1 value. Efficacy was determined using formulae:

Efficacy = FEV1 value before drug therapy - FEV1 value after drug therapy

FEV1 is a good indicator of changes in airway calibre following bronchodilators.

We have compared cost effectiveness of two drugs using incremental cost effectiveness ratio (ICER) Formulae:

ICER = DC/DE

Drug cost (DC) and drug efficacy (DE)

A drug which has lowest ICER was taken as cost effective drug.

The obtained results from the study were disseminated along with developed drug criteria of four drugs to concerned physician. Feedback from physician was obtained using standard questionnaire form.

RESULTS AND DISCUSSION:

The study was analysed for gender, diagnosis, department wise classification, age wise classification, social status, co- morbid condition, and appropriateness of therapy, efficacy and economics for each of the following drugs - Tab. Doxophylline (Drug D), Tab. Theophylline (Drug T).

Age Wise Distribution :

The majority of patients (42%) taking Drug D were aged between 61 – 70 years. Drug T taken by 24% of patients were aged between 51 – 70 years. Therefore the study proves that these drugs are taken by adult patients because they are more prone to chronic obstructive pulmonary disease (COPD), Asthma. Details are presented in table no-1.

Gender Wise Classification:

The male population were prescribed more than females i.e. Drug D 68%, Drug T 80%. Therefore both drugs were given more in men because of their high disease state which may be due to smoking habits and stress. Details are presented in table: 1.

Social Status:

Majority of the patients taking Drug D, Drug T were uneducated and non- vegetarians, Smokers and alcoholics Smoking is major aetiology for causing COPD. Details are presented in table: 1.

Table : No. 1. Patients Demographical Details

Patient demographics		Drug D	Drug T
Age		42% (61 – 70)	24% (51 – 70)
Gender	Male	68%	80%
	Female	32%	20%
Social Status	Alcoholics	70%	72%
	Un- educated	84%	96%
	Non- Veg	80%	76%
	Smokers	60%	36%

Diagnosis wise Classification:

The usage of Drug D was high in COPD patients where as Drug T in Asthma patients. Details are presented in table no-2.

Co - Morbid Conditions:

The most common co-morbidities were hypertension, diabetes mellitus, seizure and ischemic heart disease. In Drug D, dyslipidemia and hypertension were high, where as hypertension was high in Drug T. Details are presented in table no-3.

USAGE OF DRUGS:

The Usage of drugs was evaluated based on prescriber indicators (process and outcome indicators) and consumer indicator.

Justification of the Indicators:

The percentage of appropriateness and inappropriateness of each specification of prescriber and consumer indicators are discussed with respect to indication, dose, monitoring, adverse events, contraindication, drug – drug interaction, medication adherence. Outcome indicators with respect to disease monitoring parameter were also discussed. Details are presented in table no- 4 and

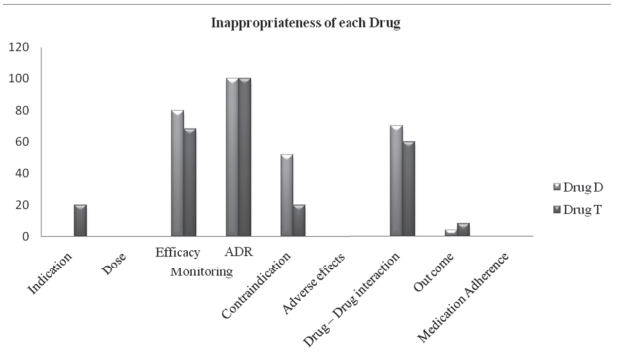
Figure.no- 1

Process Indicators:

Indication:

Drug D was given to 50 patients, among them it was indicated to Asthma 12(24%), COPD 32(64%), and

Figure No. 1 : Inappropriateness of each Drug



acute exacerbation (AE) 6 (12%) which was found to be 100% appropriate as per the study criteria.

Drug T was given to 50 patients, among them it was indicated to COPD 18 (36%) and Asthma 22(44%) which was found to be 80% appropriate as per developed criteria where as 20% inappropriate for Drug T which was taken for old PTB 4(8%), Bronchiectasis 2(4%), Right fibro cavitary lung disease 2(4%) and Lower respiratory tract infection 2(4%) patients as per the study criteria. Details are presented in table no- 4 and figure no- 1.

Dose:

In case of Drug D, the oral dose range is 400 mg – 1200 mg /day in divided dose at every 4 to 6 hours where as for Drug T, the oral dose range was 400 mg – 1000 mg/day in divided dose at every 4 to 6 hours which was indicated for Asthma, COPD, Acute exacerbations, and Apnoea as per the study criteria.

Table : No. 2. Diagnosis wise Classification

Diagnosis	Doxophylline		Theophylline	
	Frequency	Percent	Frequency	Percent
COPD	32	64.0	18	36%
Asthma	12	24.0	22	44%
Acute exacerbation	6	12.0	**	**
Old PTB	**	**	4	8%
Bronchiectasis	**	**	2	4%
Right fibro cavitary lung disease	**	**	2	4%
Lower respiratory tract infection	**	**	2	4%

** *: Not Applicable*

COPD: Chronic Obstructive Pulmonary Disease
PTB: Pulmonary Tuberculosis

Dose given to Drug D and Drug T was correct; hence the appropriateness was 100% for both drugs. Details are presented in table no- 4 and figure no- 1.

Monitoring:

Monitoring of Efficacy:

In case of Drug D and Drug T, PFT (Pulmonary Function Test) should be done before and after therapy to know its efficacy as per the FDA Guidelines.

Only 10 (20%) patients who are taking Drug D was undergone PFT before and after therapy which is shown to be 20 % appropriate , rest of 40 (80%) patients are taken as inappropriate. In majority of the patients PFT was not done due to its high cost (Rs. 500 per test)

For Drug T, 16 (32%) patients undergone PFT before and after therapy which was said to be 32% appropriate therapy, remaining of 68% was said to be inappropriate. Details are presented in table no- 4 and figure no- 1.

Monitoring of Adverse events:

For Drug D & Drug T TDM (Therapeutic Drug Monitoring) should be done to know whether drug concentration (10-20 µg/ml) is within the therapeutic range or not to avoid adverse effects as per FDA Guidelines. TDM was not done for all 50 cases of Drug D & Drug T which is shown to be 100% inappropriate for both drugs. Details are presented in table no- 4 and figure no- 1.

Contraindication:

Contraindication is a condition or factor that might contraindicate or interfere with chosen therapy. Drug D and Drug T were contraindicated in MI (myocardial infarction), CAD (coronary artery diseases), HTN (hypertension), Seizure and Gastric ulcer as per the FDA Guidelines, so Drug D and T therapy was monitored for above mentioned contraindications and it was shown that Drug D was given to 26 (52%) patients for whom it was contraindicated. Among 26 patients, 15 (30%) patients with HTN, IHD (ischemic heart disease) 10 (20%) patients and seizure 1 patient (2%) and it was found that 26 (52%) patients were prescribed inappropriately as per study criteria whereas for 24 patients (48%) it was prescribed without contraindication, taken as appropriate.

While Drug T was given to 8(16%) patients with HTN and 2 (4%) patients with CAD which was shown to be 10 (20%) patients were prescribed inappropriately as per the study criteria. Details are presented in table no - 4 and figure no - 1

Adverse effects:

Drug D and Drug T therapy was monitored for nausea, vomitting, seizures, epigastric pain, tachycardia, and insomia. There was no adverse reaction reported, which was taken as 100% appropriate for both drugs. Details are presented in table no- 4 and figure no- 1.

Drug – Drug interaction:

The interacting drugs were prescribed with the Drug D in 35 patients among 50 patients. In 35 patients, we found 20 patients had been prescribed with interacting drug Tab. Hydrocortisone (mild), 9 patients had been prescribed with interacting drug Tab. Furosemide (moderate) and 6 patient had been prescribed with interacting drug Tab.Rifampicin (severe). Therefore 15(30%) patients prescribed without interacting drugs taken as appropriate therapy whereas 35(70%) patients had been prescribed with interacting drugs inappropriate therapy as per FDA Guidelines.

In Drug T, 30 patients had interacting drugs in their prescription, out of which 20 (40%) patients had mild interaction with Tab. Hydrocortisone, 10 (20%) patients had moderate interaction with Tab. Salbutamol. Therefore total of 20 (40%) patients prescribed without interacting drugs taken as appropriate. Details are presented in table no- 4 and figure no- 1.

Outcome indicator:

In this, patient outcome was measured by using medical records and disease monitoring parameters. For Drug D and Drug T , the disease monitoing parameter was SP02 . This value was monitored using pulse – oximeter , the SPO2 value above 96% was considered as improvement in patients medical condition as per FDA Guidelines.

Table : No. 3. Co - Morbid Conditions

Co morbid illness	Doxophylline		Theophylline	
	Frequency	Percent	Frequency	Percent
IHD	10	20.0	**	**
HTN	15	30.0	8	16%
DM	8	16.0	2	4%
UTI	5	10.0	**	**
Dyslipidemia	20	40.0	**	**
TB	5	10.0	**	**
Seizure	1	2.0	2	4%
Hypothyroidism	**	**	2	4%
Fibro thorax	**	**	4	8%
Cor pulmonale	**	**	2	4%
Respiratory failure	**	**	2	4%
CAD	**	**	2	4%
Bronchiectasis	**	**	4	8%
GERD	**	**	2	4%

** *: Not Applicable*

IHD: Ischemic Heart Disease
HTN: Hypertension
DM: Diabetes Mellitus
UTI: Urinary Tract Infection
TB: Tuberculosis
CAD: Coronary Artery Disease
GERD: Gastro Esophageal Reflux Disease

For Drug D, 48 (96%) patients has shown improvement taken as 96% appropriate where as 2 (4%) patients not improved,was considered as inappropriate.

Table : No. 4. Inappropriateness of Each Drug

INDICATORS		Drug D	Drug T
Indication		0%	20%
Dose		0%	0%
Monitoring	Efficacy	80%	68%
	Adverse events	100%	100%
Contraindication		52%	20%
Adverse effects		0%	0%
Drug – Drug interaction		70%	60%
Out come		4%	8%
Medication Adherence		0%	0%

For Drug T, 46 (92%) patients has shown improvement, rest 4 (8%) were not improved which was shown to be 92% appropriateness. Details are presented in table no- 4 and figure no- 1.

COMPARISON OF EFFICACY:

Patients who have undergone specific disease monitoring test before and after therapy of selected drugs were taken to compare efficacy.Drug D and Drug T which are xanthine derivatives were compared by using FEV1 (important parameter to know breathing status in PFT) values. Details are presented in table no- 5.

COST EFFECTIVE ANALYSIS:

Cost effective drug determined by Incremental Cost Effective Analysis. Details are presented in table no- 6.

STUDY LIMITATIONS:

The study may be extended to other departments of the hospital including a larger sample size.

Table : No. 5. Mean efficacy value of Doxophylline and Theophylline

Efficacy	Group 1(Doxophylline)	Group 2(Theophylline)
FEV1	1.277	1.057

FEV1: Forced Expiratory Volume at one second

Table : No. 6. Cost Effective drug among Doxophylline and Theophylline done using ICER

	Doxophylline	Theophylline
Drug cost	Rs. 5.95	Rs. 0.68
Drug efficacy	1.277	1.057
DC/DE	46.5%	6.4%
Lowest ICER was seen in Drug T which was said to be cost effective		

ICER: Incremental Cost Effective Ratio
DC: Drug Cost
DE: Drug Efficacy

A comparative study can also be carried out to assess the risks and benefits in patient groups following and not following FDA guidelines.

Comparing outcomes could give us an idea to what extent these criteria are relevant in clinical practice and influence the prognosis of patients

CONCLUSION:

In this study, prescriber and consumer indicators of two drugs were observed. The majority of patients in the study were 51 – 70 years; most of them are men who were uneducated, smokers and alcoholics. Inappropriateness was found to be high in monitoring adverse events and drug-drug interactions. In contrast dose and medication adherence was found to be appropriate. The selected drugs were compared for their efficacy, Drug D and Drug T having similar efficacy. Incremental cost effective ratio analysis was done; in xanthine derivatives theophylline showed low cost effective ratio. Education is the most immediate current need; concerned physicians in pulmonology have been given a copy of developed criteria for two drugs along with our obtained results. Feedback was obtained from the physician in the form of standard questionnaire, in which most of physicians accepted our criteria, except in case of selecting doxophylline rather than theophylline. The reason said by the physician for selecting doxophylline was because of its more safety and efficacy. But the study outcome proved that oral theophylline may not produce fatal adverse effects and it can be used instead of doxophylline where many patients are affordable for theophylline because of its low cost. Hence this study proved that drug utilisation studies are effective in improving prescribing practice and reducing treatment errors.

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Development and Validation of Spectrophotometric Methods for The Determination of Efavirenz In Pharmaceutical Dosage Form

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ABSTRACT

Two simple and precise spectrophotometric methods (A and B) were developed for the estimation of efavirenz (EFZ) in bulk drug as well as in pharmaceutical dosage form(tablets). Methods A is a simple standard absorbance method by UV spectrophotometry in which EFZ exhibited absorption maximum at 243nm. Method B is Second derivative UV spectrophotometric method. The second derivative spectrum shows well-resolved trough from excipients. Beer's law was obeyed in the concentration range of 4-24 µg/ml for methods A and B. The proposed methods were statistically validated and found to be useful for the routine determination of EFZ in tablets.

Key words : Efavirenz, Standard absorbance, Second derivative, Tablets, Validation

INTRODUCTION

Efavirenz is an antiviral medication that prevents human immuno deficiency virus (HIV) cells from multiplying in our body. Chemically it is (+)6-chloro-4-cyclopropylethynyl-1,4-dihydro-4(trifluoromethyl)2H-3,1 benzoxazin- 2- one1. Literature review revealed very few analytical methods including RP-HPLC, HPTLC and UV-spectrophotometry for determination of EFZ in plasma, bulk drug and pharmaceutical formulations[2-8]. In the present work, two simple and sensitive spectrophotometric methods (A and B) have been developed for the estimation of EFZ in bulk drug and pharmaceutical dosage form. The present work deals with the estimation of EFZ in tablets by a simple UV Spectrophotometric method[9] (Method A) and Second derivative spectrophotometric method[10] (Method B). Spectrophotometric parameters are established for standardization of the methods including statistical analysis of data.

EXPERIMENTAL

Instrument:

All spectral and absorbance measurements were made on Shimadzu UV-Vis Spectrophotometer-1650.

Standard solution of EFZ :

A 1mg/ml stock solution of EFZ was prepared by dissolving 100mg of drug in 100ml of ethanol.

Sample preparation :

Twenty tablets were weighed. A quantity equivalent to 100mg of EFZ was weighed accurately, transferred to a beaker, dissolved in ethanol, filtered through Whatmann filter paper No.1 into a 100ml volumetric flask and made up to volume with ethanol to get a concentration of 1mg/ml .

Assay :

Method A :

Aliquots of EFZ ranging from 0.1 – 0.6 ml (1.0 ml = 1000 µg) were pipetted out into a series of 25ml volumetric flasks and made upto volume with ethanol. The absorbance of the solutions were measured at 243nm against the reagent blank. The λ_{max} of EFZ is shown in Fig.1. The analytical curve was constructed by plotting concentration versus absorbance.

Method B :

Aliquots of stock solution of EFZ were suitably diluted with ethanol to give varying concentrations ranging from 4-24 µg/ml. The solutions were scanned in the spectrum mode in the wavelength range of 400-200nm. The resulting spectra were derivatised to get second order derivative spectra. The second derivative spectrum of EFZ is shown in Fig.2. The amplitudes of the corresponding troughs were measured in mm and plotted against the concentration.

Sample Analysis :

Pharmaceutical formulation of EFZ was successfully analysed by the proposed methods. Appropriate aliquots were subjected to the above methods and the amount of EFZ was determined from the calibration curves.

Results and Discussion :

The optical characteristics such as absorption maxima, Beer's law limits, molar absorptivity and Sandell's sensitivity are furnished in Table-1. The regression characteristics like slope(m), intercept(c), correlation co-efficient(r), percent relative standard deviation(% RSD) and standard error(SE) were calculated and the results are summarized in Table-1. The results of sample analysis showed that the drug determined by the proposed methods was in good agreement with the label claim proving the accuracy of the proposed methods. The results of sample analysis are furnished in Table-2.

To study the accuracy and reproducibility of the proposed methods, recovery experiments were carried out by adding a known amount of drug to preanalysed sample and the percentage recovery was calculated. The results are furnished in Table-2. The results indicate that there is no interference of other ingredients present in the formulations. Thus, the proposed methods are simple, sensitive, economical, accurate and reproducible and useful for the routine determination of EFZ in bulk drug and its pharmaceutical dosage forms.

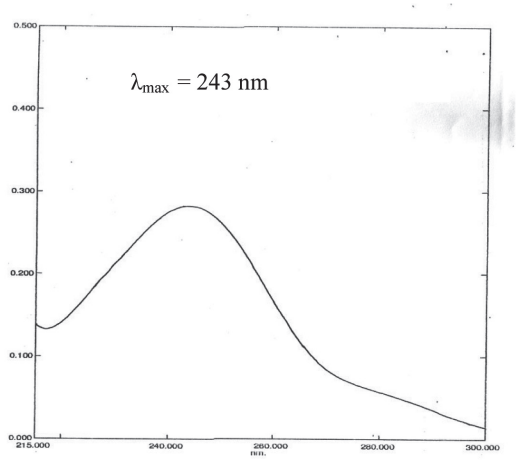

Fig.1: λ_{max} of EFZ by Method A

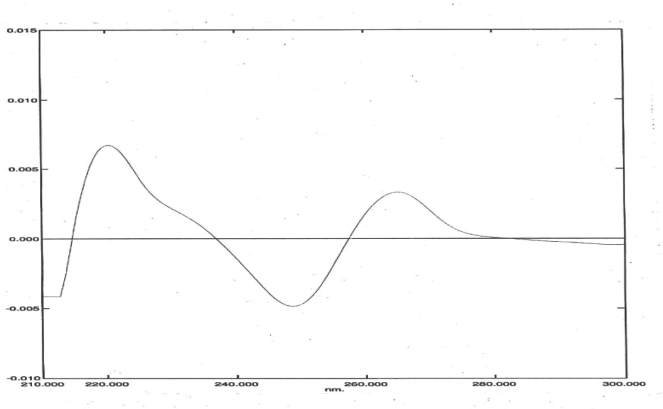

Fig.2: Second derivative spectrum by Method B

Table : No.1. Optical and Statistical parameters by methods A and B

Parameters	Method A	Method B
Absorption maximum/ Wavelength range(nm)	243	243
Linearity Range(µg/ml)	4-24	4-24
Correlation coefficient	0.996	0.999
% RSD	0.0469	0.0673
Standard Error(SE)	0.0114	0.0116
Regression Equation y=mx+c	0.068x+ 0.0473	0.1466x+ 0.3728
Intercept (c)	0.0473	0.3728
Slope (m)	0.068	0.1466
Sandell's Sensitivity (µg/cm^2/0.001A unit)	0.0014	-
Molar absorptivity (Lmol-^{1} cm-^{1})	1.725 x 103	-

Table : No.2. Assay and recovery of EFZ in dosage form

Method	Labelled amount(mg)	Amount obtained(mg)*	Percentage recovery**
A	600	599.98	100.02%
B	600	600.02	99.99%

**Average of six determinations*

***Average of three determinations*

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Study on Prevalence of Diseases and Prescribing Pattern of Drugs In Pediatrics In An Outpatient Community Pharmacy

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ABSTRACT

The objective of the present study was to analyze the prevalence of diseases, present prescribing pattern of drugs and its appropriateness in pediatrics. To identify the most common category of drugs prescribed and rational use of antibiotics in pediatrics. The study was planned to conduct in an outpatient community pharmacy at Eraviperoor, Pathanamtitta District, and Kerala. A specially designed data entry format was used to note the details of the patient. A total of 110 cases screened with or without prescription, Out of which the prevalence of diseases were more in females than males. The risks of diseases were more in age between 1-4 years and body weight between 6-12 kg. The pattern of diseases more were RTI(34.55 %) ,GI disorder (16.36 %) and the drug therapy revealed that antibiotics(23.6 %)were prescribed more followed by NSAIDS and cough suppressant .The route of administration of drug per prescription indicate that oral route were more practiced . The categorization of antibiotics showed that the penicillin was prescribed more than other antibiotics. The study revealed that the prevalence of diseases was more and the drug utilization pattern in the present study was found to be semi rational.

Key words : Pediatrics, Prevalence, Community pharmacy, Drug utilization.

INTRODUCTION

The study of prescribing pattern of drugs is an important component of medical audit which helps in monitoring, evaluating and making necessary modification in the prescribing practices to achieve a rational and cost effective medical care .A study of prescription pattern should help in accessing the quality of health care services[1]. There is evidence that irrational use of drugs is a common occurrence throughout the world. Infants and children suffer from frequent but usually no serious illness. Drug use in pediatric is not extensively researched and the range of licensed drugs in appropriate dosage form is limited. Drug therapy is considered to be major component of pediatric management in health care setting. Effective medical treatment of pediatric is based upon an accurate diagnosis and optimum course of therapy, which usually involves a medication regimen [2].

MATERIAL &METHODS :

Study design and patients[1]:

The study was planned to conduct in an outpatient community pharmacy Eraviperoor, Pathanamthita, District, Kerala. A pilot scale study was carried out for a period of 5 days in the community pharmacy to find the scope of the study in selected area. It was found that many of pediatrics drugs were dispensed with or without prescription. The study was planned to carry out for a period of four months from June 2011 to September 2011.All categories of pediatrics drugs included in the study and children above the age of 4 yrs were excluded. A specially designed data entry format was used to note the details of the patients include sex, age, diagnosis, drugs practiced, dosage, route of administration.

Data analysis :

The collected data were analyzed for its appropriateness and suitability by using SPSS version 11. From the data analysis results were obtained about the prescribing pattern of drugs in pediatrics under the age of 4 yrs were submitted to the pharmacy for further proceeding.

RESULTS AND DISCUSSION :

Out of 110 cases, it is found that the prevalence of diseases were more in females 70% (N=77) than in males 30% (N=33).(Figure-1).The result of age categorization revealed that risk of diseases were more in age group between 1-4yrs 49.09% (N=54) followed by 34.54% (N=38) in infants of age 4wks-1yr.(Figure-2).The result body weight status revealed that the prevalence of diseases were more in patients with body weight between 6-12 kg 45.45% (N=25) followed by 12-18 kg 32.72%(N= 36).(Figure-3). The result on drug therapy revealed that antibiotics 23.6% (N= 26) were prescribed more followed by NSAIDS 16.11% (N=18) cough suppressants 14.54% (N=16) and OTCs were 11.8% (N=13). (Figure-5). These four studies were compared with the study on prescription pattern of drugs in OP department of childcare centre in Moradabad city was carried out by Khan. N.A and his team (2010)[1].The study showed that the pattern of diseases more were RTI 34.55% (N=38) and GI disorder about 16.36% (N=18).(Figure-4). The categorization of antibiotics showed that the penicillin 47.2 %(N=52) was prescribed more followed by cephalosporin 25.45% (N=28). (Figure-8).These two results were compared with the evaluation study on assessment of antibiotic use in pediatric in a tertiary care teaching hospital conducted by Rajeswari R and his team (2008)[2,3].Route of administration per drugs in each prescription indicated that oral route 68.18% (N=75) were more practiced. The study on dosage form per drugs revealed that syrups 54.5 %(N=60) were found to be more followed by drops 18.18 %(N=20). (Figure-6&7). A similar study was carried out by Thakur.S.R, and his team on utilization pattern of antibiotics in pediatric patient (2007)[2]. The average of 3 drugs per prescription was about 45.45%(N=50).(Figure-9). A similar study conducted by K.V. Georgekutty, a study on prescription pattern Madurai city(2002)[4] .The study showed that patient compliance 66.36% (N=73) were more than non-compliance 33.63%(N=33)[7].

CONCLUSION :

The study revealed that the prevalence of disease was predominantly more in females than in male patient of age group between 1-4 years. RTI was found to be the most common disorder of the study population. The most commonly prescribed drugs were found to be antibiotics follower by NSAIDs. Study on dosage form revealed that syrups were more used and oral route of administration were practiced more in the study population. The study revealed that the prevalence of diseases and utilization pattern in pediatrics was found to be semi rational.

AKNOWLEDGEMENTS:

We would like to thank the community pharmacy authorities for their cooperation. We thank all the faculties and our friends for their support and encouragement.

FIGURE- 1
SEX DISTRIBUTION OF PATIENTS STUDIED (N=110)

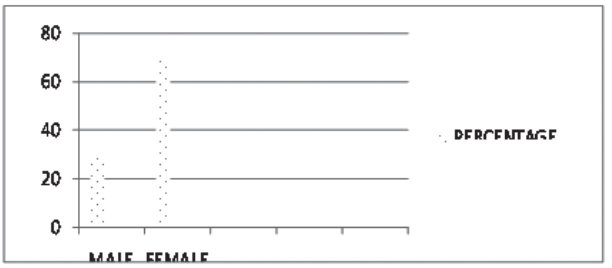


FIGURE-2
AGE DISTRIBUTION OF THEPATIENTSSTUDIED (N=110)

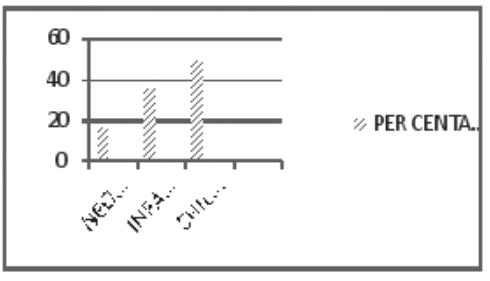


FIGURE- 3
BODY WEIGHT STATUS
(N=110)

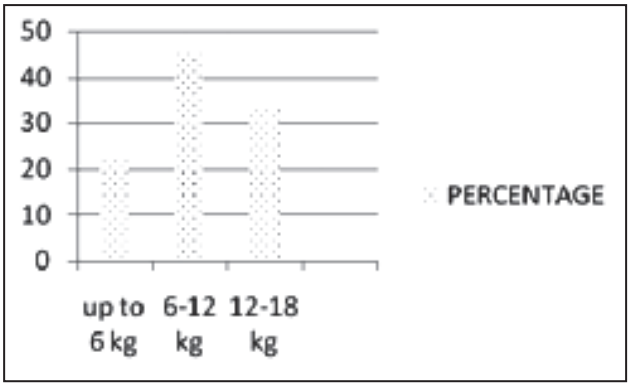


FIGURE- 4
PREVALANCE OF DISEASES
(N=110)

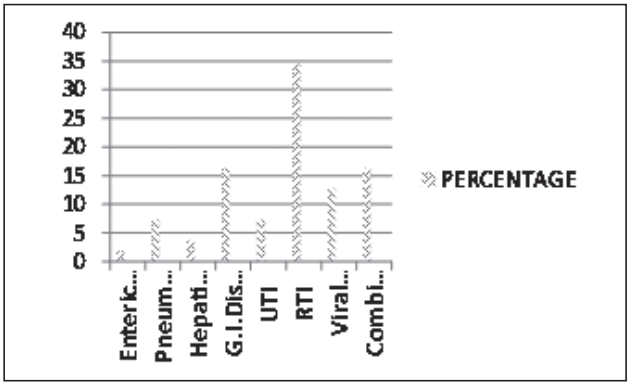


FIGURE- 5
CATEGORIES OF DRUGS
(N=110)

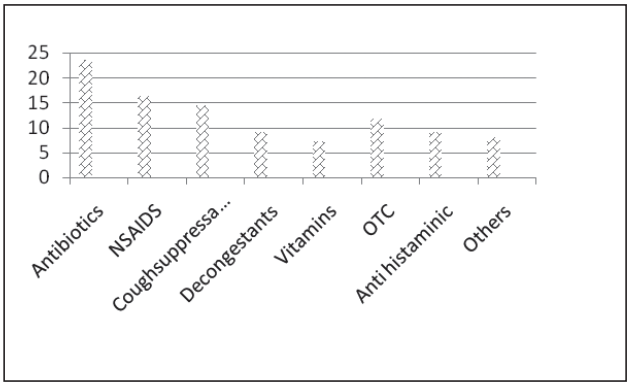


FIGURE- 6
DOSAGE FORM OF DRUGS PRESCRIBED
(N=110)

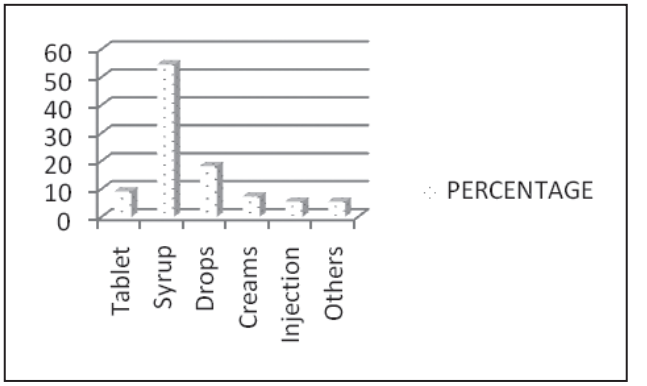


FIGURE- 7
ROUTE OF ADMINISTARTION OF PRE-CRIBED DRUGS STUDIED
(N=110)

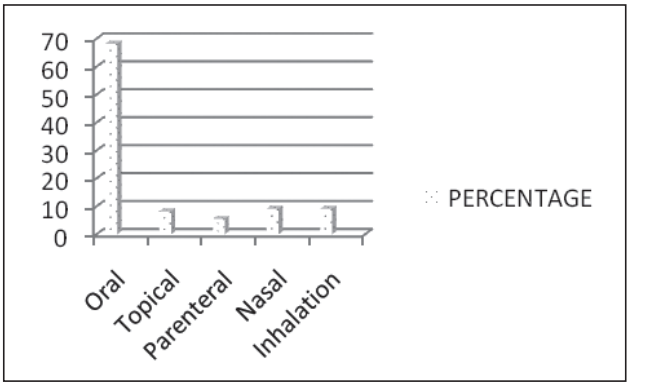


FIGURE- 8
CATEGORISATION OF ANTIBIOTICS
(N=110)

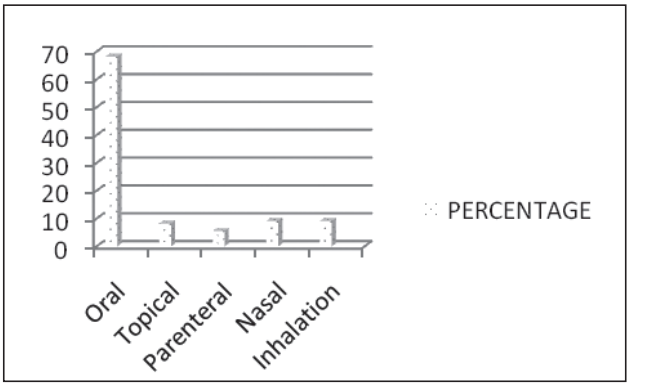


FIGURE- 9
NUMBER OF DRUGS PER PRESCRIPTION
(N=110)

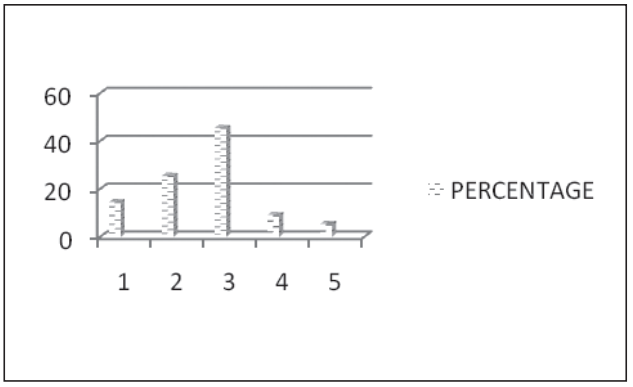
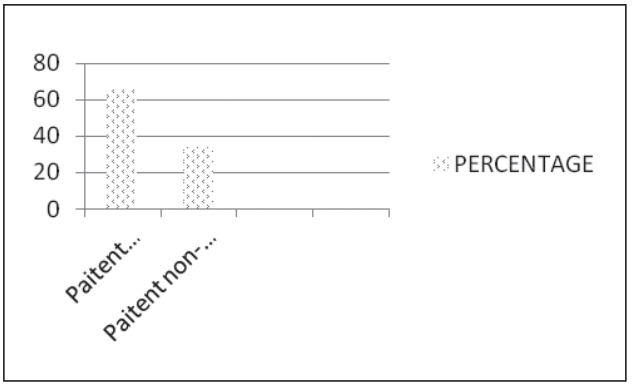


FIGURE- 6
PAITENT COMPLIANCE
(N=110)



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