International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1728-1736 www.ijprajournal.com ISSN: 2456-4494

Formulation and Evaluation of Nifedipine Sustained Release Matrix Tablet Using Different Grade of Hpmc

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Submitted: 15-04-2022 Accepted: 30-04-2022

ABSTRACT :-The main objective of the study was to develop Nifedipine sustained release tablet using different grade of HPMC. Nifedipine is a dihydropyridine derivative mainly used for the treatment of Hypertension. This drug is classified as the calcium channel blocker and inhibit the transmembrane influx of extracellular calcium ions in to myocardial and vascular smooth muscle cells , causing dilatation of the main coronary and systemic arteries and decreasing myocardial contractility . In the present study nine formulations with variable concentration of polymers (HPMC-K100, HPMC-K4) were prepared by the using direct compression method and after that evaluated for physicochemical properties, total floating time, buoyancy lag time, and also in-vitro drug release. The results indicated that optimized formulation F 6 on immersion in 0.1N HCl solution at pH 1.2 & 6.8 pH phosphate Buffer at 37±0.50C tablets immediately and remain buoyant up to 12 hrs without disintegrate ion.

KEY WORDS: Nifedipine, HPMC-K100, HPMC-K4

I. INTRODUCTION:

The introduction of matrix tablets in the field of pharmaceutical technology has given a new breakthrough for the novel drug delivery system in the form of time releases. In the form of this dose, external complex production processes like coating and palletation during manufacturing and drug release rates are mainly controlled by the type and proportion of polymers used in preparations. Scientists have given more attention to the development of continuous release or due to the complexity and expenditure involved in the marketing of new drug units

The sustained release formulation is those which give slow but prolonged action. I.e. giving action for a long period of action without hampering the drug concentration. Sustained release formulation maintains uniform drug plasma concentration. But the all type of medicaments cannot be administered through the sustained release drug delivery. Enteric coated tablet and capsule, implantable tablet are the example of this type of system. Reservoir type of mechanism is associated with this type of system.

- Prolonged action
- Enhancement of half-life of drug
- Slow action
- Poor dissolution rate
- Site specific action
- Enteric coated materials & Tablet hardness
- Natural & Synthetic polymer

MATERIAL: Nifedipine provided by Anode pharma, Kanpur, Ethyl Cellulose, H.P.M.C. K 100, H.P.M.C. K 4 by Merck Limited (India), Talc , Magnesium Sterate S.D Fine Chemicals Mumbai, India

NIFEDIPINE MATRIX TABLET PREPARATION :-

First of all take the drug, polymer and other excipients which is selected and were passed through 40- mesh sieve. And properly weighed the quantity of drug, polymer and excipients which is requiring and transferred safely into polyethylene bag and the blended was mixed for minimum 15 min. The blend found was then lubricated the blend by adding 1% magnesium stearate and mixed again for another 5 min.

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Table:1- formulation composition of nifedipine tablets

INGREDIENTS	N1	N2	N3	N4	N5	N6	N7	N8	N9
Nifedipine Hydrochloride	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
HPMC K 4	2.400	2.700	3.000	-	-	-	1.200	1.350	1.500
HPMC K 100	-	-	-	2.400	2.700	3.000	1.200	1.350	1.500
Lactose	1.290	0.990	0.690	1.290	0.990	0.690	1.290	0.990	0.690
Talc	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
Magnesium stearate	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
Total Weight	4.800	4.800	4.800	4.800	4.800	4.800	4.800	4.800	4.800

II. RESULT

PHYSICAL APPEARANCE OF DRUG

White to off white powder, Odor less Crystalline Powder.Melting point of drug is found to be 174-175°c by using Capillary fusion method.The percentage of loss on drying was 0.0168 %w/w. The compressibility index of Nifedipine is 29.36%.The Moisture content of Nifedipine is 0.964 %.Bulk density of nifedipine Untapped Density is 0.242 g/cc and Tapped Density(after 50 tapping) is 0.342 g/cc and Standard value of hausner ratio is 1.25.The Angle of repose of Nifedipine is 30 degree.

DISSOLUTION

In vitro drug release study of Matrix tablet

Time	% Cumulative Drug Release								
(hr)	N1	N2	N3	N4	N5	N6	N7	N8	N9
0.5	08.23	07.14	07.23	08.23	07.23	07.45	08.32	07.26	07.28
1	12.32	10.23	11.45	10.45	10.45	11.23	12.23	11.87	12.56
1.5	26.23	22.42	24.23	23.76	31.23	38.23	32.13	26.28	18.58
2	42.45	40.32	45.23	44.23	48.23	46.32	47.14	38.21	40.28
3	76.34	66.11	67.21	65.71	50.56	67.02	71.13	68.24	56.98
4	82.23	77.33	75.11	82.34	55.00	88.13	91.23	89.12	73.98
6	82.55	97.13	87.13	83.00	56.00	99.13	92.00	99.25	84.16
8	83.00	97.10	94.24	83.21	57.25	99.99	93.00	99.56	89.26
12	84.21	97.23	99.26	83.50	57.85	99.87	94.56	99.76	94.56

TABLET THICKNESS

Formulation code	Thickness(mm)
N1	3.90 ±0.05
N2	3.89 ±0.09
N3	3.90 ±0.04

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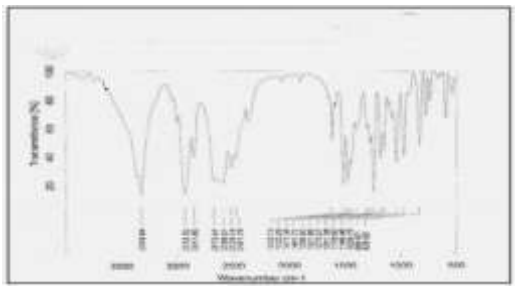
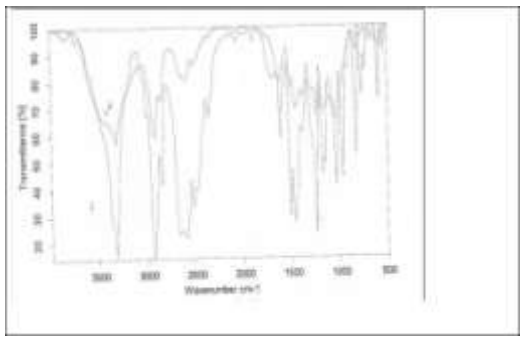
N4	**3.90 ±0.03**
N5	**3.88 ±0.08**
N6	**3.89 ±0.06**
N7	**3.87 ±0.08**
N8	**3.89 ±0.02**
N9	**3.86 ±0.05**

FTIR Spectroscopy:
Sample of pure Nifedipine



FT-IR Spectrum of Pure Drug (Nifedipinee Hydrochloride)
FTIR Spectrum of HPMC- K100



FT IR Spectrum of Nifedipine&HPMC-K100

RELEASE KINETICS OF NIFEDIPINE MATRIX TABLET Zero order release kinetics data Nifedipi ne Matrix tablet with HPMC K-4 as Binder

Time in	**% Cum.**	**Drug**	**Release**
minutes	**N1**	**N2**	**N3**
0	**0**	**0**	**0**
0.5	**08.22**	**07.15**	**07.22**

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1	12.32	10.23	11.45
1.5	26.22	22.41	24.24
2	42.44	40.32	45.22
3	76.35	66.12	67.20
4	82.23	77.32	75.11
6	82.53	97.12	87.12
8	83.00	97.10	94.23
12	84.22	97.24	99.25

Zero order release kinetics data Nifedipine Matrix tablet with HPMC K-4 as Binder

Zero order release kinetics data Nifedipine Matrix tablet with HPMC K-100 as Binder

Time in	% Cum.	Drug	Release
minutes	N1	N2	N3
0	0	0	0
0.5	08.21	07.22	07.22
1	10.41	10.44	11.45
1.5	23.75	31.25	24.24
2	44.22	48.23	45.22
3	65.72	50.54	67.20
4	82.34	55.00	75.11
6	83.01	56.01	87.12
8	83.22	57.24	94.23

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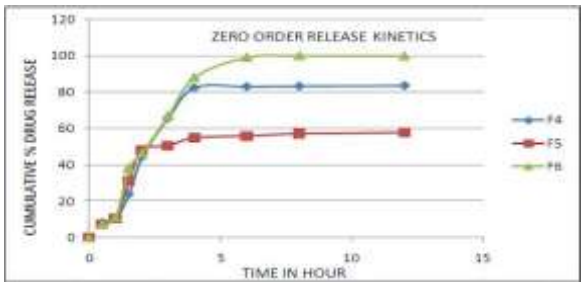
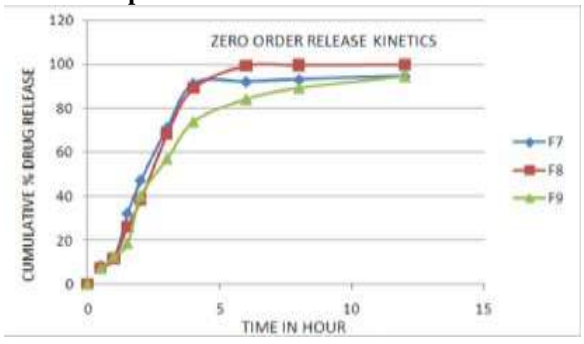
12	83.50	57.84	99.25



Zzero order release kinetics data Nifedipine Matrix tablet with HPMC K-100 as Binder

Time in minutes	% Cum. Drug Release		
	N1	N2	N3
0	0	0	0
0.5	08.33	07.25	07.27
1	12.22	11.86	12.55
1.5	32.12	26.27	18.59
2	47.13	38.22	40.29
3	71.12	68.23	56.98
4	91.23	89.11	73.98
6	92.00	99.25	84.16
8	93.00	99.57	89.26
12	94.56	99.70	94.56

Zero order release kinetics data Nifedipine Matrix tablet with HPMC K-4 + HPMC K-100 as Binder



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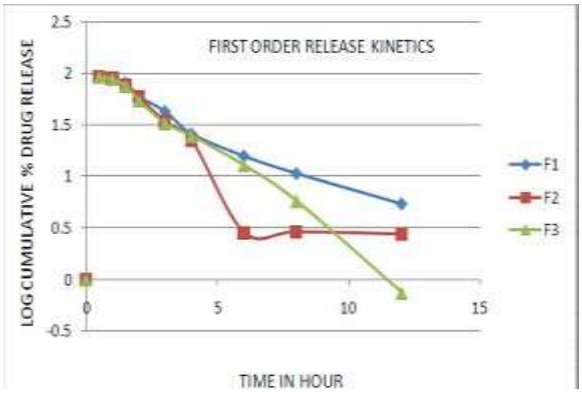
Zero order release kinetics data Nifedipine Matrix tablet with HPMC K-4+ HPMC K-100 as Binder first order release kinetics data Nifedipine Matrix tablet with HPMC K-4 as Binder

Time in	% Cum.	Drug	Release
minutes	N1	N2	N3
0	0	0	0
0.5	1.966	1.967	1.967
1	1.941	1.952	1.946
1.5	1.911	1.889	1.878
2	1.776	1.775	1.738
3	1.532	1.530	1.515
4	1.415	1.354	1.395
6	1.198	0.456	1.109
8	1.031	0.461	0.761
12	0.735	0.442	-0.13



: first order release kinetics data Nifedipine Matrix tablet with HPMC K-4 as Binder

First order release kinetics data Nifedipine Matrix tablet with HPMC K-100 as Binder

Time in	% Cum.	Drug	Release
minutes	N1	N2	N3
0	0	0	0

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0.5	1.962	1.967	1.966
1	1.952	1.952	1.948
1.5	1.882	1.837	1.790
2	1.746	1.714	1.729
3	1.535	1.694	1.518
4	1.246	1.653	1.074
6	1.230	1.643	1.025
8	1.225	1.630	1.026
12	1.217	1.624	1.036

First order release kinetics data Nifedipine Matrix tablet with HPMC K-100 as Binder

First order release kinetics data Nifedipine Matrix tablet with HPMC K-4 + HPMC K-100 as Binder

Time in	% Cum.	Drug	Release
minutes	N1	N2	N3
0	0	0	0
0.5	0.293	1.967	1.967
1	0.288	1.945	1.941
1.5	0.271	1.866	1.910
2	0.252	1.790	1.776
3	0.176	1.501	1.633
4	0.0153	1.035	1.415
6	-0.906578	0.124	1.199
8	-0.4485	0.356	1.031
12	-0.2083	0.619	1.735

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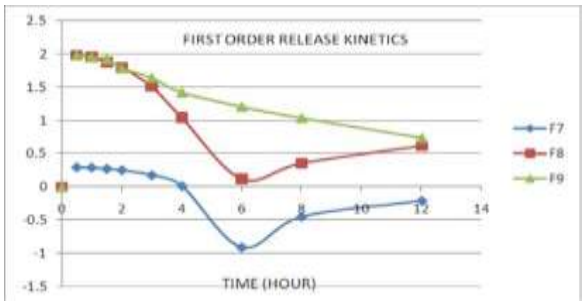

First order release kinetics data Nifedipine Matrix tablet with HPMC K-4 + HPMC K-100 as Binder

III. DISCUSSION

In the present study nine formulations with variable concentration of polymers (HPMC-K100,HPMC-K4) were prepared by direct compression method and evaluated for physicochemical properties, buoyancy lag time, total floating time, and in-vitro drug release. The results indicated that optimized formulation N 6 on immersion in 0.1N HCl solution at pH 1.2 & 6.8 pH phosphate Buffer at 37±0.50C tablets immediately and remain buoyant up to 12 hrs without disintegration. The two main two factors are required for the tablet to acquire bulk density < 1, just because it will remains buoyant on the gastric fluid.

The drug release data of the optimized formulation after in vitro testing was subjected to positiveness of fit test by linear regression analysis according to zero order, first order kinetic equation, Higuchi's and Korsmeyer's models in order to determine the mechanism of drug release. When the regression coefficient values of were compared, it was observed that 'r' values

of Higuchi was maximum i.e. 0.978 hence indicating drug release from formulations was found to follow Higuchi kinetics.

We are thinking of developing matrix drug delivery system of drugs only due to recent advance in technology. In present study matrix tablet of Nifedipine was prepared and evaluated. This tablet contains layer of API which called matrix layer. This tablet may helpful for reducing multi dosing therapy in depressed patients experience difficulty in taking multi dose of drug.

Suitable analytical method based on UV visible spectrophotometer was developed for Nifedipine. λ max of 276 nm was identifying HCL solution.From the FT-IR spectra the interference was verified and found that Nifedipine did not interfere with the polymers and excipients used.Direct compression method was established to manufacture matrix tablet of Nifedipine.

First of all pre and post compression parameter of powder blend of all formulations like bulk density, tap density, Carr,s index , Hausner,s ratio, angle repose.

that value were within permissible limit for All formulations was indicated by All the parameters for the evaluation like weight variation ,hardness, thickness, friability, drug content.

IV. CONCLUSION

In data which is obtained vitro evaluation for matrix tablet of Nifedipine resulted long time drug release. by different the formulation variables , Tablets of different release kinetics could be obtained . so that , Nifedipine sustained release tablets is most suitable drug for the Antihypertensive patient .

On the basis of the all these considerations, formulation number N6 was found to be as optimized formulation , all the result of table shows that it resulted that the all the parameters of Matrix Tablet were found to be satisfactory for the deliberated use.

In pharmacological term , bioavailability is a measurement of the rate and extent to which a drug reaches at the site of action.It is denoted by the letter F (or, if expressed in percent,) in other waord we can say that bioavailability is the rate and extent of drug whichreaches in the systemic ceculation.the other substance or of a drug proportion which enters the systemic circulation when the drug introduced into the body that's why it have able to active effect.

In N6 formulation the percentage of HPMC K100 is higher between all formulation and after all evaluation parameter has been completed it is found that bioavailability of this formulation is higher from other than.

So that we can say that if the NIFEDIPINE Tablet is by using HPMC 100 in the amount 62.5% in preparation Formula. Than bioavailability of tablet is increases and tablet

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efficacy is also increases and also it can be useful for reducing the frequency of administration.

The very effective and generally well tolerated antihypertensive agents are Calcium channel blockers. are benefits of calcium channel blocker are they have their long duration of action and favorable adverse effect profile., and they are mostly prescribed for patient . 30% to 40% of patients who have hypertension are prescribed a calcium channel blocker in observational studies,, Their use is increasing by the prevalence.

Drug bioavailability and disposition differentiated according to weight of body and weight loss of body after bariatric surgery. This study evaluating the effect of the weight of body and weight loss of body on the pharmacokinetics of different using drugs, and these effects is compared in to the three groups of patients receiving either a operation of gall bladder, gastric bypass or a calorie diet in very low state .

The use of HPMC K100 gum was highly effective to achieve the sustained drug release for 12 hours from nifedipine sustained release tablets. The drug release kinetics was found to be explained by the use of zero order equation. The anomalous diffusion was resulted that the mechanism of release. diffusion and erosion mechanism of drug release both are associated from the tablets which is in matrix form were established by SEM studies. Selection of polymer concenctration and combination played major role in retarding efficiency of matrix tablets. the drug release rate is decreases with increase in the tablets which is in matrix form was also examined that and it It was concluded from the present research that sustained released profile is maintained for an extended periods of time with in safety margin

REFERENCES:-

[1]. Chowhan Zt. Role Of Binders In Moisture-Induced Hardness Increase In Compressed Tablets And Its Effect On In Vitro Disintegration And Dissolution. J Pharm Sci 1980; 69: 1–4.
[2]. Curry S.H. (1983) Novel drug delivery systems, 2nd.: John Wiley & Sons, Ltd.
[3]. Campagnolo, Di. "Autonomic Dysreflexia In Spinal Cord Injury". Emedicine. Retrieved• 2011-07-14.
[4]. Dahl Tc, Calderwood T, Bormeth A, Et Al. Influence Of Physicochemical Properties Of Hydroxypropyl Methylcellulose On Naproxen Release From Sustained Release Matrix Tablets. J Control Release 1990; 14: 1–10.
[5]. Dewan T Akhter, Riaz Uddin, Naz H Huda, Kumar B Sutradphar Design And Formulation Of Twice Daily Nifedipine Sustained Release Tablet Using Methocel K15m Cr And Methocel K100lv Cr International Journal Of Pharmacy And Pharmaceutical Sciences 2012 Vol 4,Issue 1,
[6]. Eriksson-Lepkowska, Annhild Larsson Drug Absorption From Nifedipine Hydrophilic Matrix Extendedrelease (Er) Tablet-Comparison With An Osmotic Pump Tablet And Effect Of Food Journal Of Controlled Release 1998 52 Page No. 301–310
[7]. Gennaro A.R. (1990) Remington, "The Science and Practice of Pharmacy", 20th ed. Mack Pub. Co.
[8]. Grossman E, Messerli Fh, Grodzicki T, Kowey P (1996). "Should A Moratorium Be Placed On Sublingual Nifedipine Capsules Given For Hypertensive Emergencies And Pseudoemergencies?".
[9]. Hypertension: Management Of Hypertension In Adults In Primary Care. Clinical Guideline Cg34. National Institute For Health And Clinical Excellence (Nice), June 2006. Fulltext Index. Isbn 1-86016-285-1.