Original Research Article

Formulation and Evaluation of Ondensetron HCL chewing gum by compression method

Aabid K Pathan*, Gayatri Panse, Ashwani Mishra

Department of Pharmacy, Barkatullah University, Bhopal, Madhya Pradesh, INDIA.
Email: aabikhan001@gmail.com

Abstract

In this research work an attempt has been made to formulate chewing gum formulation of Ondansetron hydrochloride by compression method The Compressed chewing gum consisting of gum core combined with sweetener, plasticizer which provide smooth appearance and flexibility during storage and chewing. Drug release from a dosage form is the critical step in drug absorption and bioavailability, thus an experimental work has been designed to evaluate the efficiency of this kind of drug delivery system by verifying its capability to release the drug delivery system and by assessing the delivery of Ondansetron hydrochloride for bypassing the hepatic first pass effect. The Prepared formulation were evaluated for hardness, fracture, springiness, cohesiveness, gumminess, chewiness and resilience and for *invitro* drug release.

Key word: Chewingum, antiemeticdrug ,bioavailability, hardness.

***Address for Correspondence:**
Dr. Aabid K Pathan, Department of Pharmacy, Barkatullah University, Bhopal, Madhya Pradesh, INDIA.
Email: aabikhan001@gmail.com

Access this article online	
Quick Response Code:	Website: www.statperson.com
	Accessed Date: 26 March 2018

INTRODUCTION

Chewing gum is most widely used as a pleasure gum to chew. They are majorly accepted by children and teenagers for their joyful use. This formulation normally contain gum as core which remains in mouth for chewing .This gum may be coated or uncoated .Committee for Medicinal Products for human use given guideline for the pharmaceutical dosage forms which was issued in 1991 and according to this guideline solid single dose preparations contains a base consisting mainly of gum that are formulated to be chewed but not to be swallowed ,it provides slow steady release of the medicine it contained. [1-2] There are many factors which should be consider for this formulation like Contact Time of formulation with oral mucosa. Physicochemical properties of drug since it plays major role in the release of the drug from the chewing gum formulation. Formulation factor like Composition and amount of gum base even type of the base these factors affect rate of release of active ingredient. it was also observed that The increased lipid fraction of gum used in formulation leads to the delayed release rate of drug.[3] Chewing gum also elevate blood flow to the brain due to chewing and thus stimulate alertness and better cognitive function The stability of this formulation against moisture, oxygen, light, and high temperature eliminate increasing care compared to other delivery routes.[4] Wide variety of excipients used in the manufacture of chewing gums like elastomers, elastomer solvents, bulking agents, softening agents, sweetening agents, flavouring agents, antioxidants, glidants. There are many methods which can be utilized by the formulation of the Medicated chewing gums like conventional/traditional method, direct compression method and cooling and grinding method.[5] Vomiting and Nausea are the most commonly observing symptoms in majority of pathophysiological conditions like cancer, pregnancy ,motion and postoperative conditions.[6] OndansetronHCl is used as drug of choice because it has half life of 5 hrs. It is sparingly soluble in water. Its absorption is through oral cavity is good.[7] After analysing and studying about drug and dosage form, formulation of medicated chewing gum of Ondansetron HCL. Formulation of OndansetronHCl chewing gum was decided by using combination of polyvinyl pyrollidone

and polyvinyl alcohol as gum base. Polyethyleneglycol was used as a plasticizer to impart chewability and gummy texture to the formulation

MATERIALS AND METHODS

Ondansetron HCL obtained as guft sample, Polyvinylpyrrolidone, polyvinyl alcohol, Polyethylene glycol 400, beeswax, dextrose, calcium carbonate, peppermint, ascorbic acid were purchased from CDH Delhi. and other reagent were of analytical grade.

Formulation of directly compressible mixture

First polyvinylpyrrolidone, polyvinyl alcohol 200, beeswax, dextrose, calcium carbonate, peppermint, ascorbic acid and drug are weighed separately and mixed in ascending order in a mortar. After mixing, ingredients thoroughly grounded in a mortar pestle and then required quantity of PEG 400 was added. Then the whole mixture was mixed and ground thoroughly using a pestle mortar . After mixing and grinding the mixture was subjected for compression

by using rotary tablet press compression machine to form medicated chewing gum.

Evaluation of Prepared formulation

Evaluation of flow property of mixture

Bulk density

The bulk density was determined by transferring the accurately weighed blend sample into the 100 ml graduated cylinder by keeping it in a slanting position. The initial volume and weight were noted. The ratio of weight of the sample to the volume it occupied was calculated.

BULK DENSITY= *Weight of sample in gram/Final volume of sample contained in cylinder*

TAPPED DENSITY-

Tapped density was determined by transferring the accurately weighed blend sample into 100 ml measuring cylinder which was placed in Electrolab Tapped Density Apparatus . Initial volume (V0) of the cylinder was noted and then the cylinder was tapped for 10 times and the volume was measured. Further additional 500 tapings were made and the volume was noted. .

Carr's compressibility index

Used for compare the bulk density and tapped density. The Compressibility index was calculated by the formula

$$CI = \frac{Tapped\quad Density - \quad Bulk\quad Density}{Tapped\quad Density} \times 100$$

Hausnerratio

The flow properties of blend, granules or Powder are measured by this ratio.

$$Hausners\quad Ratio = \frac{Tapped\quad Density}{Bulk\quad Density}$$

Weight Variation

Twenty chewing gums were selected at random and the average weight was calculated. The batch passes the test if not more than two of the individual chewing gums weight deviates from the average weight by more than the acceptable percentage

Friability

Chewing gums were weighed and placed in the Rochesfriabilator. The chewing gums were placed into theapparatus for four minutes, which was rotating at the speed of 25 revolutions/min.Then the chewing gum wereremoved and de dusted and weighed. The Percentage loss in weight was calculated and taken as a measure of friability. Ideally there should not be more than 1 % variation of weight loss.

Percent Friability= *1 – Loss in weight/Initial Weight*100*

in-vitro drug release

In vitro study was performed on modified dissolution apparatus by taking a medicated chewing gum in the receptor compartment and then it was subjected for a number of compression cycle of 40 to 50 times per minute. Then aliquot was collected at a regular interval of 5 minutes for 30 minutes. Then drug concentration was determined by UV spectroscopy.

Texture Analysis

Texture analysis was performed by stable micro system TA.XD texture analyser .In that the heavy duty plat form was placed on the machine base. The sample was positioned on the platform, centrally under the probe. Then the probe approaches the sample and once the 5g trigger force is attained, a rise in force is observed, as the probe penetrates through the chewing gum. A drop in force is observed when the probe enters the interior of the gum. The probe returns to its original starting position when a penetration distance of 3mm from the trigger point is reached. Measurement of the hardness and resistance of chewing gum sticks to Sequence Title: TPA 1

T.A. Variable No: 1: Compression
Pre-Test Speed: 2.0 mm/sec
Test Speed: 3.0 mm/sec
Post-Test Speed: 3.0 mm/sec
T.A. Variable No: 5: 0.0 g
Target Mode: Strain
Distance: 10.0 mm
Strain: 20.0 %
TriggerType: Auto (Force)
Trigger Force: 5.0 g
Probe: P/35 ; 35mm
DIA CYLINDER ALUMINIUM
Batch: Points per second: 200

RESULTS AND DISCUSSION

Prepared mixture was evaluated for their flow properties. Carr's compressibility index obtained and formulation batch FC3 showed better from15.9 as shown in table no. 2 which show good compressible properties. Hausner ratio was observed 1.18 as it shows good flow property shown in table no 2 .These values shows good flow properties of prepared mixture. Formulation containing high concentration of glycerine,(FC3) as a plastisizer showed maximum gumminess value of 5681.352, cohesiveness of 0.832,Springiness 22.870 and hardness of 6832.179g, which is highest among all other formulations and most flexible. These Values indicate that glycerine is the best plasticizer for the compressed chewing gum. Drug release were also found to be 32.8% at 25 minutes.

Table 1: Formulation of trial batches of chewing gum with incorporation of drug using various concentrations of ingredients

S. no	Ingredients	FC1	FC2	FC3
1	PVP+ PVA (1:1)	5000	5000	5000
2	Ondansetron HCL (mg)	100	100	100
3	PEG 400	0.6	0.8	1
4	Calcium Carbonate(mg)	480	480	480
5	Bees wax(mg)	500	500	500
6	Dextrose(mg)	600	600	600
7	Peppermint(mg)	70	70	70
8	Ascorbic Acid (mg)	15	15	15

Table 2: Evaluation of drug entrapped formulation of chewing gum

Batch no	Bulk Density(g/cm^3)	Tapped density(g/cm^3)	Carrs Index (%)	Hausner Ratio
FC1	0.123	0.163	23	1.32
FC2	0.134	0.166	19	1.23
FC3	0.148	0.176	15.9	1.18

Table 3: Weight variation and percentage Friability of Prepared formulation batches

Batch no	Weight Variation	% Friability
FC1	Passed	0.14
FC2	Passed	0.12
FC3	Passed	0.13

Table 4: Adhesiveness, Springiness,Hardness,Resilience and Cohesiveness of chewing gum

Batch no	Adhesiveness g.sec	Springiness	Cohesiveness	Hardness (g)	Gumminess	Fracturability	Resilience
FC1	-3.101	21.300	0.793	5357.566	4248.460	-	0.893
FC2	-3.509	22.042	0.814	6249.118	5085.138	-	0.969
FC3	-3.285	22.870	0.832	6832.179	5681.352	-	1.062

Table 5: Percent Drug release of Formulation code FC3

Time (min)	Percentage drug release
0	0
5	10.2
10	16.7
15	22.5
20	28.4
25	32.8

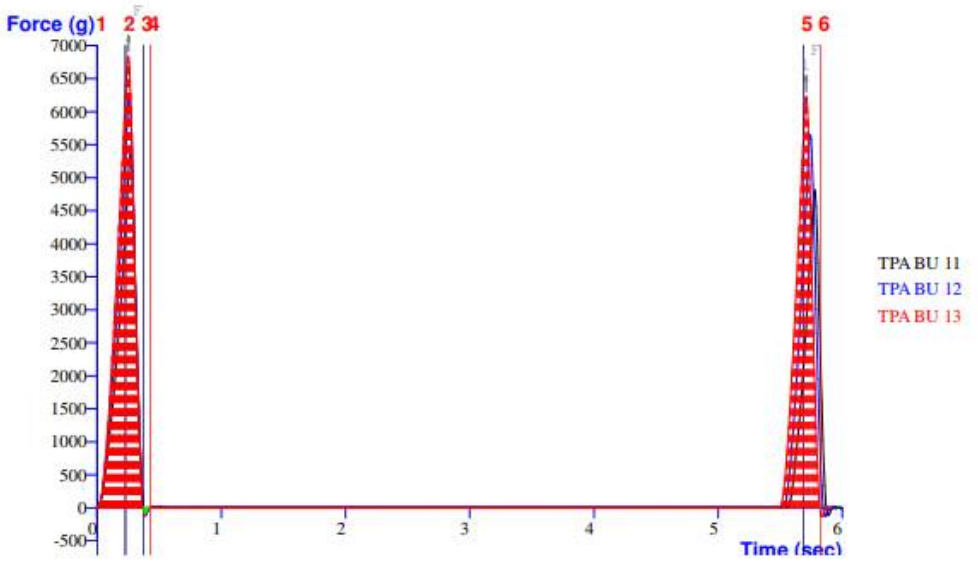

Figure 1: Texture Analysis report

CONCLUSION

Medicated chewing gum of Ondansetron HCl was successfully prepared by direct compression technique. The formulation FC3 shows good flow properties of prepared mixture. The Hausner ratio and carr's index shows good flowing of the mixture. The weight variation, % friability of formulation F3 was found to be in the acceptable limiting and thus passed this evaluation parameters. The texture analysis results shows that the FC3 shows good gumminess, adhesiveness, springiness, cohesiveness, resilience and springiness as compared to FC2 and FC3 and itis also in the acceptable limit. The in vitro study of Formulation shows the release of 32,8% of drug from the formulation in 25 minutes. Therefore medicated. Chewing gum of Ondansetron prepared will be possibly a better formulation and promising dosage form for Vomiting and Nausea.

ACKNOWLEDGEMENT

Author is thankful Head department of Pharmacy Barkatullah University for providing research facility.

REFERENCE

1. European Pharmacopoeia, 2010. Directorate for the Quality of Medicines, Council of Europe, 709
2. Imfeld T. Chewing gum – Facts and fiction: A review of gum-chewing and oral health. Crit Rev Oral Biol Med 1999;10:405-19.
3. PrabhanshuVaishy, Evneet K. Bhatia, Ashwani Mishra, A. K Pathak A Holistic Concept on Medicated Chewing Gum. International Journal of Pharmaceutical and Biological Archives, 2014; 5(4), 30 – 39.
4. AbolfazlAslani, AlirezaGhannadi, FarnazRostami .Design, formulation, and evaluation of ginger medicated chewing gum.Adv Biomed Res 2016, 5:130
5. Koppula. Rajitha, Yamsani. MadhusudhanRao.Formulation and Evaluation of Medicated Chewing Gums of Chlorpheniramine Maleate.Ijppr.Human, 2016; Vol. 6 (2): 72-79.
6. MansiParadkar,BalaramGajra,BhautikPatel.Formulation development and evaluation of medicated chewing gum of anti-emetic drug.Saudi Pharmaceutical Journal. 24, 2, 2016, .153-164
7. PrabhanshuVaishya, Ashwani Mishra and AnupamPathak. Formulation and evaluation of medicated chewing gum of OndancetronHCl for chemotherapy induced nausea and vomiting. Der Pharmacia Lettre, 2015, 7 (5):80-86.

Source of Support: None Declared
Conflict of Interest: None Declared