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Formulation and Evaluation of Sublingual Tablet of Meclizine Hydrochloride

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ABSTRACT

Meclizine Hydrochloride is an oral antiemetic medication used to treat nausea, vomiting, vertigo, and motion sickness. However, its oral bioavailability is weak (25%), and its solubility is significant. A study aimed to develop a sublingual tablet with inclusion complexes of Meclizine Hydrochloride and β-cyclodextrin in a 1:1 dosage ratio. The formulation was tested for precompressional and postcompressional evaluation parameters, and the results showed that the tablets were effective in treating nausea, vomiting, and vertigo. The study also found that the dissolution and solubility rate of the tablets increased with the limited content of β-cyclodextrin. Further clinical studies are needed before the tablets can be used in the market.

Introduction

Sublingual Glands

Sublingual glands, also known as salivary glands, are found on the floor of the mouth beneath the tongue and produce mucin, which aids in the production of saliva. These gland secretions keep the inside of the mouth lubricated, which is necessary for chewing and swallowing food. Salivary enzymes are secreted into food as it is chewed, making the material slippery and easy to swallow. Because of its salivary content, chewed food can easily move into the throat and digestive tract.[1]

They produce mucin, which produces saliva. The fluid produced by the glands mixes with the food, making it easier to chew. Absorption is the transfer of a drug from its administration site into systemic circulation, so absorption is directly proportional to layer thickness. The drug's absorption proceeds as follows: Sublingual > buccal > gingival > palate.Because of the high permeability and rich blood supply, the sublingual route can produce a rapid onset of action, allowing the drug to be delivered in a short period of time and with a frequent dose regimen.[2]

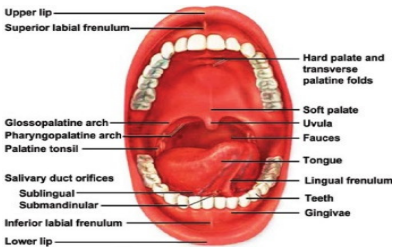

Figure 1: Human Oral Cavity

Mechanism of action

In sublingual dosage form, the drug passes through the mucous membrane beneath the tongue before entering the circulation via the sublingual vein. This direct entrance into the systemic circulation that bypasses digestive enzymes and the reverse first pass metabolism allows for improve availability and a faster therapeutic effect than standard oral administration.[5]

The pharmaceutical aspect is absorbed by the mucosa of the mouth when the tablet is dissolved or dissolved under the tongue, resulting in the medication entering the circulation more quickly and contributing to a faster start of effect because the medication avoids the lengthy process of stomach emptying and movement through the digestive system. The medicine is then delivered directly to the heart and systemic circulation, where it reaches the intended tissue faster.[3]

Advantages of Sublingual Tablets

- When sublingual tablets placed under the tongue, it produces immediate systemic effect by enabling the drug absorbed quickly or directly through mucosal lining of the mouth beneath the tongue.
- Dose gets reduced.
- Onset of action is very fast.
- Improved bioavailability.
- Fewer side effects.
- Effective in disease like nausea, vomiting, migraine, schizophrenia.
- No need of water for administering tablet.

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- Provides sustained drug delivery.
- Ease of drug administration gets increased.[4,6]
- Sublingual area is much more permeable than buccal area.
- Bypass GI tract and hepatic portal system, therefore it increases the bioavailability of orally administered drugs that otherwise undergo hepatic first pass metabolism.[7]

Disadvantages of Sublingual Tablets

- Area available for absorption is much less.
- Unsuitable for bitter drugs.
- Poor Patient compliance.
- Eating, drinking, and smoking are not allowed.
- Administration of highly ionic drug is not allowed.
- Administration of high dose is not possible.[8]

Challenges in the Formulation of Sublingual Tablets for the Treatment of Motion Sickness

Despite the numerous benefits of sublingual tablet, there are formulation challenges that must be addressed. Discuss difficulties such as low solubility, stability, and patient compliance, all of which can restrict the usefulness of sublingual tablet.[10] Stability is an especially important factor when choosing medications like scopolamine in which can deteriorate when exposed to moisture or light. Furthermore, that taste of the medicine might have an undesirable effect on patient adherence, particularly for youngsters and the elderly. Taste masking methods of the use of stabilizing agent are crucial in overcoming those formulations of obstacles and further improvements in sublingual tablet design will most likely focus on resolving these concerns in order to enhance patient experience and outcomes.[9]

Table 1: Physicochemical Criteria of drug for Sublingual Drug Delivery[12]

Physicochemical Properties of drug	Accepted Range
MinimumDose	<20mg
Taste	Notintenselybitter
Stability	Goodstabilityin waterorsaliva
Molecularweight	Smalltomoderate(163.3-400g/mol)
pKavalue	>2foracidicDrug;<10forbasicDrug
Logp	1.6to 3.5
Lipophilicity	Lipophilic

Material and Methods

JB Chemicals & Pharmaceutical Limited, Mumbai provided a gift sample of meclizine hydrochloride, and β-cyclodextrin was obtained from Alkem Laboratories in Mumbai. All other ingredients and chemicals were analytical grade and obtained from LobaChemie Pvt. Ltd. in India.

Preformulation Studies:[16]

Preparation of standard stock solution of drug in methanolic distilled water and methanolic phosphate buffer pH 6.8 (1:9 ratios):

To prepare the standard stock solution, and dissolve 50mg of Meclizine Hydrochloride in a 50ml volumetric flask containing methanolic distilled water and methanolic buffer at a 1:9 ratio. To prepare a stock solution with a concentration of 1000 µg/ml in a volumetric flask.[17]

Determination of λ max in methanolic distilled water and methanolic buffer pH 6.8:

To prepare the substock solution, 1ml of the standard solution (100µg/ml) was added to a 10 ml volumetric flask and diluted to the mark. Distilled water and buffer at pH 6.8. To determine the maximum absorbance of Meclizine Hydrochloride in methanolic distilled water and pH 6.8 buffer, a dilution of 10 µg/ml was prepared and scanned at 400-200nm using a UV visible spectrophotometer (Shimadzu 1800, Japan).[18]

Preparation of calibration curve of Meclizine Hydrochloride in methanolic distilled water:

To prepare the substock solution, dissolve 2ml of the standard solution in 20ml of distilled water at a concentration of 100 µg/ml. Stir thoroughly for 2 hours at room temperature.

Dilutions of 10-50 µg/ml in distilled water were analyzed using a UV spectrophotometer at 229.60nm against a reference solution. The absorbance data for various concentrations was recorded.

Preparation of calibration curve of Meclizine Hydrochloride in methanolic phosphate buffer pH6.8:

Calibration curve of Meclizine hydrochloride in methanolic phosphate buffer at pH 6.8.

To prepare the substock solution, 2ml of the standard solution was dissolved in phosphate buffer pH 6.8 up to 20ml with a concentration of 100 µg/ml. The mixture was then stirred for 2 hours at room temperature. Dilutions with phosphate buffer pH 6.8 at concentrations ranging from 10-50 µg/ml were analyzed using a UV spectrophotometer at 228.80nm against the reference solution. The absorbance data for various concentrations was recorded.[19]

Solubility Determination:

To prepare the samples, 5ml glass vials were filled with distilled water and phosphate buffer pH 6.8. The excess drug was added and sonicated for 2 hours at room temperature. The samples were then placed on a magnetic stirrer for 48 hours and kept aside for 24 hours.

After filtering, the solution was evaluated for solubility using UV visible spectroscopy at 229.60nm and 228.80nm. The experiment was repeated three times to ensure accurate results.[7]

Melting Point Determination:

Fill a capillary tube with 1mg of Meclizine Hydrochloride drug sample, seal one end, and place in a melting point apparatus. The temperature was recorded when the drug started melting.[2]

Drug-Excipients Interaction Study:[15]

The FTIR spectrum of the drug was recorded using a Shimadzu spectrophotometer. Fourier FTIR spectroscopy is an analytical technique for identifying organic, polymer, and inorganic materials. The samples were compressed into pellets using a hydraulic press and then transformed into disks. The final signal at the detector ranges from 4000 to 400 cm^{-1}.

Preparation of Inclusion complexes of Meclizine hydrochloride in β-cyclodextrin containing three different ratios of dose (1:1, 1:2, 1:3) by Kneading method:[19]

To prepare the drug (Meclizine hydrochloride) and β-cyclodextrin, weigh them separately and grind them in a mortar and pestle for 1 hour. Mix them in a polybag for 15 minutes before passing through sieve number 60. The powdered mass was evaluated for drug content and yield.

Determination of Solubility:

The excess Meclizine Hydrochloride and β-cyclodextrin inclusion complexes (1:1, 1:2, and 1:3) were dissolved in 5ml of phosphate buffer pH 6.8 in vials and stirred continuously at room temperature for 48 hours. The solution was stored at room temperature for 24 hours and filtered using Whatman's filter paper. The sample was diluted with phosphate buffer pH 6.8 and analyzed using a UV visible spectrophotometer at 228.80 nm.22

Percentage Drug Contain:[17]

Weighed inclusion complexes containing 25mg of meclizine hydrochloride were dissolved in 10ml of phosphate buffer solution at pH 6.8. The solutions were filtered through filter paper and diluted appropriatel. The drug content is calculated by UV The formula for calculating the visible spectrophotometer at 228.80 nm is given below.

%Drug content =Actual weight of drug in solid dispersion× 100/ Calculated theoretical weight of drug in solid dispersion

Preparation of Sublingual Tablet by direct compression method [1,8,23]:

Inclusion complexes containing Meclizine hydrochloride and β-cyclodextrin in a 1:1 ratio were found to be more efficient than other ratios. So this ratio was used to make sublingual tablets. The sublingual tablet was prepared using a direct compression method, combining other excipients with the drug and β-cyclodextrin ratio and passing through sieve number 60. The mixture was then triturated for the appropriate amount of time before being mixed in a polybag for 15 minutes. The mixed powder was tested for precompressional properties such as bulk density, tapered density, and so on. Furthermore, the tablet was prepared using a tablet punching machine, and the prepared tablets were assessed for various post-granulation parameters.[10,12]

Table 2 : Formula Table for Sublingual tablet of Meclizine Hydrochloride:

Ingredient(mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Drug and β-cyclodextrin complex (1:1 ratio)	50	50	50	50	50	50	50	50	50
Microcrystalline cellulose	10	10	7	20	15	5	5	3	-
Cross carmellose sodium	5	10	10	-	5	10	10	10	-
Sodium starch Glycolate	15	12	28	12	-	5	-	-	25
Mannitol	10	8	2	13	20	25	30	30	20
Talc	5	5	2	4	5	2	2	5	3
Magnesium stearate	5	5	1	1	5	3	3	2	2
Total (mg)	100	100	100	100	100	100	100	100	100

Evaluation Studies[15,18,21]

Precompression Studies

Bulk Density:

To determine bulk density, weigh the powder and pass it through sieve #60 before transferring it to a measuring cylinder. The value is calculated by measuring the volume of powder without tapping the cylinder, as shown in the formula below.

Bulk density = Weight of blend or powder / Bulk volume of blend or powder (in ml).23

Tapped Density:

The powder was accurately weighed and placed in a 10 ml measuring cylinder on the tapping apparatus. The reading was taken after tapping it 100 times. Calculated using the formula.

Tapped density = Weight of blend or powder / Tapped volume of blend or powder (in ml).

Hausner's ratio: It is a number which is related toflowability of a powder and calculated using formula:

Hausner's ratio = Tapped / Bulk density

Carr's index: The compressibility index is also called Carr's index.

Carr's Index (%) = 100X (Tapped Density of powder– Bulk density of powder) / Tapped Density.

Angle of repose: The funnel was placed on burner stand and weighed quantity of powder was allowed to flow through funnel then height (h) and radius (r) of pile were measured by given formula:

tan θ = Height / radius.

Postcompression Studies[15,18]

Weight variation: According to Indian Pharmacopoeia twenty tablets were selected from each formulation, and weighed individually with average weight was calculated. The average weight of one tablet was determined from collective weight.

Thickness: Vernier Caliper was used to measure diameter of each tablet. It was measured by simply placing the tablet in between the jaws of verniar caliper and slide the scale arm to press the tablet against the stationary arm then the reading displayed was noted.

Hardness: Monsanto hardness tester was used for tablets to measure hardness. The tablet was placed between 2 jaws and the scale jaw moves towards by pushing it against fixed jaw until the tablet breaks. The pressure at which the tablet breaks is recorded and carried out 3 times for particular batch.

Friability:10 tablets from each formulation were rotated at 25 rpm for 4 minutes using a rochefriabilator, then dropped at a height of 6 inches in each revolution. The tablets were removed after 100 revolutions, dusted, and weighed again. The percentage of friability was calculated using the provided equation. Weight loss is limited to 1% or less.15

Friability = (initial weight of tablets– final weight of tablets) / (initial weight of tablets) × 100

Drug Content: Crush 10mg of tablets with a mortar-pestle and dissolve in 100ml volumetric flask with phosphate buffer pH 6.8. The sample was filtered and diluted in a 10ml volumetric flask with phosphate buffer at pH 6.8. The drug content was measured using a UV visible spectrophotometer at 228.80nm.16

***In vitro* Disintegration Study**:4 tablets from each formulation were dissolved in 600 ml of phosphate buffer 6.8 pH in a disintegration apparatus. The assembly was then placed in phosphate buffer pH 6.8 at 37±0.5 ◦ c with beats added to the test tubes. The apparatus was moved up and down in a buffer to disintegrate tablets, and the time of disintegration in solution was recorded.8

Water Absorption Ratio and Wetting time:Tissue paper was folded twice and placed in a petri dish with 6 mL of water. After wetting, the tablet was weighed.

Water absorption ratio = (Wa– Wb) / Wb × 100,

Where,
Wa = weight after water absorption
Wb= weight before water absorption.[20]

***In vitro* Dissolution Studies:** Meclizine Hydrochloride sublingual tablets' in vitro drug release rate was tested using a USP dissolution testing apparatus type II (paddle method). The dissolution test was conducted in a 900 ml jar of 6.8 pH phosphate buffer. A 5ml solution was withdrawn from the dissolution apparatus after 5, 10, 15, 20, 25, and 30 minutes. Samples were replaced with fresh dissolution. Samples were filtered through filter paper, analyzed with a UV spectrophotometer, and percentage drug release was calculated.6

Stability Study: Stability studies have been performed on batch F8 tablets. Tablets were stored in a stability chamber at 40±2 °C and 75±5% RH for two months. Samples were collected and analyzed for evaluation parameters.[23]

Result and Discussion

Pre-formulation studies:

theλmax of Meclizine Hydrochloride in methanolic distilled water was found to be 229.60nm and 228.80nm in methanolic phosphate buffer pH 6.8 using UV Spectroscopy.

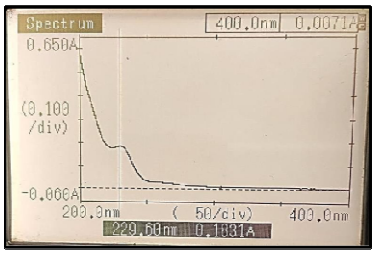

Figure 2: λmax of Meclizine Hydrochloride in methanolic distilled Water

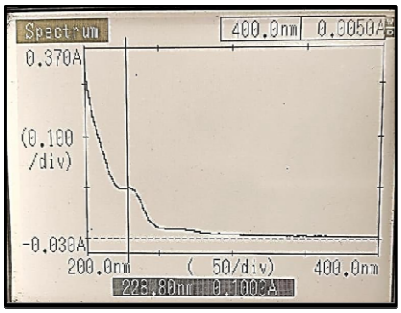

Figure3: λmax of Meclizine Hydrochloride in methanolic phosphate buffer pH 6.8

Preparation of calibration curve of drug (Meclizine Hydrochloride):

Calibration curve of Meclizine Hydrochloride in methanolic Distilled waterthe prepared calibration curves are shown below

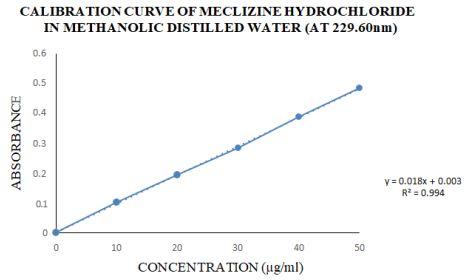

Figure 4: Calibration Curve of Meclizine Hydrochloride in methanolic distilled water.

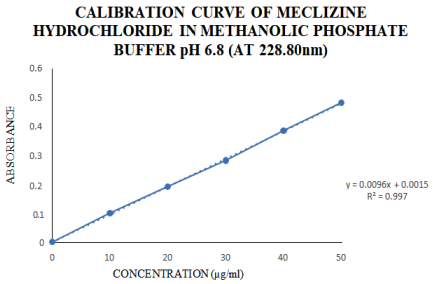

Figure 5: Calibration Curve of Meclizine Hydrochloride in Methanolic Phosphate Buffer pH 6.8

Melting Point of Drug:

Themeltingpointofdrugwasdeterminedbycapillarymethod andmeltingpointofMeclizine Hydrochloride was found in range of 210 ◦ c - 220 ◦ c.

Table 3: Melting point of Meclizine Hydrochloride:

S. No.	Observed values	Reported value
1.	214.8◦c	210◦c
2.	215.2◦c	
3.	220.5◦c	

Solubility determination of Meclizine Hydrochloride:

Table 4: Solubility of Meclizine Hydrochloride and inclusion complexes in different solvent

S.No.	Name of Solvents	Solubility (mg/ml) n=3	Ratio of Drug andβ-cyclodextrin Inclusion complexes (mg/ml)		
			1:1	1:2	1:3
1.	Distilled water	0.0253mg/ml	3.8045mg/ml	3.5204mg/ml	1.6098 mg/ml
2.	Phosphate Buffer pH 6.8	0.016902mg/ml	7.79617mg/ml	4.1078mg/ml	3.0604 mg/ml

Drug and Excipients Interaction Study:

This was done of ensuring drug and excipient compatibility. FTIR graphs are presented below. It has been found to be compatible with many kinds of excipients used in dosage forms.

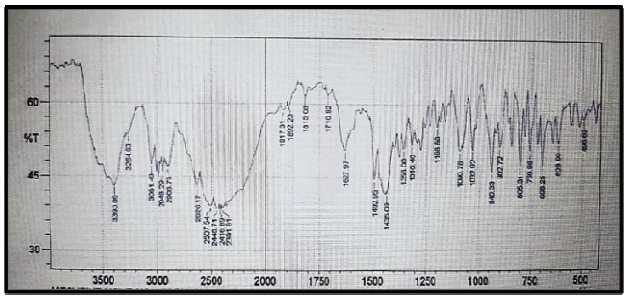

Figure6: FTIR spectrum of Meclizine Hydrochloride

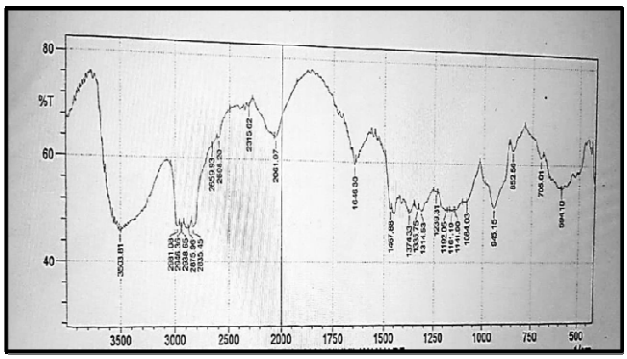

Figure 7: FTIR spectrum of Meclizine Hydrochloride + β-cyclodextrin + Magnesium stearate+ Mannitol + Sodium starch glycolate + Cross povidone + Crosscarmellose sodium + microcrystalline cellulose

Formulation and Evaluation of Sublingual Tablet containing Meclizine Hydrochloride:

A powder blend for the manufacturing of sublingual medications which consists of different amounts of superdisintegrant and other excipients was made with a 1:1 dose ratio, which produced the best results for drug content uniformity and in vitro disintegrating test. Sublingual tablets were made applying the direct compression method with a tablet punching machine and examined for pre and post compression properties.

Pre-compressional evaluation parameters:

Bulk Density: The bulk density of all developed formulations (F1 to F9) varied between 0.43 and 0.573 g/ml, indicating loose powder packing. These numbers were then utilized to calculate Carr's index and Hausner's ratio for estimating the flowability.

Table 5: Evaluation of Precompressional studies:

Formulation	Bulk density (gm/ml) Mean±SD	Tapped density (gm/ml) Mean±SD	Angle of repose(◦) Mean±SD	Carr'sIndex (%) Mean±SD	Hausner's ratio Mean±SD
F1	0.48±0.01	0.57±0.01	29.82± 0.3	15.79±0.52	1.18±0.09
F2	0.456±0.05	0.724±0.12	35.48± 0.9	35.47±25.3	1.62±0.29
F3	0.506±0.05	0.58±0.03	33.74 ±0.51	14.55 ±22.79	1.18±0.10
F4	0.45±0.01	0.47±0.01	29.27 ±0.19	4.26±8.17	1.05±0.01
F5	0.447±0.05	0.618 ±0.031	34.12 ±0.205	27.81±9.53	1.37±0.08
F6	0.475±0.03	0.687±0.04	31.95 ±0.203	30.42 ±12.51	1.45±0.12
F7	0.476±0.01	0.46±0.50	29.91 ±0.402	26.82±6.83	1.37±0.05
F8	0.574±0.01	0.757±0.02	30.46 ±0.200	27.16 ±12.77	1.32±0.02
F9	0.557±0.02	0.754 ±0.009	33.18 ±0.04	26.34±5.32	1.34±0.04

Tapped Density: The bulk density of all developed formulation (F1 to F9) varied between 0.43 and0.573 g/ml, indicating loose powder packaging. The values were then utilized for determining Carr's index and Hausner's ratio for estimating the flowability.

Carr's Index: The compressibility index of all prepared batches was in rage of 4.26% - 35.49% showing that the mixtures possess a good flow in all batches.

Angle of Repose: The angle of repose of all batches were in range of 29.27 ◦ - 35.75 ◦ involving that powders have smooth surfaced particles leading to increased flow of powder in all batches.

Hausner's Ratio: This ratio of all prepared formulations were in range of 1.16 – 1.38 having good flow ability.

Post compressional evaluation parameters of sublingual tablet:

Weight Variation: All the prepared sublingual tablets were evaluated for weight variation and found that all tablets were within the permitted limit of ±7.5%.

Thickness: It was found to be within a range of 1.26 – 3.84mm.

Table 6: Post compressional studies:

Formulation	Weight variation (mg) Mean±SD	Thickness (mm) Mean±SD	Hardness (kg/cm^2) Mean±SD	Drug content uniformity (%)Mean±SD	Friability (%) Mean±SD
F1	110.67± 0.109	2.4±0.06	2.75±0.10	40.62±0.007	0.57 ± 0.008
F2	99.34 ± 0.057	2.62±0.21	2.66±0.17	95.37±0.003	0.34±0.04
F3	98.9 ± 0.01	3.84±0.09	3.02±0.02	81.87±0.009	0.68±0.04
F4	99.13 ± 0.04	3.72±0.02	3.12±0.01	91.16±0.01	0.26±0.04
F5	97.76 ± 0.20	2.20±0.19	2.6±0.031	85.02±0.09	0.45±0.03
F6	102±0.27	2.21±0.17	1.7±0.19	91.53±0.01	0.39±0.05
F7	100.34 ± 0.15	1.87±0.23	2.37±0.206	99.62±0.005	0.17±0.01
F8	100.7 ± 0.12	1.25±0.24	3.38±0.26	98.72±0.004	0.41±0.03
F9	99.44 ± 0.07	1.96±0.02	2.71±0.10	96.83±0.01	0.57 ± 0.036

Hardness: Thehardness of all tablets was found in range of1.7 – 3.39 kg/cm2. It was also found that on decreasing concentration of binder the hardness also decreases in all batches. Lower the value of hardness less will be wetting time which also affects dissolution study of sublingual tablets.

Friability: Calculated percent loss in weight was checked by Roche Friabilator tester in permitted range as given in I.P. The lower values of percentage loss ensure that tablets were mechanically stable.

Drug Content Uniformity: The percentage drugs content of tablets were found to be in range of 40.63% - 99.61% indicating that drug was percent uniformity in tablets.

Wetting time: it is given in table below so, it was clear that when absorption ratio decrease wetting time it may be due to increase in concentration of superdisintegrants and decrease in addition of binder in formulation.

Water Absorption ratio: It was given in between 59.61% – 98.24% for F1 to F8 batches. The water content was observed maximum when decrease in binder concentration and increase in superdisintegrant concentration in formulation.

Table 7: *In vitro* disintegration test, wetting time and water absorption ratio is given below:

Formulation	*Invitro*Disintegration test (sec) Mean±SD	Wettingtime(sec) Mean±SD	Waterabsorption ratio (%) Mean±SD
F1	90±2.79	84±0.68	81.61±0.29
F2	97.90±1.01	89±1.35	78.32±0.05
F3	90±3.15	82.08±0.46	75±0.16
F4	89.34±1.91	76±2.72	64.62±0.06
F5	90±3.17	67.32±2.44	91.28±0.06
F6	99.32±0.97	99.98±2.52	62.57±0.031
F7	59.61±1.25	62.34±1.47	99.22±0.003
F8	67.65±0.86	90±3.17	97.63±0.009
F9	89.67±1.00	78.34±1.17	97.54±0.012

Disintegration Study: The disintegration time was found that with higher water absorption ratio lead to lowering in wetting time as well as disintegration time, thus decreasing absorption time of tablets.

Dissolution: This studies were carried out of all formulation and the maximum drug release was found with batch F8 of 95.79% in 30 minutes.

Table 8: % Drug Release of Sublingual Tablets:

Time [min.]	% Drug release (Mean±SD) in Formulation								
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**
5min	18.65 ±5.64	16.86 ±2.04	33.91 ± 16.14	29.07 ± 8.32	27.05 ± 3.21	21.64 ± 3.69	40.81 ± 8.42	21.38 ±2.33	32.75 ± 3.02
10min	41.24 ±7.34	63.81 ±4.09	40.15 ± 1.87	63.05 ± 6.30	36.27 ± 10.50	40.47 ± 5.81	60.77 ± 4.72	38.65 ±1.04	46.52 ± 1.82
15min	57.61 ±1.82	78.12 ±3.44	67.39 ± 2.44	78.17 ± 4.94	51.00 ± 3.26	63.43 ± 8.99	74.34 ± 1.85	68.62 ±1.16	60.21 ± 1.53
20min	76.37 ±6.34	85.21 ±1.42	76.27 ± 4.91	81.56 ± 2.86	66.38 ± 3.22	74.90 ± 5.05	77.40 ± 11.13	80.81 ±1.88	76.93 ± 1.44
25min	85.75 ±4.34	81.22 ±8.69	90.79 ± 2.00	87.63 ± 1.99	79.51 ± 7.45	83.64 ± 2.91	89.96 ± 1.38	87.43 ±2.14	82.18 ± 1.91
30min	87.28 ±3.04	92.52 ±3.31	93.31 ± 0.97	94.35 ± 2.21	93.96 ± 5.02	92.32 ± 3.27	94.89 ± 3.34	95.79 ±2.06	87.83 ± 1.91

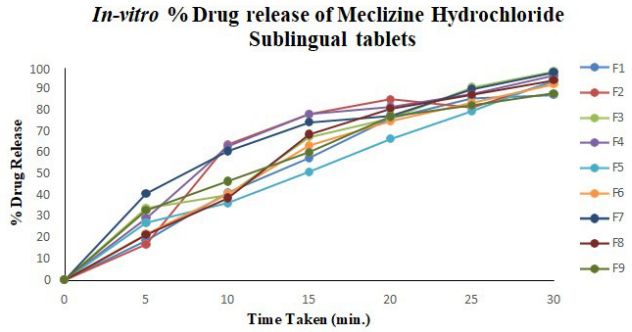

Figure 8: In vitro % drug release of sublingual formulation

Stability studies

The stability studies after storage of two months formulation F8 was examined bydrug assayand in vitro dissolution studies given in table below and from statistical analysis there was significant difference between before and after storage [P<0.08]. The tablets were analysed timely after two months and recorded studies are mentioned below.

Table 9: Stability studies of F8 Formulation:

S. No.	Parameter	Beforestorage	After2months	Inference
1.	Weight variation	100.34±0.15	99.88±0.15	Within limit
2.	Hardness	2.36±0.20	2.37±0.20	Within limit
3.	Drug content	97.89%±0.05	96.20%±0.05	Within limit
4.	Wetting time	62.32±1.47	69±1.46	Within limit
5.	Water absorption ratio	99.24%±0.03	99.24%±0.03	Within limit
6.	Disintegration time	59±1.25	65±1.21	Within limit
7.	*In vitro* Drug release	99.15%±3.34	98.57%±1.01	Within limit

Summary & Conclusion

Meclizine hydrochloride is a histamine H1 receptor antagonist with antiemetic and antivertiginous properties. Because it is metabolized by the hepatic CYP2D6 enzyme through hepatic hydroxylation, its oral bioavailability is low (25%), as is its solubility (BCS class 2).Meclizine Hydrochloride has a short half-life due to its low solubility and high first-pass metabolism. As a result, the medication's solubility should be improved, and it should be formulated in such a way that it avoids first pass metabolism. The study aimed to create a sublingual tablet containing Meclizine hydrochloride and β-cyclodextrin in a 1:1 dosage ratio. The tablet was formed by kneading both components together. The calibration curve for 10-50 µg/ml yielded a regression value of 0.997 in methanolic phosphate buffer pH 6.8. The FTIR data for the drug, excipient, and drug-excipient combination revealed no interaction.

The formulation results indicate that Meclizine Hydrochloride sublingual tablets dissolve and dissolve more quickly with less β-cyclodextrin content. The formulation results indicate that Meclizine Hydrochloride sublingual tablets dissolve and dissolve more quickly with less β-cyclodextrin content. Inclusion complexes using β-cyclodextrin in a 1:1 ratio of drug and solubility enhancer resulted in optimal water solubility, drug content, and dissolution. As a result, the current research aims to create a sublingual tablet of meclizine hydrochloride using the direct compression method. Furthermore, the goal of developing this dosage form is to provide a rapid onset of action, which is useful in the treatment of diseases such as nausea, vomiting, and vertigo, as well as to solve drug solubility issues using the inclusion complex technique.This formulation was created using the direct compression method and tested for precompressional and postcompressional evaluation criteria. The powdered blend of all batches before compression was tested for bulk and tapped density, Carr's and Hausner's ratios, and angle of repose. It was determined that all sublingual tablets were free-flowing and properly crushed. Sublingual tablets were tested for thickness, hardness, weight variation, friability, disintegration time, wetting time, water absorption ratio, and drug content consistency. Thickness and hardness were found to be within acceptable limits, and the friability of all batches was less than 1%. The minimum wetting time and water absorption ratio in the F8 formulation were determined, leading to the conclusion that Meclizine Hydrochloride sublingual tablets can be an effective treatment for nausea, vomiting, and vertigo, with improved patient compliance. More clinical trials are required before it can be used on the market.

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