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A COMPARATIVE QUALITATIVE STUDY OF DISPERSIBLE TABLETS OF THREE DIFFERENT COMMERCIAL BRANDS

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ABSTRACT:
Dispersible tablets are uncoated or film-coated tablets meant to be spread in water before administration giving a unvaried dispersion. Pediatric and old patients face complications in swallowing the conventional tablets. So according to the need dispersible tablets have been developed which combine the benefits of liquid dosage forms and solid dosage forms. The dispersible tablets allow dispersion in water prior to administration. In present study we have compared three brands of different dispersible tablets. The objective of the study was to find out the best dosage form based on the post compression parameters of dispersible tablets and to develop a co-relation among these parameters. Three brands of dispersible tablets had been selected i.e. Acetylsalicylic acid, Cefixime & Paracetamol tablets and they have been compared on the basis of different parameters of dispersible tablets like uniformity of weight, friability testing, hardness, wetting time, wetting volume, water absorption ratio, dispersion time, disintegration time, uniformity of dispersion. Acetylsalicylic acid & Cefixime complies all the parameters except friability test, while Paracetamol tablets complies all the tests except it was showing more hardness compared to other two brands due to which it's properties like wetting time, wetting volume, water absorption ratio, dispersion time, disintegration time was lower than other two. So after overall comparison Cefixime was found to be the best in comparison to other two brands.
Keywords: Dispersible tablets, paracetamol, cefixime, acetylsalicylic acid, comparison, post compression parameters.

Introduction:

Dispersible tablets are uncoated or film-coated tablets that is required to be dispersed in water prior to administration and which gives a homogeneous type of dispersion.[1] It is very difficult for children and old patients to swallow the conventional tablets so by considering them, dispersible tablets are very beneficial. Dispersible tablets has the advantages to combine the benefits of both solid dosage form and liquid dosage form and these can be used for the drugs which are not stable in liquid dosage forms and to provide fast action by quick disintegration and bioavailability. They can help in maintaining the drug stable in solid dosage forms and making them palatable by converting them in the form of homogenous suspensions. Pediatric and geriatric patients and those who are under uncooperative conditions, dispersible tablets can be utilized easily but condition is to mask the taste of drug by proper masking agents.[2]

Normally for conventional tablets the evaluation parameters which are to be considered are uniformity of weight, hardness, friability, in vitro disintegration test, in vitro dissolution test etc.[1] In case of dispersible tablets along with these parameters some others which are to be evaluated are disintegration time, wetting time, wetting volume, water absorption ratio, dispersion time &uniformity of dispersion which are specifically important for them.[3]

Drugs like Acetylsalicylic acid, Cefixime, Paracetamol are available in the form of dispersible tablets in market to provide quick actions.

The objective of the study was to find out the best dosage form based on the post compression

parameters of dispersible tablets and to develop a co-relation among these parameters.

Material and Methods

Dispersible tablets of acetylsalicylic acid, cefixime and paracetamol were purchased from different medical stores of Gwalior (M.P.) region. Different instruments used in the testing were utilized, available in ITM University Gwalior (M.P.). The tablets from all the batches were tested for different parameters as follows:

1. Uniformity of Weight of Single-Dose Preparations [4] [5]

This method is used for checking the weight uniformity of tablets within a given batch. According to pharmacopoeia of India 20 tablets were weighed individually, randomly selected and average weight was calculated. According to I.P. only two tablets can be deviated from the average weight by more than the percentage shown in the table and not an individual tablet is allowed to deviate by more than twice the percentage shown below in the table.

Dosage form	Average weight	Percentage deviation
Uncoated or film coated tablets	80 mg or less	±10
	>80 mg but <250 mg	±7.5
	250 mg or more	±5

Formula

$$\textbf{Average weight} = \frac{\textbf{total weight of tablets}}{\textbf{total no. of tablets}}$$

$$\%\ \boldsymbol{Deviation} = \frac{\boldsymbol{weig\,t\ of\ eac\ tablet - average\ weig\,t}}{\boldsymbol{average\ weig\,t\ of\ tablet}} \times \mathbf{100}$$

2. Hardness [3][5]

Hardness was studied to check the breakage pressure point of tablet. 5 Tablets randomly selected from each brand and hardness was checked using the Monsanto hardness tester, mean was calculated.

3. Friability [4][5]

According to Indian Pharmacopoeia if the total average weight of selected tablets are 0.65 g or less, then tablets are selected in such a manner that it is equal to 6.5 g and if the average weight of selected tablets is more than 0.65 g, a 10 whole tablets as sample should be taken.

In our study all tablets having an average weight of more than 0.65 g, so we took 10 whole tablets, deducted them and these tablets were placed in the drum of roche friabilator and it was allowed to rotate 100 times or 25 revolution/minute. The tablets were removed from friabilator deducted and were weighed them accurately. A maximum reduction in weight not greater than 1.0 per cent is acceptable.

Formula

$$\%\ \textbf{Friability} = \frac{\textbf{initial weight} - \textbf{final weight}}{\textbf{initial weight}} \times \mathbf{100}$$

4. Uniformity of Dispersion [1]

It is also an important parameter in case of dispersible tablets, for checking dispersion uniformity, two tablets were taking and placed in water in quantity of 100 ml. and it was stirred slowly until it made a complete homogenous dispersion. This dispersion was passed through a sieve screen having a nominal mesh aperture of 710 mm (sieve number 22). The test has been performed three times and mean was calculated.

5. Wetting Volume [3]

For checking the wetting volume a tablet was put in the center of a petri dish and distilled water was added drop wise on the tablet by a five ml pipette;. The amount of water required to completely disintegrate the tablet was taken as the wetting volume. The test has been performed three times and mean was calculated.

6. Wetting Time [3]

In a petridish having a diameter of ten centimeter, ten milliliter of water was taken, eosin, an water soluble dye was added to this water and on which double folded tissue paper (12 centimeter × 10.75 centimeter) was placed. On this tissue paper a tablet was placed carefully and time was noted in which tablet was completely wet and this time was referred as wetting time. Same test has been performed three times and mean was calculated.

7. Water Absorption Ratio[3]

In a petridish having a diameter of ten centimeter, six milliliter of water was taken and on which

double folded tissue paper was placed. A tablet was allowed to wet completely after putting it on this tissue paper, same test has been performed three times and mean was calculated. One weight was taken before wetting and another was after wetting and water absorption ratio (R) was calculated by using following formula:

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

Where, Wa = weight of tablet after water absorption & Wb = weight of tablet before water absorption.

8. Dispersion Time[3]

In this test a single tablet from test formulation was added to ten milliliter of water retained in a fifty milliliter beaker and the time was noted in which complete tablet was dispersed.

The above test has been performed with each three formulation and dispersion time was noted. Same test has been performed three times and mean was calculated.

9. Disintegration Time [1][6]

Disintegration time was determined at 24°c to 26°c by using USP disintegration apparatus and the apparatus was operated for 3 minutes using 6 tablets of each formulation. Three trials for each brand were performed and mean was calculated.

Results & Discussions

In the above study dispersible tablets of three different drugs have been selected i.e. Acetylsalicylic acid, Cefixime & Paracetamol tablets and they have been compared on the basis of different parameters of dispersible tablets like uniformity of weight, friability testing, hardness, wetting time, wetting volume, water absorption ratio, dispersion time, disintegration time, uniformity of dispersion.

Table 1: Post compression evaluation parameters of Dispersible Tablets

Sr. no.	Name of Drugs	Wetting Volume (ml)	Dispersion Time (sec.)	Disintegration Time (sec.)	Uniformity of Dispersion
1	Acetylsalicylic acid	0.76	59	48	Pass
2	Cefixime	1.5	46	26	Pass
3	Paracetamol	2.63	1:06	2.5	Pass

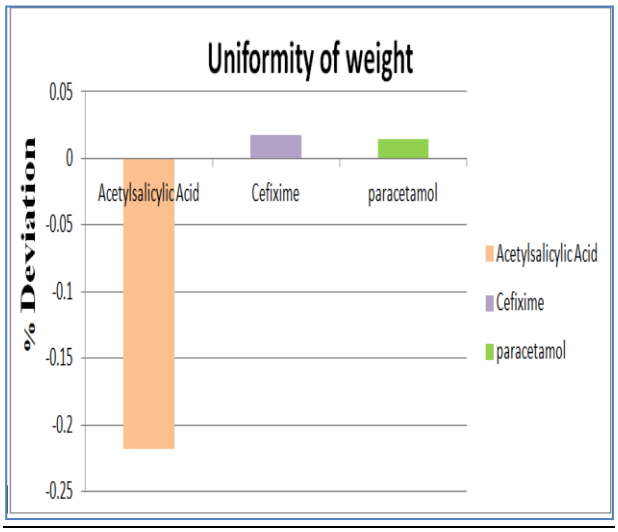

Figure 1: Uniformity of weight of three different dispersible tablets

Table 2: Post compression evaluation parameters of Dispersible Tablets

Sr. no.	Name of Drugs	Uniformity of weight (gm) (±SD)	Friability Testing (%)	Hardness (kg/cm2)	Water Absorption Ratio (%)	Wetting Time (sec.)
1	Acetylsalicylic acid	-0.2184	3.136	5.8	38.13	2:35
2	Cefixime	0.0173	1.81	7	169.77	1:12
3	Paracetamol	0.0141	0.755	9.1	115.78	1:44

According to limits of I.P., test has been performed and standard deviations have been calculated. Three types lied within limits but acetylsalicylic acid showing deviations to some larger extent in comparison of two.

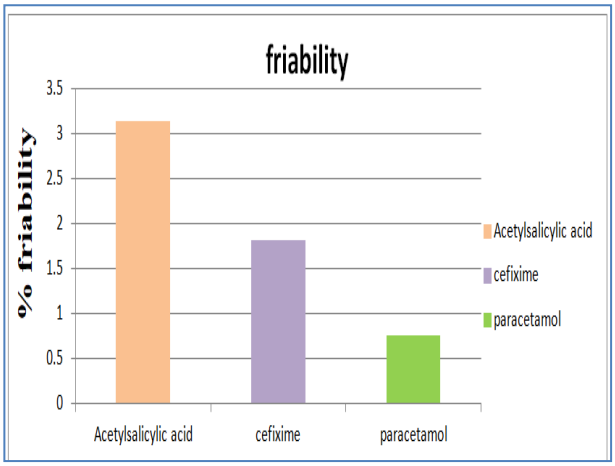

Figure 2: Friability of three different dispersible tablets

According to I.P. limit for friability is less than 1% and from above test acetylsalicylic acid and cefixime has been failed the test.[7]

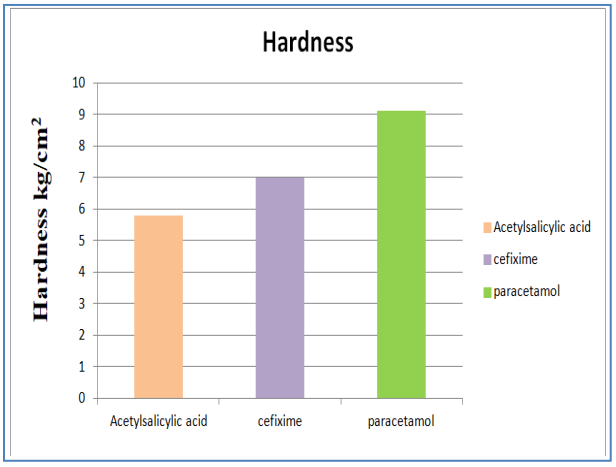

Figure 3: Hardness of three different dispersible tablets

All having hardness more than 4 kg/cm^2 that is considered lowest limit for the hardness.[8] Paracetamol having highest hardness in comparison to the rest of two which can affects it's disintegration pattern.[7]\

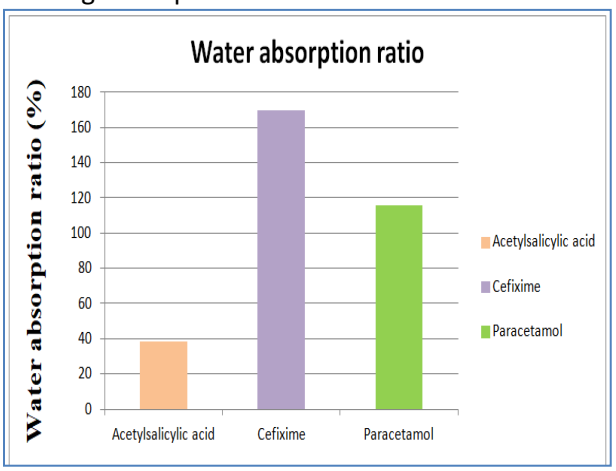

Figure 4 Water absorption ratio of three different dispersible tablets

Water absorption ratio shows the capacity of tablet to absorb the water. More the absorption of water more will be the absorption ratio and it can again affect the disintegration pattern. In this parameter cefixime has highest water absorption ratio, which would be helpful in its disintegration.[9]

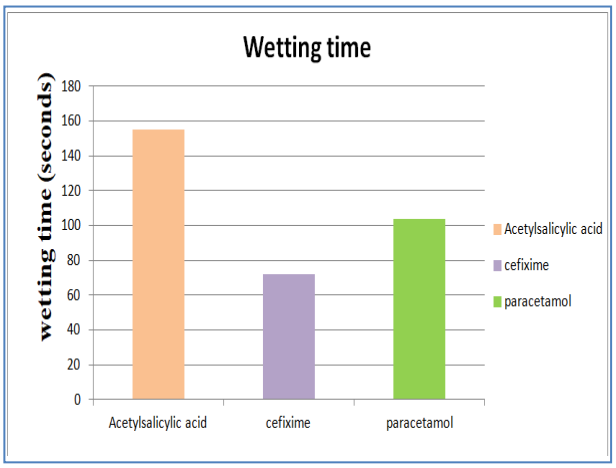

Figure 5: Wetting time of three different dispersible tablets

If we relate water absorption ratio with the wetting time then due to maximum water absorption ratio cefixime has least wetting time. It was observed from the study that when water absorption ratio is high it means tablets absorb more water which will eventually affect the wetting pattern because when water absorption is slow it takes time to wet completely. More the absorption of water, lesser will be the time for wetting of tablet.[9]`[10]

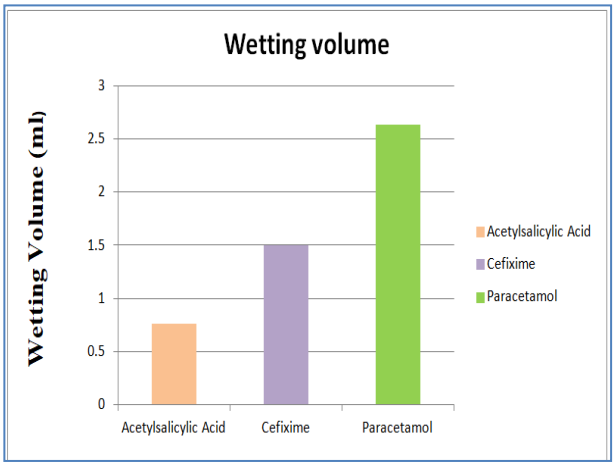

Figure 6: Wetting volume of three different dispersible tablets

Wetting volume is the volume of water that is required to complete disintegrate the tablets. Paracetamol required maximum volume of water to be disintegrated, while acetylsalicylic acid required least of water to be disintegrated.

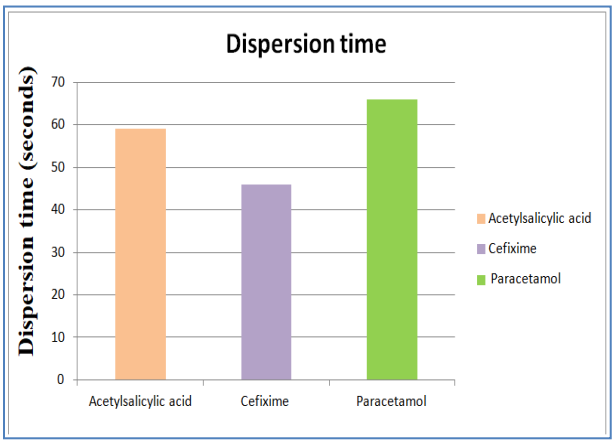

Figure 7: Dispersion time of three different dispersible tablets

Paracetamol was taken maximum dispersion time which may be due to hardness of tablets, less wetting time, less water absorption ratio.

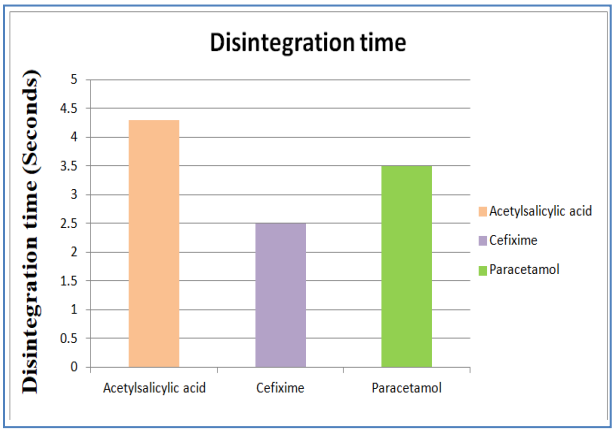

Figure 8: Disintegration time of three different dispersible tablets

In above study disintegration time of cefixime was found to be minimum while for acetyl salicylic acid it was maximized.

Conclusion

Acetylsalicylic acid & Cefixime complies all the parameters except friability test, while Paracetamol tablets complies all the tests except it was showing more hardness compared to other two brands due to which it's properties like wetting time, wetting volume, water absorption ratio, dispersion time, disintegration time were lower than other two. So after overall comparison keeping in mind the parameters of dispersible tablets for which disintegration is an important parameter, Cefixime was found to be the better in comparison to other two brandsafter the evaluation of postcompression parameters of dispersible tablets.[10]

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