A Comparative Study of Different Brands of Cetirizine Hydrochloride Tablets Available in Karachi, Pakistan

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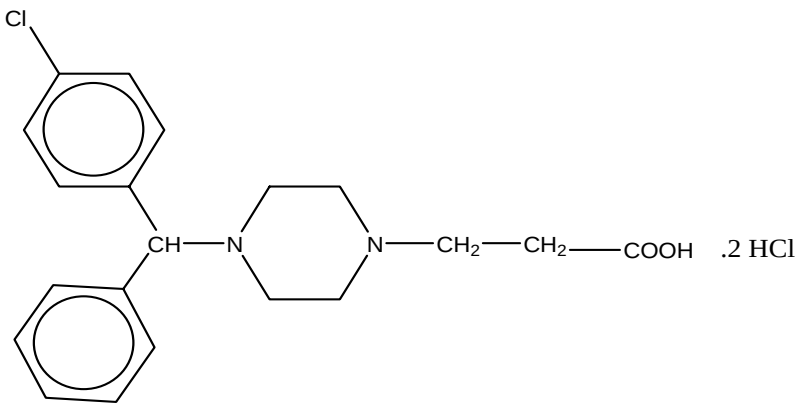
ABSTRACT

The development of a formulation requires expertise during each manufacturing stage. Tablets are the most commonly used oral, solid dosage forms in which various excipients are used and various methods are employed for their preparation. Quality of tablets should fulfill certain specifications. If the formulations are not manufactured properly and are not optimized, they will not render the desired effects. This study shows the analysis and evaluation of various pharmaceutical parameters, i.e. thickness, hardness, weight variation, disintegration and dissolution, on different brands of cetirizine hydrochloride tablets available in the local market. Cetirizine hydrochloride is an orally administered drug used as anti-histaminic with almost no sedation. The analysis done can conveniently give a general survey of different brands of cetirizine hydrochloride tablets where the difference in parameters tested can relate to difference in the bioavailability of drugs.

Keywords: cetirizine hydrochloride, tablets, anti-histaminic, quality control.

INTRODUCTION

Cetirizine hydrochloride, a piperazine derivative and metabolite of hydroxyzine, is described as a long-acting non-sedating antihistamine with some mast-cell stabilising activity.[1]



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Cetirizine hydrochloride (CTZ), a human metabolite of the piperazine H1-receptor antagonist hydroxyzine, is used to treat seasonal allergic rhinitis, chronic idiopathic urticaria, perennial allergic rhinitis, allergic asthma,

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physical urticaria, and atopic dermatitis.[2-4] Reduced dosage of cetirizine hydrochloride is recommended for patients with hepatic or renal impairment.[5-7]

Many tests are frequently applied to tablet dosage forms to render their optimum therapeutic effects. The technique of optimization is well reported in the literature for the development of tablet formulations.[8-10] The purpose of carrying out optimization is to select the best possible formulation from a pharmaceutical as well as consumer point of view.

The tablet should include the correct dose of the drug (weight uniformity and content uniformity test), the drug should be released from the tablet in a controlled and reproducible way (dissolution test), the tablet should show sufficient mechanical strength to withstand fracture and erosion during manufacturing and handling (hardness and friability test), the appearance of the tablet should be elegant with its weight, size and appearance consistent (visual observation, weight variation, thickness and diameter of the tablet) and the tablet should be packed in a safe manner. The formulation of a tablet is thus designed so that the final tablet has all these essential properties as well as being stable.[11] An important variable in any tablet system is the rate at which the drug substance dissolves; for many solid dosage forms, disintegration precedes drug dissolution. Hence, the proper choice of disintegrants and their consistency of performance are of critical importance to the formulation development of such tablets.[12] In addition to compressional force used to manufacture a tablet, the chemical component in the formula also has shown to prolong disintegration time, which subsequently affects the drug dissolution rate and bioavailability.

MATERIALS AND METHODS

Different brands of cetirizine hydrochloride were used in the study and were purchased from the local market. The brands analyzed were:

Cerizine (Pharm Evo)
Gixer (Barrette Hodgson)
Rigix (AGP)
Arix (Tabros Pharma)
Zyrtec (UCB Farchim, S.A, Switzerland)

Various pharmaceutical parameters were employed as in USP 31 (2008), i.e. thickness, hardness, weight variation, friability, disintegration, and dissolution, to test the different brands of Cetirizine hydrochloride tablets available.

Hardness test

Hardness of the tablet is controlled by (or is affected by) the degree of the pressure applied during the compression stage. It is an important criterion since it can affect disintegration and dissolution. A hardness tester (Fujiwara, Ogawa Seiki, OSK Co. Ltd.) was used for 20 tablets which were taken randomly. Table 1 shows mean ± S.D. of each brand tested.

Thickness test

Vernier calipers were used to determine the thickness of 20 tablets. Table 1 shows mean ± S.D. of each brand tested.

Weight variation test

The weight of tablets is routinely evaluated to ensure the proper amount of the drug in the tablet. An analytical balance (Mettler) was used for proper weighing of individual tablets and table 1 shows mean ± S.D. of each brand of cetirizine hydrochloride.

Friability test

20 tablets were taken randomly and placed on a sieve. Loose dust was removed with the aid of a soft brush. Tablet samples were weighed accurately and placed in the friabilator (Roche, Erweka). After 100 rotations/4 min., loose dust was removed from the tablets as before. Finally, the tablets were weighed. The loss in weight indicates the ability of the tablets to withstand this type of wear.[13]

Disintegration test

Disintegration time was observed for six tablets at a time to ensure quality control using a disintegration apparatus (Erweka-ZT2) having a rigid basket rack

assembly suspended in 1000 ml beaker, at 37°C. Results are shown in Table 2.

Dissolution test

Since drug absorption and physiological availability depend on the availability of the drug substance in the dissolution state, having suitable dissolution characteristics is important for a satisfactory tablet. The dissolution test measures the amount of time required for a certain percentage of the drug substance in a tablet to go into solution under a specified set of conditions. It describes a step towards physiological availability of the drug substance, but it is not designed to measure the safety or efficacy of the tablet being tested. It provides an in vitro control procedure to eliminate variation among production batches. The dissolution medium must be aqueous and the pH of the medium should be controlled and should simulate the biological conditions.[14,15] Dissolution studies were conducted using a USP apparatus II, paddle type with 50 rpm at 37°±1C. For standard preparation, about 10 mg of cetirizine hydrochloride was placed in a 100 ml volumetric flask and dissolved with 0.1 M hydrochloric acid and then the volume was made up to 100 ml with 0.1 M hydrochloric acid. 2 ml of this solution was transferred to another 100 ml volumetric flask and diluted to 100 ml with the same solvent. For the sample, about 900 ml of 0.1 ml HCl was placed in the dissolution bowl with one tablet and the apparatus was started. The sample was drawn at time intervals of 5, 10, 15, 30 and 45 minutes for each formulation. Absorbance of the sample preparation and that of standard were taken at 220 nm using a 0.1 M hydrochloric acid solution as a blank. Drug concentrations were measured spectrophotometrically. Results are shown in Table 2.

RESULTS

The results of the assessment of various pharmaceutical parameters of cetirizine hydrochloride brands are shown in Tables 1 and 2. The data provides the view that these formulations, though having cetirizine hydrochloride as their active ingredient, show different behaviour within specification limits after their analyses. Among the brands tested, Zyrtec showed best results while the other tablets had nearly marginal differences between them.

DISCUSSIONS

In this study, five different brands of cetirizine hydrochloride, i.e. Zyrtec, Gixer, Cerizine, Arix and Rigix, were analyzed. Zyrtec has European specifications whereas the remaining brands have local specifications. The results of the cetirizine hydrochloride brands show that differences are present during the manufacture of these products, i.e. excipients, speed of machine, etc.

It is a well-known fact that weight variation has a direct impact on the assay of the tablets. Moreover, it also indicates that the distribution of excipients is not right or homogenous. The variation of the weight of individual tablets is a valid indication of the corresponding variation in the drug content.[16] The results have shown that weight variation of the tablets is within specified limits. The prepared tablets had satisfactory hardness & thickness. Friability is another mechanical property of a tablet with a compendial specification not more than 1%. The tablets showed satisfactory friability test results.

The rate of disintegration is directly proportional to the rate of dissolution. Disintegration is evaluated to ensure that the drug substance is fully available for dissolution and absorption from the gastrointestinal tract.[17] All tablets disintegrated rapidly (less than 7 minutes) except Arix (in USP disintegration test). Out of the five brands studied, Zyrtec tablets disintegrated much more rapidly than the other brands. This could be attributed to the relatively lower hardness of the tablets.

Dissolution test results revealed that Zyrtec showed the highest dissolution rate whereas Arix gave the lowest. Nearly all the brands had a satisfactory dissolution rate. It can be concluded that, on the basis of the results shown, Zyrtec would be considered to be the product having the best proerties. F2 (similarity factor) calculations were done using Zyrtec as the reference brand since it complies to European specifications while the other brands comply

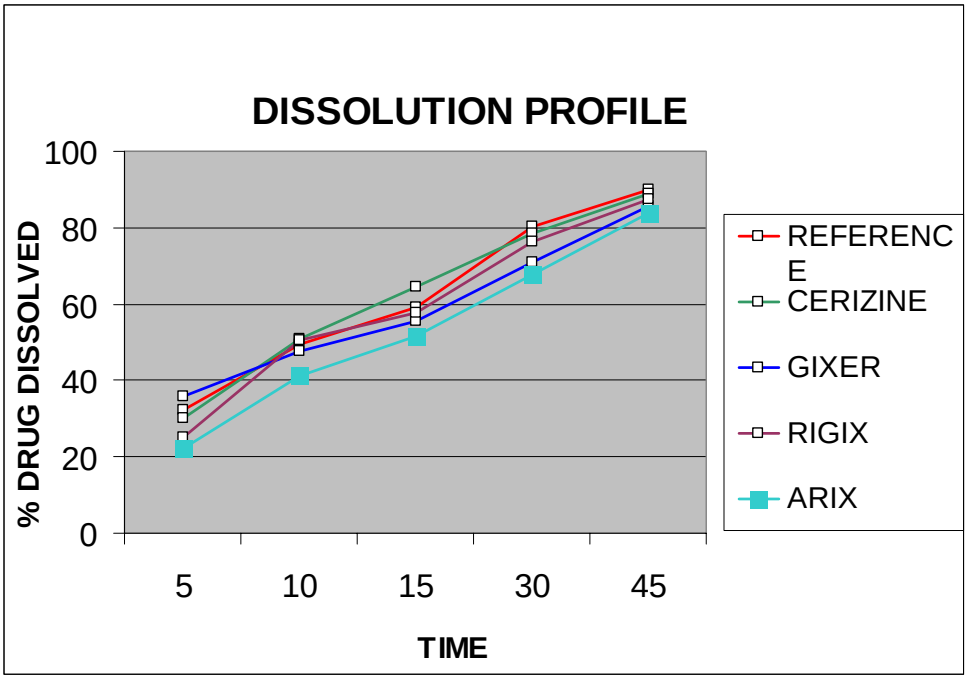
to local specifications. The reference brand dissolved rapidly and completely within the time frame. Results of the profile showed that all the test brands (Cerizine, Gixer, Rigix, Arix) release more than 80% of the drug within 45 min, with F2 (similarity factor) values of 81.64, 68.93, 74.49, and 56.98 respectively. The graph for F2 calculations shows that the result for all the brands is satisfactory.

Table 1: Assessment of Physical Parameters of Various Formulations of Cetirizine Hydrochloride Tablets

Formulation	Weight variation mg (S.D.)	Hardness (kg) mean (S.D.)	Thickness (mm) mean (S.D.)
Cerizine	12.996 (0.268)	6.822 (1.108)	3.13 (0.103)
Gixer	11.755 (0.436)	8.637 (1.229)	2.82 (0.150)
Rigix	11.735 (0.364)	7.835 (1.337)	2.87 (0.183)
Arix	12.54 (0.253)	8.505 (1.958)	3.305 (0.176)
Zyrtec	11.551 (0.254)	7.245 (0.737)	2.695(0.135)

Table 2: Assessment of Physical Parameters of Various Formulations of Cetirizine Hydrochloride Tablets

Formulation	Friability %	Disintegration test	Dissolution test
Cerizine	0.5%	4 min	88.96 %
Gixer	0.4%	4.3 min	85.83 %
Rigix	0.8%	4.3 min	87.74 %
Arix	0.3%	14.33 min	83.88 %
Zyrtec	0.4%	3.3 min	90.09%



Graph for F2 (similarity factor) results:

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دراسة مقارنة لمختلف سلالات أقراص هيدروكلوريد سيتيريزين المتوفرة في كراتشي، باكستان

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ملخـص

يتطلب وضع الصياغة خبرة خلال كل مرحلة من التصنيع. تعد الأقراص من الاشكال الجرعات الصلبة التي تستخدم السواغات المختلفة ويوجد أساليب مختلفة لإعدادها. ويوجد كذلك موصفات معينة لجودة الأقراص. فإذا لم يتم تصنيعها بشكل صحيح ، فإنها لن تؤدي الآثار المرجوة. تبين هذه الدراسة تحليل وتقييم المعلمات الصيدلانية المختلفة، مثل السمك، والصلابة، والتباين الوزن والتفكك والانحلال، على ماركات مختلفة من أقراص هيدروكلوريد سيتيريزين المتاحة في السوق المحلية.

الكلمـات الدالـة: هيدروكلوريد سيتيريزين، أقراص، ، ومراقبة الجودة.

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