

Original Article

PHARMACEUTICAL STUDIES OF ATENOLOL BRANDS: INTERCHANGEABILITY BETWEEN ATENOLOL (100 MG) TABLETS BRANDS MARKETED IN LIBYA

ABDULRHMAN. A. AKASHA*, SOMAIA . A .ELSAEDI

Department of Pharmaceutics, Faculty of Pharmacy, Tripoli University, Libya, P O Box 13645.

Email: akashaabdu@yahoo.co.uk

ABSTRACT

Hypertension is the most widely distributed cardiovascular diseases in Libyan regions. Atenolol is one of most used β -blockers in Libya as the first line in treatment of hypertension. Therefore, In Libya there are several companies interested to import and distribute many Atenolol brands. The objective of this study was to evaluate the quality of five commercial Atenolol products available on the Libyan market. We carried out a survey of all Atenolol tablet products and assessed their quality. To assess quality, all products of Atenolol such as: Atenolol tablets, Actavis United Kingdom, Totamol tablets WOCKHARDT, United Kingdom, Atenolol Normon Spain, Atenolol Film Coated tablets, BRISTOL, United Kingdom and Hypoten tablets, HIKMA Amman-Jordan were subjected for the survey includes ten community and hospital pharmacies and volunteers. Our survey was including: Atenolol drug order, Pharmaceutical company sales, Atenolol drug cost, Atenolol drug prescription and Atenolol drug purchase. Based on our testing procedure, the data of our survey 80-90%, 40-60% and 40-50% of Atenolol tablets, Actavis, Atenolol Film Coated tablets and Totamol tablets respectively are more requested and desired in Libyan drug market. Also, our data revealed 80% and 90% of volunteers said that, Film Coated tablets and Atenolol tablets, Actavis respectively are more cheaper than other brands. About 80% to Atenolol tablets, Actavis and 70% to Film Coated tablets are more requested and desired to the patients or customers. Our survey represented about 80% and 70% of pharmacy purchases are belonged to Atenolol tablets, Actavis & Atenolol Normon respectively.

Keywords: Atenolol, β -blockers, Hypertension, Tablets, Libyan market, brand.

INTRODUCTION

The speed of drug introduction to the marketplace is dependent upon its development processes and clinical estimation [1]. Hypertension is the most widely distributed cardiovascular diseases in world. Atenolol is a cardio selective beta blocker β_1 , is used in the management of hypertension, angina pectoris, cardiac arrhythmias, and myocardial infarction. It may also be used in the prophylactic treatment of migraine [2]. In hypertension atenolol is given by mouth in a dose of 50 to 100 mg daily, as a single dose, although 50 mg daily is generally adequate. The full effect is usually evident within 1 to 2 weeks.

Atenolol is used alone or in combination with other medications to treat high blood pressure. It also is used to prevent angina [chest pain] and improve survival after a heart attack. Atenolol is in a class of medications called beta blockers. It works by relaxing blood vessels and slowing heart rate to improve blood flow and decrease blood pressure [3].

The Biopharmaceutical characteristic of atenolol is described as sparingly to slightly soluble in water in different Pharmacopoeias [4,5]. Solubility of atenolol was evaluated in pH values [1.0-7.5 or 1.2-6.8] that vary from 24.8 to 31.3 mg/mL [6]. This indicates that the solubility of atenolol is pH dependent. On the basis of studied biopharmaceutical data, atenolol could be clearly classified into BCS Class III. In addition, atenolol is listed in WHO Model List of Essential Medicines [7]. According to WHO Technical Report, atenolol in vitro equivalence may be evaluated under Bio-waiver conditions for BCS Class III [8].

About 50% of a dose is absorbed after oral doses. Peak plasma concentrations are reached in 2 to 4 hours. Atenolol has low lipid solubility. It crosses the placenta and is distributed into breast milk where concentrations higher than those in maternal plasma have been achieved. Only small amounts are reported to cross the blood-brain barrier, and plasma-protein binding is minimal. The plasma half-life is about 6 to 7 hours. Atenolol undergoes little or no hepatic

metabolism and is excreted mainly in the urine. It is removed by haemodialysis [9].

The marketing of generic drug products registered by national drug agencies in developing countries has its attendant problem of ascertaining quality to determine their interchangeability [10]. Accordingly, drugs having more than 2 generic products should be analyzed for biopharmaceutical and chemical equivalence to ascertain their interchangeability. This analysis ensures that any of the generic products can be used interchangeably, especially when some of these products are locally manufactured.

It has been observed that most locally manufactured generic products are less expensive than imported products. Accordingly, this may raise the suspicion of non-equivalent performance. According to the guidelines of regulatory agencies such as the Food and Drug Administration, the prediction of the in vivo bioavailability of drugs from an oral solid dosage form depends on its in vitro dissolution profile [11]. Dissolution testing of drug products plays an important role as a quality control tool to monitor batch-to-batch consistency of drug release from a dosage form and as an in vitro surrogate for in vivo performance [12].

2. Materials and Methods of Survey

2.1 Materials

- I. Atenolol tablets produced by Actavis "United Kingdom" [Batch number OKB061004].
- II. Totamol tablets produced by WOCKHARDT "United Kingdom" [Batch number OLT1937CP4].
- III. Atenolol Normon produced by Laboratorios Normon, S.A "Spain" [Batch number D-5].
- IV. Atenolol Film Coated tablets produced by BRISTOL "United Kingdom" [Batch number EP0071009].
- V. Hypoten tablets produced by HIKMA Pharmaceutics "Amman - Jordan" [Batch number 7611].

METHOD OF SURVEY

The study was carried out at Faculty of Pharmacy, department of Pharmaceutics, University of Tripoli, Libya.

We have subjected the survey of all five brands of Atenolol such as: Atenolol, Totamol, Atenolol Normon, Atenolol Film Coated tablets and Hypoten tablets, for ten community and hospital pharmacies and volunteers in different regions of Libya. Our survey was including: several question to assess the best brand should be available in Libyan market for sales. Our survey concerned the type and nature of questionnaire including Atenolol drug order, Pharmaceutical company sales, Atenolol drug cost, Atenolol drug prescription and Atenolol drug Purchase. Based on our testing procedure, we have collected all the data of our questionnaire and statistically were analysed and tabulated. Our survey data were plotted in figures to show the related results.

RESULTS AND DISCUSSION

Hypertension is a widely prevalent and is the leading risk factor for the development of cardiovascular disease [CVD]. This post marketing surveillance study aimed to collect information on the efficacy, safety and interchangeability of atenolol tablets because more than five different brands of atenolol are present in the Libyan drug market, coming from different sources [manufacturer].

In the present study of five brands of Atenolol [100 mg] tablet, the data of our survey showed 80-90% , 40-60% and 40-50% of Atenolol tablets, Actavis, Atenolol Film Coated tablets and Totamol

tablets respectively are more requested and desired in Libyan drug market table[1] and figure [1, 2 &6]. Also, our data revealed 80% and 90% of volunteers said that, Film Coated tablets and Atenolol tablets, Actavis respectively are more cheaper than other brands table[1] and figure [3&6]. About 80 % to Atenolol tablets, Actavis and 70% to Film Coated tablets are more requested and desired to the patients or customers table[1] and figure [4&6]. Our survey represented about 80% and 70% of pharmacy purchases are belonged to Atenolol tablets, Actavis & Atenolol Normon respectively table[1] and figure [5&6].

Our investigation was revealed the correlation between the price of Atenolol tablets were imported from different manufactures with different companies for drug importation & distribution and local community pharmacists and physicians.

Previous researches in this area have shown that the post-marketing evaluation of drug products is important to develop the confidence for manufacturer in order to ensure the safety and efficacy of the product [13,14]. As well as this kind of studies help the healthcare people in interpretation between different brands of same generic.

Previous studies, all of the five brands show the fulfilment of the compendia specification for uniformity of weight, hardness, disintegration, friability and content assay [15]. All the brands are within their expiry dates but there is major difference in price. Regardless of price, generic products should be compared with innovator for its quality and efficacy.

Table 1: Showed the survey data of five Atenolol brands

	% Atenolol drug order	% pharma-Companies sales	% Atenolol price	% drug	% Atenolol drug Purchase	% Atenolol pharmacist Drug opinions
Atenolol	80	90	90	80	80	80
Totamol	40	50	40	40	40	40
Atenolol Norman	20	40	20	20	20	70
Atenolol Film-coated	60	40	80	70	70	50
Hypoten	0	0	40	0	0	30

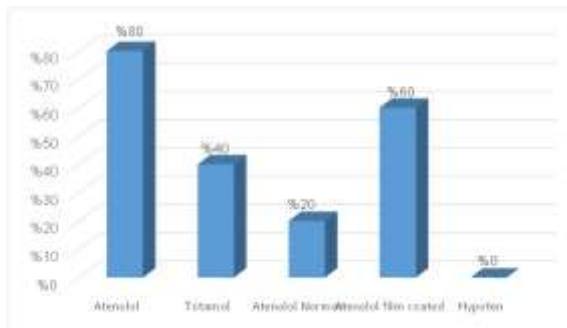


Fig. 1: Showed the relation between Atenolol brands and pharmacy drug order.

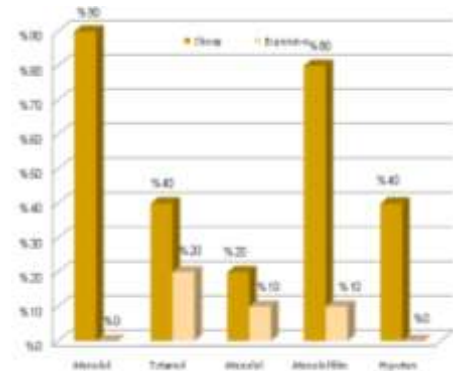


Fig. 3: Showed the relation-ship between Atenolol brands and their prices.

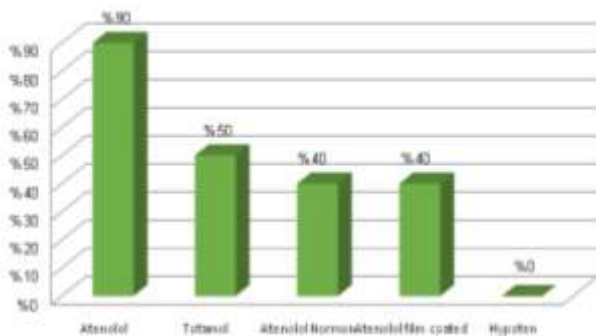


Fig. 2: Showed the relation-ship between Atenolol brands and pharmaceutical companies' sales.

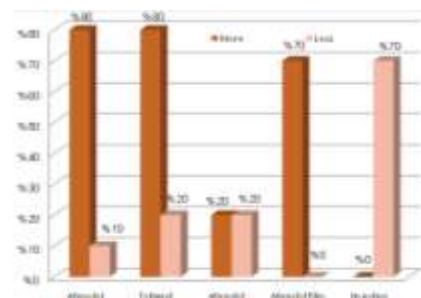


Fig. 4: Showed the relation-ship between Atenolol brands Purchase.

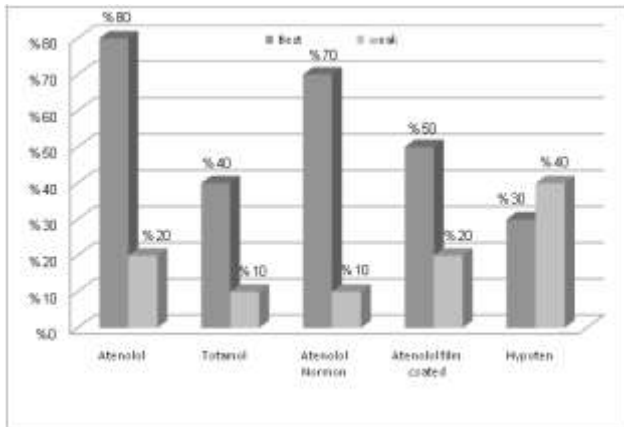


Fig. 5: Showed the relationship between Atenolol drug pharmacist opinions.

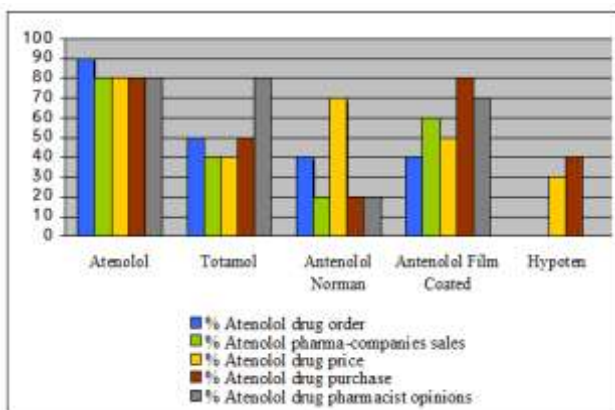


Figure 6: Showed the cumulative relationship between Atenolol brands with all survey contents .

CONCLUSION

The post-market monitoring is very crucial for effective clinical outcome. The study has emphasized that pharmaceutical equivalence indicated that the products have same drug molecules with approximately same pattern specification for uniformity of weight, hardness, disintegration, friability and content assay [15]. By making fine tunings in the survey equivalence study we can reduce the time, cost and unnecessary exposure of healthy subjects to medicines and finally to market the quality generic drug products with good prices deals.

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