

## Short Survey

# A COMPARATIVE STUDY ON METRONIDAZOLE BRANDED GENERICS AND UNBRANDED GENERICS: A SHORT SURVEY

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## Abstract

**Background:** World Health Organization (WHO) reported that almost 30 % of the world population cannot afford essential medicines; this may go up in the coming days in some developing countries if there is no proper intervention by the government. In the year 2008, Jan Aushadhi Scheme was initiated by the Government of India to have a powerful intervention against the unjustifiable pricing of medicines by the private pharmaceutical industries and make the generic medicines available at affordable prices but it has failed because of lack of awareness among the general public. **Objective:** The main objective to undertake this study is to show a comparison between Branded Generics and Unbranded generics in India. **Methods:** A survey was conducted in the East Sikkim region of India and listed some commonly dispensed drugs. Based on the survey report one particular drug was selected and the study was undertaken. Our study mainly focused on the Evaluation of the Percentage content of the Label Claim for both the Branded generics and Unbranded generics. **Results and Discussion:** Comparative study was carried out by taking three different Branded generics (BG-1, BG-2, and BG-3) and Unbranded Generics(UBG) of metronidazole of same dosage form. Results were found satisfactory as the metronidazole content of all the samples is within the Pharmacopoeial limit. **Conclusion:** This is a preliminary study with a low-cost drug, performed in our lab condition with the limited facility. So our study can be a basis for carrying out a similar kind of study on high-cost drugs and can create awareness among people.

**Key Words:** Branded Drug; Generic Drug; Branded Generics; Unbranded Generics

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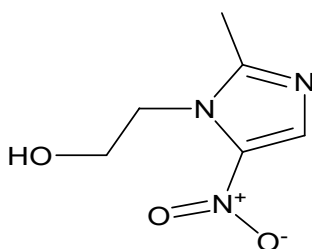
## Introduction

Commercially, medications are either brand name drugs or generic drugs. Brand name drugs are also called innovator drug and they are the types of medications which are patented, manufactured, and licensed for the first time. In contrast, generic drugs are the types of medications that are bioequivalent to the brand name drugs and have identical active ingredients but produced after patent expirations by another manufacturer [1].

Generic drugs are similar to brand-name drugs in terms of identity, strength, quality, purity, safety, potency, uses, and treatment. Generic drugs must have an identical active ingredient, dosage form, and strength, and efficacy, route of administration, drug bioavailability profile, and pharmacokinetic (PK) parameters similar to the brand name drug [2].

Considering the Indian scenario, there are other terms like 'Branded generics' and 'Unbranded generics'. Branded generics indicates medicines which are now off-patent and sold under a brand name by manufacturing companies, this represents almost all the drugs in the Indian Pharmaceutical market whereas Unbranded generics is a new category of a generic drug, generally manufactured by organizations which mainly concentrate on the social welfare rather than profit, they are called as not-for-profit organizations or Non-Profit Organizations, or they may be subsidized by Non-governmental organizations (NGO) [3].

Metronidazole comes under the category of Benzimidazole derivative as it contains benzimidazole as a basic ring. It is a drug of choice for the treatment of amoebiasis. Metronidazole was launched way back in the 1950s for the treatment of infections and still, it is used effectively in the treatment of amoebiasis, giardiasis, and trichomoniasis with great success. Metronidazole therapy is used effectively against Anaerobic bacterial infections caused by, Fusobacteria, Bacteroides species, and Clostridia with high success rate. [4]



2-methyl-5-nitro-1H-imidazole-1-ethanol

Figure 1: Chemical Structure of Metronidazole

Metronidazole is a nitroimidazole derivative, as the nitro group is directly connected to the benzimidazole ring. It is a drug of choice for the treatment of infections with bacterial vaginosis and *Trichomonas vaginalis* during pregnancy [5]. The drug is used three times/day for 3-5 days as per treatment protocol. [6] Typically dose range for an adult is 250 mg three times a day for five to seven days and children 15 mg/kg three times a day for five to seven days. Therapeutic failure of metronidazole and the drug for giardiasis in humans have been increasingly reported all over the world, as it is prescribed commonly for a wide range of non-parasitic infections which leads to the development of clinically drug-resistant strains of *Helicobacter pylori* HP, causing GI cancer. This is because of over usage of metronidazole for the treatment of parasitic infections as well as nonparasitic infections. According to previous reports, metronidazole toxicity may induce several neurologic side effects, including ataxic gait, peripheral neuropathy, dysarthria, encephalopathy, and seizures [7,8]. Chemically, metronidazole is 2-methyl-5-nitro-1H-imidazole-1-ethanol. Protozoans reduce the nitro group and generate metabolites that inhibit DNA synthesis. Metronidazole tablets contain not less than 95% and not more than 105% of the stated amount of metronidazole, C<sub>6</sub>H<sub>9</sub>N<sub>3</sub>O<sub>3</sub>. It is a white powder having molecular weight 171.16 gm/mol, Soluble in water, ethanol, and HCl [9,10].

The basic principle behind the UV spectroscopy is the absorption of visible and UV radiation (200–400 nm) and associated with excitation of electrons, in both atoms and molecules, from lower to higher energy levels. Since the energy levels of matter are quantized, only light with the precise amount of energy can cause transitions from one level to another will be absorbed [11]. UV spectroscopy obeys the Beer-Lambert law. This Law states that, when a beam of monochromatic light is passed through a solution of an absorbing substance, the rate of decrease of intensity of radiation with the thickness of the absorbing solution is proportional to the incident radiation as well as the concentration of the solution. The expression of Beer-Lambert law is given by Equation 1.

$$A = \log \left( \frac{I_0}{I} \right) = ECL \quad \text{Eq.1}$$

Where, A = absorbance; I<sub>0</sub> = intensity of light incident upon sample cell;  
 I = intensity of light leaving sample cell; C = molar concentration of solute;  
 L = length of the sample cell (cm); E = molar absorptivity

From the Beer-Lambert law, it is clear that the greater the number of molecules capable of absorbing light of a given wavelength, the greater the extent of light absorption [12].

### **Materials and Methods**

A survey was conducted in different Pharmacy shops of Singtam, Majhitar, and Rangpo regarding the most commonly dispensed drugs. Among which we have selected a drug for quality assessment, namely Metronidazole because Amoebiasis is very common here in hills.

#### ***Sample collection***

Branded generics of three different manufacturers were collected from Singtam, Majhitar, and Rangpo whereas the Unbranded generic was obtained from Pradhan Mantri Bhartiya Janaushadhi Kendra, Tezpur Medical College, Assam.

Table 1: Different Marketed Samples along with Price

<b>Metronidazole Drug Sample*</b>	<b>Price (INR)</b>
BG-1	21.33/15 tabs
BG-2	21.40/15tabs
BG-3	100.00/10tabs
UBG	5.00/10tabs
Metronidazole(Pure drug)	

\*BG-Branded Generics; UBG-Unbranded Generics

#### ***Determination of Percentage content of the Label Claim by UV Spectrophotometry***

Instrument Used: U.V-1800

Manufacturer: Shimadzu Corporation, Japan.

Chemical Used: HCl, Distilled water, Pure drug (metronidazole).

### ***Wavelength Selection***

We have planned to evaluate the Percentage Content of the label claim of marketed samples by using two different solvents. A solution of 100 ppm metronidazole standard was accurately prepared. Standard metronidazole of high purity was dissolved in water and the solution was in the 200 - 400 nm UV region. The wavelength maxima ( $\lambda_{\max}$ ) was observed at 340 nm and this wavelength was used for further absorbance measurement.

The same procedure was repeated for metronidazole by using HCl as a solvent and the wavelength maximum was observed at 277 nm. [13].

### ***Preparation of solutions*** [13,14]

#### **1. Preparation of standard solution**

(a) Weighed accurately 10 mg of metronidazole standard was transferred to a 100 mL volumetric flask containing a little amount of distilled water, dissolved the content, and finally, volume was made up to the mark with distilled water. (Stock1). 10mL was pipetted out from Stock-1 and transferred to another 100mL volumetric flask and made the volume up to the mark with distilled water. (Stock2)

(b) Weighed accurately 10 mg of metronidazole standard was transferred to a 100 mL volumetric flask containing a little amount of 0.1(M) HCl, dissolved the content, and finally, volume was made up to the mark with the same solvent. (Stock 1). 10 mL was pipetted out from Stock-1 and transferred to another 100 mL volumetric flask and made the volume up to the mark with 0.1(M) HCl (Stock-2).

#### **2. Preparation of sample solution**

(a) Tablets taken for the study were labeled to contain metronidazole 400 mg per tablet and had 2- 5-year shelf life. 10 Tablets from three different brands of metronidazole from the marketed sample were weighed separately and crushed uniformly with the help of a mortar and pestle, the average weight was calculated and the sample powder equivalent to 10 mg of metronidazole was transferred into a volumetric flask of 100 mL capacity containing 10 mL distilled water. The solutions were sonicated for about 5-10 minutes and then the volume was made up to the mark with distilled water (Stock 1). Further, Stock 2 was prepared following the same steps as in the case of standard.

(b) Tablets taken for the study were labeled to contain metronidazole 400 mg per tablet and had 2- 5-year shelf life. 10 Tablets of three different brand of metronidazole from the marketed sample were weighed separately and crushed uniformly with the help of a mortar and pestle, the average weight was calculated and the sample powder equivalent to 10 mg of metronidazole was transferred into a volumetric flask of 100 mL capacity containing 10 mL of 0.1(M) HCl. The solutions were sonicated for about 5-10 minutes and then the volume was made up to the mark with 0.1(M) HCl (Stock 1). Further, Stock 2 was prepared following the same steps as in the case of standard.

### (3) Measurement of absorbance and calculation

After the preparation of Standard and Sample solutions of strength 10 µg/mL, the absorbance of the sample preparation and standard preparation was measured at the wavelength of 340 nm and 277 nm, using UV Spectrophotometer. The percentage content of the label claim was calculated using Equation 2 and 3.

$$\text{Amount of drug present} = \frac{\text{Sample Absorbance}}{\text{Standard Absorbance}} \times \frac{\text{Weight of Standard}}{\text{Weight of Sample}} \times \text{Average Weight} \times \text{\% purity of Standard}$$

Eq. 2

$$\text{\% Content of the Label Claim} = \frac{\text{Amount Present}}{\text{Label claim}} \times 100$$

Eq.3

### Results and Discussion

The absorbance of all the samples was taken using two different solvents in their wavelength maximum and percentage content was calculated. Three times reading was taken and finally, the average was calculated.

Table 2: Summary of Percentage Content of Metronidazole in Samples

Samples	Solvent	Pharmacopeial (%)	Limit	Average % content of label claim
BG-1	Water			98.90 %
	HCl			98.65 %
BG-2	Water	95.0- 105.0 %		97.99 %
	HCl			98.76 %
BG-3	Water			96.42 %
	HCl			96.40 %
UBG	Water			98.61 %
	HCl			97.17 %

### Conclusion

This is a preliminary study with a low-cost drug, performed in our lab condition with the limited facility. So our study can be a basis for carrying out a similar kind of study on high-cost drugs and can create awareness among people regarding unbranded generics, which is cost-effective. In the coming days, we are planning to perform a complete comparative quality assessment of Branded and Unbranded generics of few high-cost drugs, which can be a basis of creating awareness among the general public who can't afford high-cost drugs.

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