



**COMPARATIVE QUALITY EVALUATION OF TWO DIFFERENT COMMERCIAL BRANDS OF PANTOPRAZOLE GASTRO RESISTANT TABLET IP AS PER INDIAN PHARMACOPOEIA MARKETED IN NORTHEAST INDIA**

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Article Received on 08/11/2017

Article Revised on 29/11/2017

Article Accepted on 19/12/2017

**ABSTRACT**

The safety and efficacy of a pharmaceutical dosage form can be guaranteed when its quality is reliable. The efficacy of pharmaceutical dosage forms generally depends on their formulation properties, and manufacturing methods, hence it is likely that the quality of dosage form may vary. The aim of our present study is to evaluate the quality of two brands of Pantoprazole Gastro-resistant Tablets I.P 40mg which are marketed in North East region of India whether they qualify the entire test mentioned in Indian Pharmacopoeia thereby suggesting their quality and efficacy for use among the general public. The study was exclusively experimental that used Indian Pharmacopoeia 2014 to check the *in vitro* quality of Pantoprazole Gastro-resistant Tablets I.P using different analytical techniques and procedure. All the two brands under the study were within the specification for weight variation test for tablet. The test for identification, assay and uniformity of content and dissolution were carried out by High Performance Liquid Chromatography using U-HPLC System (Thermo- Dionex) equipped with an UV detector and stainless steel column (25cm × 4.6mm × 5µm) packed with octadecylsilane chemically bonded to porous silica. The dissolution study was carried out in two stages in Apparatus 1 of I.P. For acid phase, 1000 ml of 0.1M Hydrochloric acid was used as dissolution medium with the speed, temperature and time of apparatus set at 100rpm, 37±0.5°C and 120 minutes respectively. For buffer phase the dissolution medium used was 1000ml of Tris acetate buffer, pH 8.5 with the speed and time of apparatus set at 75rpm and 60 minutes respectively. The research work indicated that two different brands did not show much difference in their results and they were found to be within the acceptance limits.

**KEYWORDS:** Pantoprazole, Indian Pharmacopoeia, Quality control.

**INTRODUCTION**

The importance of good manufacturing practices (cGMP) for establishing the quality of pharmaceutical products has emerged as a very significant issue. In the manufacturing process of a pharmaceutical product quality control test plays a very significant role, it includes various parameters for eliminating or preventing every possible error for maintaining the quality of finished product. Quality as per ISO 8402-1986 is best defined as "the totality of features and characteristics of a product or service that bears its ability to satisfy as stated or implied needs".<sup>[1]</sup> In process and Finished product quality control tests are done to measure the efficiency of the product before they get released commercially. On completion of the manufacturing process of finished product, quality control tests are done with reference to qualitative and quantitative characteristics. The compliance of the approval limits of the finished product during its entire shelf life is studied. Pharmacopoeias are standard monograph for all drugs. There are various

official pharmacopoeias which include the Indian Pharmacopoeia (IP), United States Pharmacopoeia (USP), British Pharmacopoeia (BP), European Pharmacopoeia (EP), wherein they have laid down specified limits within which the product should fall to fulfill the requirements in order to be compliant as per the standards.<sup>[2]</sup>

Pantoprazole belong to a class of antisecretory compounds, the substituted benzimidazoles, Proton pump inhibitors (PPIs) suppress gastric acid secretion by specific inhibition of the H<sup>+</sup>/K<sup>+</sup>- ATPase in the gastric parietal cell.<sup>[3]</sup> This process starts with absorption of the PPI in the parietal cell. PPIs are weak bases, so protonation takes place in the acidic region of the secretory canaliculus of the parietal cell. In the secretory canaliculus, the methylsulfinyl group shifts to a highly reactive sulfenamide. The final step is covalent binding of the reactive sulfenamide to 2 cysteine moieties of the catalytic subunit of the H<sup>+</sup>/K<sup>+</sup>- ATPase of the proton

pump. This results in inhibition of the acid secretion, followed by elevation of the intragastric pH. They are used for the treatment of acid-peptic diseases such as duodenal, gastric and esophageal ulceration.<sup>[4]</sup> For pantoprazole TLC and HPTLC methods have been reported for their determination in pharmaceutical preparations.<sup>[5-6]</sup> The analysis of this drug in biological fluids has been mainly performed by HPLC techniques.<sup>[7-8]</sup>

The objective of this research work is to evaluate the quality of two brands of Pantoprazole Gastro-resistant

Tablets I.P 40mg marketed in North East region of India, in order to verify whether the products complies with the standard or not. The Indian Pharmacopoeia is an official document meant for overall Quality Control and Assurance of drugs and Pharmaceutical marketed in India published by the Indian Pharmacopoeia Commission (IPC) on behalf of the Ministry of Health & Family Welfare, Government of India. The Indian Pharmacopoeia provides standards for drugs manufactured/marketed in India to control as well as assure the quality of medicines.

**Table 1: List of Commercial Brands of Pantoprazole Gastro-resistant Tablets I.P 40mg**

Product code	Batch No.	Manufacturer	Mfd date	Exp date
A	AT-000117	Pinnacle Life Sciences Private Limited	01/2017	12/2018
B	AI6008019	Crescent Therapeutics Limited	10/2016	09/2018

## MATERIALS AND METHODS

In this study the active pharmaceutical ingredient (API), Pantoprazole sodium was obtained from M/S Regent Biotech. We have procured two commercial brands of Pantoprazole Gastro –Resistant Tablets IP 40mg from retail pharmacies located in Guwahati and they are listed in table 1.

### Quality control parameters

#### Identification Test

Reversed phase High Performance Liquid Chromatography (HPLC) was used for carrying out the identification test on U-HPLC System (Thermo- Dionex) autosampler integrated with UV detector. The software employed was Chromeleon chromatography data system.<sup>[9]</sup>

#### Assay

The assay was also carried out by HPLC. This test was done to determine the actual amount of active ingredient present in the tablet and its compliance with the labeled amount. The chromatographic conditions maintained throughout the procedure were a stainless steel column (25cm × 4.6mm) packed with octadecylsilane chemically bonded to porous silica (5µm). The mobile phase, mixture of 50 volumes of buffer solution which is prepared by dissolving 6.8 gm of Potassium dihydrogen orthophosphate and 1 gm of hexane sulphonic acid sodium salt in 1000 ml of HPLC grade Water (Fischer Scientific) which is finally adjusted to pH 7.3 with 1 M sodium hydroxide and in the other channel 50 volumes Acetonitrile (Fischer Scientific) is used. The mobile phase was pumped into the system at a flow rate of 1.5ml per minute with Spectrophotometer wavelength set at 290nm and injection volume of 10µl. The mobile phase prior to use was degassed under vacuum by filtration through 0.2µ nylon membrane.<sup>[9]</sup>

#### Preparation of Reference solution

Pantoprazole sodium working standard (WS) equal to

10.1 mg was accurately weighed and dissolved in 50ml of the mobile phase. The prepared solution was sonicated for 10 minutes making final concentration equivalent to 200mcg and filtered through 0.45µm filter.<sup>[9]</sup>

#### Preparation of Test solution

Of all the two batches 20 tablets of each batch were weighed separately and powdered. An accurately weighed powder containing 20mg of Pantoprazole was transferred to 100ml volumetric flask with addition of mobile phase as diluent. The prepared solution was sonicated until complete mixing and filtered through 0.45µm filter.<sup>[9]</sup>

#### Uniformity of Content

This test is done on tablets containing 10mg or less or in the case of tablet having enteric coated as described under assay following the same chromatographic conditions. Amongst the two batches ten tablets of each batch were checked for uniformity of content.<sup>[9]</sup>

#### Preparation of Reference solution

Pantoprazole sodium working standard (WS) equal to 10.1 mg was accurately weighed and dissolved in 50ml of the mobile phase. The prepared solution was sonicated for 10 minutes making final concentration equivalent to 200mcg and filtered through 0.45µm filter.<sup>[9]</sup>

#### Preparation of Test solution

Test solution was prepared by dispersing 1 tablet in 100ml mobile phase. The prepared solution was further diluted to 5ml in 10 ml of mobile phase.<sup>[9]</sup>

#### Dissolution (Acid stage)

Dissolution test was carried out on all two different brands in Apparatus 1 of I.P. (TDT-08L, Electrolab) with six individual tablets of each brand. The dissolution medium used was 1000ml of 0.1M hydrochloric acid with the speed and time of apparatus set at 100rpm and 120 minutes respectively. During the entire analysis the

temperature was maintained at  $37 \pm 0.5^\circ\text{C}$ . A suitable volume of the dissolution medium was withdrawn at the end of analysis and filtered through Whatman filter No. 40. The quantity of Pantoprazole released into the dissolution medium was calculated as percentage in relation to the value declared on product label. The absorbance of both reference and test solutions were measured at the maximum at about 290nm using High Performance Liquid Chromatography using U-HPLC System (Thermo- Dionex) equipped with an UV detector and stainless steel column ( $25\text{cm} \times 4.6\text{mm} \times 5\mu\text{m}$ ) packed with octadecylsilane bonded to porous silica.

#### Preparation of Reference solution

An accurately weighed quantity of Pantoprazole sodium working standard (WS) was prepared in dissolution medium to obtain a final concentration of 400 mcg.<sup>[9]</sup>

#### Preparation of Test solution

Test solutions were not further diluted as the concentration was equivalent to 400 mcg.<sup>[9]</sup>

#### Dissolution (Buffer stage)

Dissolution test was carried out on all two different brands in Apparatus 1 of I.P. (TDT-08L, Electrolab) with six individual units of each brand. The dissolution medium used was 1000ml of Tris acetate buffer solution PH 8.5 with the speed and time of apparatus set at 75rpm and 60 minutes respectively. During the entire analysis the temperature was maintained at  $37 \pm 0.5^\circ\text{C}$ . A suitable volume of the dissolution medium was withdrawn at the end of analysis and filtered through Whatman filter No. 40. The quantity of Pantoprazole released into the dissolution medium was calculated as percentage in relation to the value declared on product label. The absorbance of both reference and test solutions were measured at the maximum at about 290nm using a Cary 100 UV-Vis Spectrophotometer.<sup>[9]</sup>

#### Preparation of Reference solution

An accurately weighed quantity of Pantoprazole working standard (WS) was prepared in dissolution medium to obtain a final concentration of 12mcg.

#### Preparation of Test solution

Test solutions were not further diluted as the concentration was equivalent to 12 mcg.

### RESULTS AND DISCUSSION

#### Identification Test

This test was found to be in compliance with the criteria mentioned in I.P. which states that the principal peak in the chromatogram obtained with test solution in assay corresponds with the peak in the chromatogram obtained with reference solution.

#### Assay

In this test the determination of actual amount of active ingredient present in the formulation was found to be within the acceptance limit of (90-110) % in all the two different brands of Pantoprazole Gastro –Resistant tablets under study and are listed in table 2. Figures 1, 2 and 3 show the chromatograms of standard Pantoprazole and tested Pantoprazole tablets obtained from HPLC.

#### Uniformity of Content

The test for uniformity of content carried out for two different brands were in compliant with the I.P. limit of (85-115) % of average weight and listed in Table 3.

#### DISSOLUTION

In this study the different brands were evaluated for their in-vitro drug release which indicated that although the results varied among the different formulations but they were within the acceptance limit of not more than (NMT) 10% in acid phase and not less than (NLT) 75% in buffer stage. The results are listed in table 4.

**Table 2: Results of Assay of the two brands of Pantoprazole Gastro –Resistant tablets.**

Product code	Batch No.	Identification (HPLC)	Assay (HPLC)
A	AT-000117	Complies	97.05(90-110) %.
B	AI6008019	Complies	95.09(90-110) %.

**Table 3: Results of Content Uniformity of the two brands of Pantoprazole Gastro –Resistant tablets.**

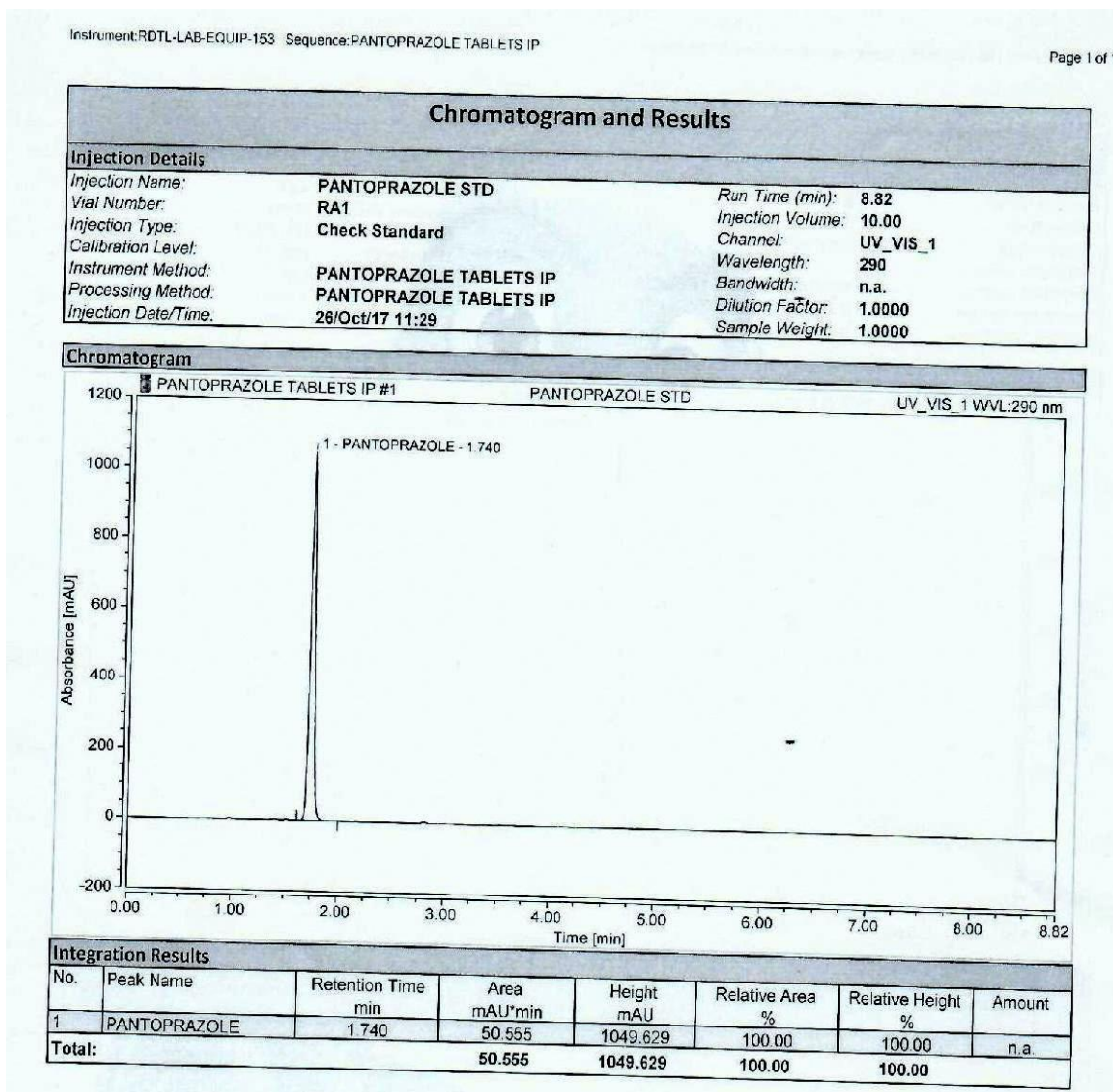
Sl. No.	AT-000117	Sl. No.	AI6008019
Tablet 1	97.15	Tablet 1	94.48
Tablet 2	97.12	Tablet 2	94.26
Tablet 3	97.24	Tablet 3	94.13
Tablet 4	97.18	Tablet 4	94.34
Tablet 5	97.29	Tablet 5	94.13
Tablet 6	97.17	Tablet 6	94.23
Tablet 7	97.32	Tablet 7	94.69
Tablet 8	97.24	Tablet 8	94.26
Tablet 9	97.35	Tablet 9	94.20
Tablet 10	97.24	Tablet 10	94.49
Average-97.23%		Average-94.32%	
Limit-(82.64-111.81) %		Limit-(80.172-108.469)%	

**Table 4: Results of comparative dissolution studies of the two brands of Pantoprazole Gastro –Resistant tablets as percentage drug release in Acid Phase.**

SI No.	AT-000117	SI No	AI6008019
Tablet 1	0.52	Tablet 1	0.49
Tablet 2	0.34	Tablet 2	0.52
Tablet 3	0.36	Tablet 3	0.37
Tablet 4	0.44	Tablet 4	0.16
Tablet 5	0.81	Tablet 5	0.46
Tablet 6	0.75	Tablet 6	0.43
Limit(NMT) 10%		Limit(NMT) 10%	

**Table 5: Results of comparative dissolution studies of the two brands of Pantoprazole Gastro –Resistant tablets as percentage drug release in Buffer Phase.**

SI No.	AT-000117	SI No	AI6008019
Tablet 1	107.52	Tablet 1	107.50
Tablet 2	107.97	Tablet 2	107.93
Tablet 3	109.40	Tablet 3	109.41
Tablet 4	107.92	Tablet 4	107.92
Tablet 5	108.58	Tablet 5	108.59
Tablet 6	110.66	Tablet 6	110.64
Limit(NMT) 75%		Limit(NMT) 75%	

**Fig.1**

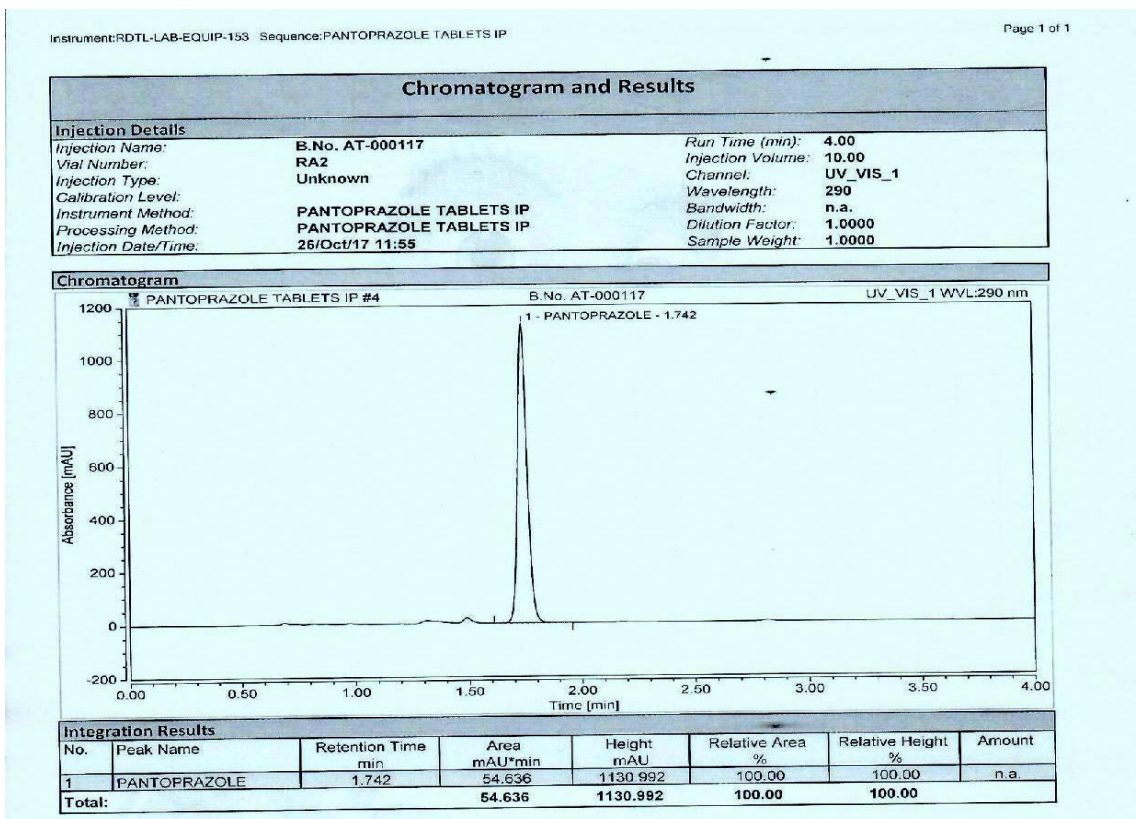


Fig.2.

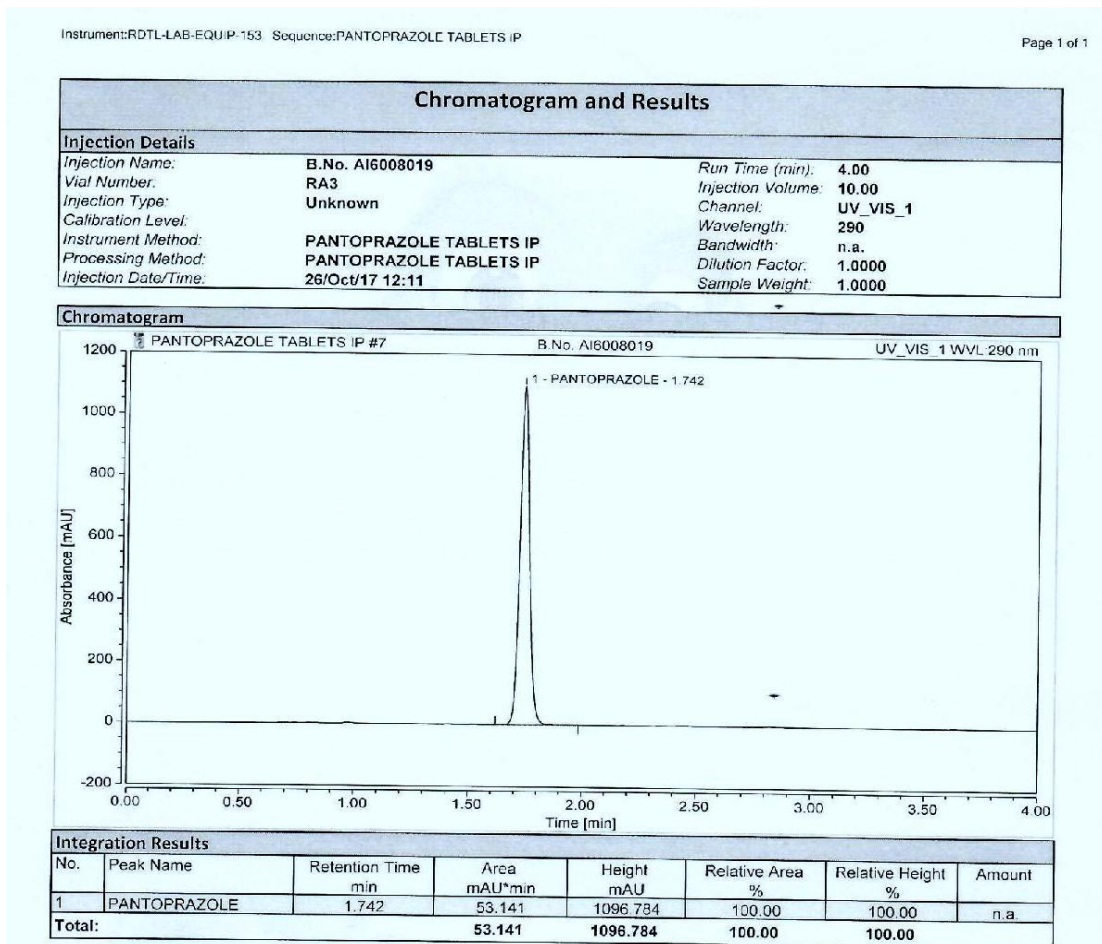


Fig.3

## CONCLUSION

The qualitative analysis as given in the monograph of Pantoprazole tablets in Indian Pharmacopoeia were performed using different analytical methods and were found to meet the requirements in all respects. All the brands have passed all the official tests prescribed by Indian Pharmacopoeia (IP). Formulation additives in the tablet, physical form of the drug used in the tablet and manufacturing processes vary from manufacturer to manufacturer which is responsible for the variation in the observed dissolution profiles. All two brands under study were evaluated for test of Identification, Assay, Content Uniformity and Dissolution and their comparative results in the entire test conform with the limits as given under acceptance criteria. Hence it is concluded that the main aim behind this research work was to check that whether various brands of different pharmaceutical companies available in Northeast region of Indian market align with the acceptance criteria and also that two brands can be substituted for one another in terms of quality depending upon their availability.

## ACKNOWLEDGEMENT

Sincere thanks to The Director of Regional Drugs Testing Laboratory (RDTL), DGHS, MOHFW, Govt of India Guwahati for supporting us in carrying out this research work.

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