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Assessment of acid neutralizing capacity of commercially available antacids

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Abstract: Digestion in the stomach results from the action of gastric fluid, which includes secretions of digestive enzymes, mucous, and hydrochloric acid. The acidic environment of the stomach makes it possible for inactive forms of digestive enzymes to be converted into active forms (i.e. pepsinogen into pepsin), and acid is also needed to dissolve minerals and kill bacteria that may enter the stomach along with food. However, excessive acid production (hyperacidity) results in the unpleasant symptoms of heartburn and may contribute to ulcer formation in the stomach lining. An Antacid is any substance, generally a base or basic salt, which neutralizes stomach acidity. They are used to relieve acid indigestion, upset stomach, sour stomach, and heartburn. The present study aimed at assessing the acid neutralizing capacity of commercially available antacids. The acid neutralizing capacities were analyzed by back titration method. In this method the antacid is first made to react with excess hydrochloric acid (main constituent of gastric juice), which is titrated against standard sodium hydroxide and the ability of the antacid to neutralize the acid is noted, which is its antacid value. Digene showed good antacid property compared to others. However, taking into account the dangers of the overuse of these medications; one can think of traditional remedies as an alternate solution for mild symptoms.

Keywords: Antacid, Acid neutralizing capacity, Digene, Antacid, Gastric fluid.

INTRODUCTION

Antacids are bases used to neutralize the acid that causes heartburn. Despite the many commercial brand, almost all antacids act on excess stomach acid by neutralizing it with weak bases. The most common of these bases are hydroxides, carbonates, or bicarbonates. The following table contains a list of the active ingredients found in several common commercial antacids, and the reactions by which these antacids neutralize the HCl in stomach acid [1].

The mechanism of working of antacid depends on acid neutralizing acidity, increasing the pH or reversibly reducing or hindering the secretion of acid by the gastric cell to reduce acidity in the stomach [2]. They perform a neutralization reaction, i.e. buffer gastric acid, raising the pH to reduce acidity in the stomach. When gastric hydrochloric acid reaches the nerves in the gastrointestinal mucosa, they signal pain to the central nervous system. This happens when these nerves are exposed, as in peptic ulcers [3-4]. The gastric acid may also reach ulcers in the esophagus or the duodenum [5].

Antacids are taken by mouth to relieve heartburn, the major symptom of gastro esophageal reflux disease, or acid indigestion. Treatment with antacids alone is symptomatic and only justified for minor symptoms. Peptic ulcers may require H_2-receptor antagonists or proton pump inhibitors [6-7].

Commercial of antacids are now available for the relief of heartburn and peptic ulcer pain. It comes in two forms, either as liquids or as solid tablets. The main constituents of antacids are magnesium and aluminum as hydroxides alone or in combination [8]. Some contains salt of calcium, sodium, carbon or bismuth. The effectiveness of each antacid depends on its neutralizing capacity and the passage time in the stomach. Liquid preparations of antacids are more effective than the solid ones because the constituents are already in their form [9]. This research work is aiming to evaluate the acid neutralizing capacity of five different commercial antacid tablets using titrimetric method of analysis.

MATERIALS AND METHODS

Five different brands of commercial antacids tablet used in this research work were purchased from medical store in form of tablets.

PREPARATION OF SAMPLES AND REAGENTS

0.1 M Hydrochloric Acid Solution

0.1 M HCl was prepared by diluting 8.6 ml of 12 M HCl with deionized water in 1000 ml volumetric flask. After the addition of the acid the volume of the flask was made up to the mark adding deionized water.

0.05 M Sodium Hydroxide Solution

0.05 M NaOH was prepared by dissolving 2.0 g of NaOH with deionized water in 1000 ml volumetric flask. After the dissolution process, the volume was made up to the mark.

0.05 M Oxalic Acid Solution

3.15 g of hydrated oxalic acid was weighed and properly dissolved with deionized water in 100 ml volumetric flask. After the dissolution process, the volume was made up to the mark by adding deionized water.

Standardization of Sodium Hydroxide Solution

10 ml of 0.05 M oxalic acid was measured into a 150 ml conical flask followed by the addition of 3 drops of phenolphthalein indicator. The solution was titrated against 0.05 M sodium hydroxide solution until it turns pink which persisted for at least 30 seconds without fading. The volume of 0.05 M NaOH solution used was recorded. The titration procedure was repeated 3 more times, and the average titre value was recorded.

Standardization of Hydrochloric Acid Solution

10 ml of the 0.1 M HCl solution was measured into a 150 ml conical flask followed by the addition of 3 drops of phenolphthalein indicator. The solution was then titrated with 0.05 M NaOH until the solution turns pink which persisted for 30 seconds without fading. The volume of 0.05 M NaOH solution used was recorded. The titration procedure was repeated 3 times, and the average titre value was recorded.

Evaluation of the Neutralizing Capacity of Antacid Tablets

Sample of each antacid tablets was crushed using a mortar and pestle and weigh 1.0 g of each. Transfer this sample into 250ml glass beaker to this add 75ml of 0.1N HCl solution. Heat the solution for about 30 minutes and then cool it at room temperature. Transfer the solution in 100 ml volumetric flask and make up the volume up to the mark by adding deionized water. 10ml of this solution was measured into 150ml conical flask followed by the addition of 3 drops of phenolphthalein indicator. The solution was titrated against standardized NaOH solution until the solution turns pink which persisted for 30 seconds without fading. The titration procedure was repeated 3 times, and the average titre value was recorded. The same procedure was repeated on all the other brands of antacid tablets and the average titre value of the NaOH solution required to neutralize the excess acid (HCl) for each brand of the antacid was recorded.

RESULTS AND DISCUSSION

Analysis of Antacid Tablets Analysis of the different commercial antacids tablet was carried out to evaluate their acid neutralizing capacity and results was given in Table 1.

	Digene	Ranidom	Ranitidine	Histac 300	Omni
Total amount of HCl used (ml)	75	75	75	75	75
Volume of Sample (ml)	10	10	10	10	10
Volume of NaOH required (ml) (back titration)	9.6	10.8	11.5	12.3	13.1
Mass of Antacid used (g)	1.0	1.0	1.0	1.0	1.0
Acid neutralizing capacity (g)	0.072	0.049	0.036	0.021	0.005

The data shows that Digene neutralized the HCl the most. So this antacid is effective at neutralizing stomach acid and also found to be the most effective at neutralizing the acid. Digene is the largest selling antacid in the country and has been associated with various firsts in antacid therapy, viz.: antiflatulent activity, coating protection, choice of delicious flavors to customers. It is available in three delicious flavors, mint, orange and mixed fruit along with an assorted flavors pack.

The total amount of HCl left by given weight of antacid can be calculated by using equation (1)

$$\text{The total amount of HCl left by given weight of antacid} = \frac{Molarity\ of\ NaOH\ x\ Volume\ of\ NaOH}{Molarity\ of\ HCl} - - - (1)$$

Weight of acid neutralized by given weight of antacid can be calculated by using equation (2)

$$\text{Weight of acid neutralized by given weight of antacid} = Molarity\ of\ HCl\ x\ Equivalent\ weight\ of\ HCl - - - (2)$$

The acid neutralizing capacity of antacid is calculated by using equation (3)

$$\text{Acid neutralizing capacity of antacid} = \frac{Molarity\ of\ HCl\ x\ Equivalent\ weight\ of\ HCl}{\text{Weight of antacid}}\ x\ Volume\ of\ HCl\ neutralized\ by\ antacid - - - (3)$$

CONCLUSION

On the basis results obtained it was clear that Digene tablet is more active, because it neutralized more amount of acid than the rest. It is recommended that further work should be carried out on other antacid drugs particularly on the different physiological aspects to fully ascertain their neutralizing capacity.

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REFERENCES

[1] Abdu K., and Abbagana M. 2015. Evaluation of Neutralizing Capacity of Different Commercial Brands of Antacid Tablets, ChemSearch Journal, 6(2):32-34.

[2] Mossner J., Caca K. 2005. Developments in the inhibition of gastric acid secretion, European Journal of Clinical Investigation, 35(8): 469-475.

[3] Mechu Narayanan M. D.(2018). Peptic Ulcer Disease and Helicobacter pylori infection, Mo. Med. 15(3): 219–224.

[4] Stevens H. and Guin H. (1963). Gastrointestinal Ulceration and Central Nervous System Lesions, Am J Dis Child.,106(6):613-619.

[5] Hiroaki N. and Mototsugu K. (2010). Comparative study of therapeutic effects of PPI and H2RA on ulcers during continuous aspirin therapy, World J Gastroenterol.; 16(42): 5342–5346.

[6] Van Dop C., Overvliet, G.M. and Smits H.M. (1976). Quality control of antacids, Pharm weekblad, 111: 748-750.

[7] Van Reit-Nales D.A, van Alst P., de Caste D., Barend D.M. (2002). An improved in vitro method for the evaluation of antacids with in vivo relevance, Eur. J. Pharm. & Biopharm., 53:217-223.

[8] Smith R.D., Herzeg T., Wheatley T.A., Hause W. and Reavey-Cantewell N.H. (1976). An in vitro evaluation of the efficacy of the more frequently used antacids with particular attention to tablets, J. Pharm. Sci., 65:1045-1047.

[9] Duffy T.D., Fawzy Z.S., Ireland D.S. and Rubinstein M.H. (1982). A comparison, evaluation of liquid antacids commercially available in the United Kingdom, J. Clinic. Hospt. Pharm., 7:53-58.