University of Basra.
College of pharmacy.
Department of pharmaceutics.

Evaluation of antacids that are available in Iraqi markets.

Supervised by

Dr. Ouday Sajjad

Submitted by:
Ali Jamhour Thani.
Fatima Raad Qasim.
Aetebar Hadeer Adbullwahab.

DEDICATION

First of all, we would like to express our gratitude to the Presidency of Al-Basra Pharmacy college for their support and encouragement.

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Abstract

- Antacids are commonly used self-prescribed medications. They consist of calcium carbonate and magnesium and aluminum salts and sometimes sodium alginate in various compounds or combinations. The effect of antacids on the stomach is due to partial neutralization of gastric hydrochloric acid and inhibition of the proteolytic enzyme, pepsin. Each cation salt has its own pharmacological characteristics that are important for determination of which product can be used for certain indications. Antacids have been used for duodenal and gastric ulcers, stress gastritis, gastro-oesophageal reflux disease, pancreatic insufficiency, non-ulcer dyspepsia, bile acid mediated diarrhea, biliary reflux, constipation, osteoporosis, urinary alkalinisation and chronic renal failure as a dietary phosphate binder. The development of histamine H2-receptor antagonists and proton pump inhibitors has significantly reduced usage for duodenal and gastric ulcers and gastro-oesophageal reflux disease. However, antacids can still be useful for stress gastritis and non-ulcer dyspepsia.

1.Introdution

Gastric juice is made up of water, electrolytes, hydrochloric acid (HCl), enzymes, mucus, and intrinsic factor. HCl is secreted by the parietal cells. On the average, an adult stomach produces 1.5–2.5 liters of gastric juice per day . Measuring a pH of 1.5 on a pH scale (0–14), the gastric juice is a strongly acidic solution expressing a high concentration of hydrogen ions (H^+) . The acidic stomach content is essential for food digestion and activation of digestive enzymes. The stomach however sheds the mucous lining every three days. Stimulation of H^+ secretion occurs during feeding . In the event of excess acid content, H^+ ions retract to the blood, leading to muscular contraction, inflammation, bleeding, pain and ulceration due to the stomach lining break down with subsequent acid attack on the stomach wall. It must however be mentioned that via a natural mechanism, the stomach protects itself from acid degradation by the production of bicarbonate-rich mucus and the provding of rich blood supply.(17)

An antacid is an antidote for reducing the H^+ in the stomach through neutralization reaction with the excess HCl in gastric juice and inhibition of the proteolytic enzyme, pepsin. Antacids are a major class of over the counter pharmaceuticals sold globally. Importantly, a significant number of consumers or patients in Basra are self-medicated with antacids. In addition, a large part of the worldwide population is affected by acid indigestion and heartburn with consumers spending billions of dollars on antacids in search of relief globally. Antacid are prescribed to relieve the symptoms of peptic ulcers/ hyperacidity (acid indigestion) or Heartburn/Gastroesophageal reflux disease (GERD) and stomach upset. GERD has emerged as an important and common acid related disorder affecting nearly 35–40% of adults in the eastern world with 36% of them reporting symptoms at the hospital once a month. Furthermore, antacids also help relieve any pain usually associated with stomach ulcer and help prevent irritation of the stomach. Most antacids are basic in nature with a net pH above 7 and may exist as buffer systems (substances that are capable of minimizing changes in the concentrations of hydrogen (H^+) and hydroxyl (OH^-) ions) to offer pH stability in the stomach. A few studies have reported on the use of antacids to promote healing in duodenal ulcer.(11)

1.1.Liquid antacids.

Different brands of antacids are available to relieve heartburn and peptic ulcer pain in Basra pharmacies. These commercial brands of antacids come in various dosage forms, as either liquids or solids. Magnesium and aluminum as hydroxides alone or in combination form the principal composition of most antacids. Some also contain salts of calcium, sodium, alginate, carbon or bismuth in their formulations, in vivo experiment were carried out to find if these antacid brands are within the standards of antacids according USP (United states pharmacopeia).

Liquid preparations of antacids are usually considered to be more effective than the solid ones (tablets) due to their already dispersed form. Antacids are generally classified as being:

- ✓ systemic (absorbable antacids – which are soluble, readily absorbable and capable of producing systemic electrolytic alterations and alkalosis e.g. sodium bicarbonate).
- ✓ non-systemic (non-absorbable antacids – which are not absorbed to a significant extent). This group includes – (i) Aluminum containing antacids – aluminum hydroxide, aluminum phosphate (ii) calcium containing antacids – calcium carbonate, tribasic calcium phosphate (iii) magnesium containing antacids – magnesium carbonate, magnesium hydroxide (iv) combination antacid preparations – simethicone (defoaming agent).

The effectiveness of each antacid depends on its neutralizing capacity and the transit time in the stomach (buffering capacity). Manufacturers of over the counter medicines including antacids often reformulate some products in order to improve on palatability and organoleptic properties of products to attract clients. Markets in Basra are thus flooded with several antacids products that are advertised on the print, electronic and the airwavesshowing their relative advantages over one another. The public and the physician are therefore baffled with choices that are not underpinned with predetermined quality and efficacy of the products. However the decision to select a particular antacid must be informed ideally by having a relatively high acid neutralizing capacity (ANC) stated in milliequivalents and the demonstration of a buffering capacity (BC) to maintain gastric pH above 3.5 for a considerable amount of time.

2.Tests carried out in this experiment for antacids:

- Appearance. (Color, odor, taste).
- Viscosity.
- Ph value.
- Buffering capacity.
- Preliminary antacid test.
- Acid neutralizing capacity.

2.1.Tests to be performed:

- **1.Appearance test**: Most of the available liquid antacids are in the form of suspension. It must appear uniform and elegant. Particles of suspensions should be well distributed. No hard cake formation of particles. The suspension is poured in a transparent glass container and it should be checked if there is any coagulated material adhering to the inside wall of the container.
- **Color, odor, taste**: Variation in color indicates poor distribution. Variation in taste is generally due to particle size and crystal habit. Change in either color, odor or taste indicates chemical instability.

- **2.PH test**: Stomach acid has a pH value of (1.5-3.5) and an antacid has a pH above 7. A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH.

Procedure for using pH meter:

1-Remove the protective cap.

2-prepare two glasses of distilled water and dissolve the buffering powder sachets in each glass.

3-Turn on the pH meter then put it inside each of the glasses, press and hold the CAL button.

4-Release the button, make sure the displayed values are the same as the buffering solution (written on the sachets).

5-Rinse the meter with distilled water before you use it again for better accuracy.

Ph Meter

- **<u>3.Preliminary antacid test</u>**: The preliminary antacid test measured the final pH of a 10-mL solution of 0.5 N HCl 10 minutes after addition of the minimum recommended dose of an antacid, while the neutralizing capacity test measured the amount (mEq) of HCl neutralized by the minimum recommended dose in 15 minutes.[5]

- ***<u>Procedure:</u>***
- *An accurate amount of a well-mixed antacid product equivalent to the minimum labeled dosage; (5 mL) was weighed into a 100 ml beaker., Sufficient distilled water was added to obtain a total volume of about 40 ml and mixed on a Hotplate magnetic stirrer at 300 r.p.m for a minute.*
- *10 mL of 0.5 N HCl was added to the test solution while stirring on the magnetic stirrer at 300 r.p.m for exactly 10 min after addition of acid.*
- *The pH was read and recorded with PH meter to ascertain label claim as an antacid if pH is 3.5 or greater.[5]*

- **4.The acid neutralizing capacity** : is often defined as a measure of the amount of base present that can accept hydrogen ions from a strong acid.(6)

- **Procedure**
- *The ANC was determined for all the brands since each had a pH of 3.5 or greater from the PAT. An accurate volume (5 mL) of the antacid suspension was measured into a 25 ml beaker and weighed. The suspension was then transferred into a 250 ml beaker and made up to 70 ml with distilled water and stirred for one minute and the pH is measured. An accurate volume of 30 ml of 1.0 N HCl was pipetted into the suspension whiles stirring for 15 mins. The excess HCl was titrated with 0.5 N NaOH to attain a threshold pH of 3.5. The experiment was carried out for the different brands and their respective batches at a temperature of 37 °C on a magnetic stirrer. The number of milliequivalent (mEq) of acid consumed per gram of antacid was calculated.*
- *The acid neutralizing capacity (ANC) was calculated using the Equation below:*
- $\mathbf{Total\ mEq = (30 \times N_{HCl}) - (V_{NaOH} \times N_{NaOH})}$**……..Equation.**
- *Where N_{HCl} and N_{NaOH} are the normality of HCl and NaOH, respectively, and V_{NaOH} is the volume of NaOH used for the back titration.(6)*

- **5.Buffering capacity**: (β) is defined as the moles of an acid or base necessary to change the pH of a solution by 1, divided by the pH change and the volume of buffer in liters; it is a unitless number.[8]

- ***Procedure:***
- *An accurate volume of 5 mL each of the antacid samples were measured and transferred into a 250 mL beaker and 50 mL of distilled water added and heated to 37 °C. The suspension was stirred for one minute and the initial pH recorded with pH meter. An accurate volume of 100 mL of 0.1 N HCl previously heated to 37°C was added to the suspension with continuous stirring. The rate of pH change of the resulting solution was measured 10 times at an interval of 5 mins, at ambient temperature.*
- *During this process, a quantity of 20 mL of the suspension was removed by means of a pipette and replaced with 20 mL of fresh 0.1 N HCl. This process was repeated at 5.0 min interval until a pH below 2.75 was observed for the different brand.*
- *The rate of pH change with time representing the Buffering capacity for each antacid was determined and compared . All the brands had their initial pH ranging from 7.91 – 8.91.[10]*

$$\text{Buffer Capacity} = \frac{(\text{number of moles of } OH^- \text{ or } H_3O^+ \text{ added})}{(\text{pH change})(\text{volume of buffer in L})}$$

- **6.Viscosity**: Viscosity is a measurment of a fluid's resistance to flow i.e. the measure of a substance's resistance to motion under an applied force. Viscosity checks should ensure the correct consistency of the end product to meet customers' expectations. We can measure the viscosity by using Viscometer.

- **Proceedure:**
- *Prepare the samples by placing a proper amount of each brand of each Antacid in a clean beaker.*
- *Set up the viscometer, and choose a suitable spindle to use, according to the sample to be evaluated.(For the sample with high viscosity, you should choose the small size spindle (Code L3 and L4) and slow rotating speed, for the sample with low viscosity you should choose the larger spindle (code L1 and L2) and fast rotating speed.)*
- *Switch on the viscometer by the left side button, the screen will flash and left on standby.*
- *Input the spindle code, the input id over when the selected spindle is displayed.*
- *Select the rotating speed.*
- *Immerses the spindle into the liquid (the mark of the spindle should be on the same level as the liquid) then adjust the device to horizontal level.*
- *Press "run"*
- *Record the readings displayed on the screen.*

viscometer

Sampling and composition of samples:

- seven different brands of commonly marketed antacids (n = 7) found in Pharmacies in Basra were purposively sampled and transported to the Laboratory of the Department of Pharmaceutics in pharmacy college of Basra for analysis.
- The samples were coded (S_1-S_7) .

Sample	Volume (ml)	Cost (IQD)	Batch no.	Manufacturing country	bottle
S_1 (MAALOX plus)	250 ml	8000	0I009	France	White plastic
S_2 (EPICOGEL)	125 ml	3000	1904147	Egypt	Glass amber
S_3 (ACILOX plus)	100 ml	2500	200574A	Iraq	Glass amber
S_4 (MOXAL plus)	100 ml	3500	0187	UAE	Glass amber
S_5 (DIGEL)	200 ml	2000	20050174	India	Clear Glass
S_6 (GAVISCON)	150 ml	5000	0332H2	India	Glass amber
S_7 (PYROSIX)	250 ml	6000	10598	France	Glass amber

3.Antacids containing Magnesium hydroxide, Aluminum hydroxide and (simethicone or dimethicone as antiflatulence)

- **Aluminum Hydroxide**: is a basic compound that acts by neutralizing hydrochloric acid in gastric secretions. Subsequent increases in pH may inhibit the action of pepsin. An increase in bicarbonate ions and prostaglandins may also confer cytoprotective effects.
- **Magnesium hydroxide**: magnesium hydroxide suspension neutralizes gastric acid by reacting with hydrochloric acid in the stomach to form magnesium chloride and water. It is practically insoluble in water and does not have any effect until it reacts with the hydrochloric acid in the stomach

- **Simethicone & dimethicone :** are silicone compounds that function as a non-systemic surfactant, decreasing the surface tension of gas bubbles in the GI tract. This action results in coalescence and dispersion of the gas bubbles allowing their removal from the GI tract as flatulence or belching.

Aluminum hydroxide

Magnesium hydroxide

simethicone

dimethicone

3.1.MAALOX PLUS.

➢ Composition:

- Magnesium hydroxide 4g.
- Aluminum hydroxide 3.5g.
- Simethicone 0.50g.

➢ Appearance: elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.

- Color: white.
- Odor: lemon.
- Teste: lemon with a little bitterness and dusty feeling upon tasting.

3.2.EPICOGEL.

- Composition:
- Dried aluminum hydroxide gel 8.1gm
- Magnesium hydroxide 2gm
- Dimethicone 2.5gm
- Appearance: elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.
- Color: white.
- Odor: mint.
- Taste: unpleasant minty teste.

3.3.ACILOX PLUS.

➢Composition:

- Aluminum hydroxide 225mg.
- Magnesium hydroxide 200mg.
- Simethicone 25mg.

➢Appearance: elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.

- Color: white.
- Odor: mint, acceptable.
- Taste: mint like taste.

3.4.MOXAL PLUS

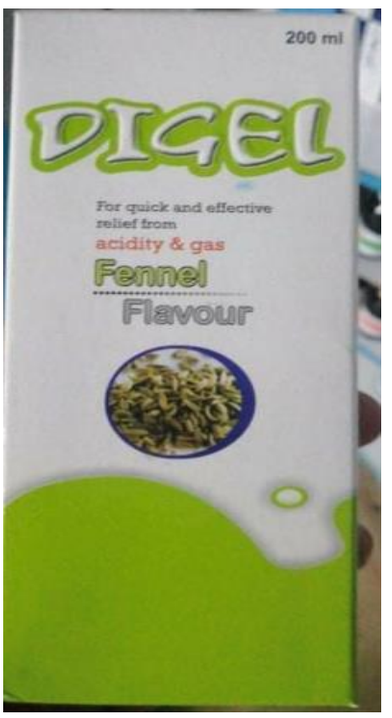
➢Composition:

- Aluminum hydroxide 215mg.
- Magnesium hydroxide 80mg.
- Simethicone 25mg.

➢Appearance: elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.

- Color: white.
- Odor: mint.
- Taste: mint.

3.5.DIGEL.



- Composition:
- Aluminum hydroxide gel 215mg.
- Magnesium hydroxide 80mg.
- Simethicone 25mg.
- Appearance: uniform, becomes two phases upon standing and the particles are well distributed upon shaking.
- Color: greenish white.
- Odor: Fennel.
- Taste: unpleasant fennel taste.

3.6.Testing

samples	density	Ph value
S_1	0.98	8.48
S_2	1.03	8.45
S_3	0.85	8.09
S_4	1.03	8.85
S_5	0.85	7.91

PAT and ANC for antacids (S_1,S_2,S_3,S_4,S_5)

Brand	PAT(pH) 0.5N HCl		ANC(pH) 1.0N HCl		ANC mEq/g
	0 min	10 min	0 min	15 min	
S1	8.02	4.38	8.6	1.25	19.53
S2	8.18	4.49	8.79	1.31	18.37
S3	8.84	6.43	8.81	1.12	13.88
S4	8.48	6.24	8.62	1.10	13.16
S5	7.82	4.85	8.06	1.20	19.59

Sample calculation using S_1

Total mEq = (30 $_{(V\ of\ HCl)}$ x N_{HCl}) – (V_{NaOH} x N_{NaOH}).
N_{HCl} = 1.0 M N_{NaOH} = 0.5 M V_{NaOH} = 22.5 mL.
Total mEq = (30×1.0) – (22.5 × 0.5) = 18.75 mEq.

ANC per gram of antacid= total mEq/ density of antacid
18.75/0.96 = 19.6 mEq/g

Buffering Capacity (Rate of pH change of antacid suspension with time)for (S_1,S_2,S_3,S_4,S_5):

	0 min	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	50 min
S_1	8.48	4.01	4.53	5.74	4.07	3.25	2.60	ND	ND	ND
S_2	8.45	3.58	3.86	4.29	3.76	3.00	2.54	ND	ND	ND
S_3	8.09	3.63	3.96	4.10	3.31	2.52	ND	ND	ND	ND
S_4	8.62	5.51	6.19	5.40	3.48	2.36	ND	ND	ND	ND
S_5	7.91	4.23	3.27	3.46	2.58	ND	ND	ND	ND	ND

ND=Not determined.

Viscosity Values:

S_1

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	5714.7	28.6%
0.6	3424.2	34.2%
1.5	1499.5	37.5%
3	800.9	40%
6	459.3	45.9%
12	200.9	52.2%
30	141	67%

S_2

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	8510.1	42.6%
0.6	5481.7	54.8%
1.5	2501.8	62.5%
3	1345.2	67.3%
6	712.6	71.3%
12	355.3	72.6%
30	ND	ND

S_3

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	5714.7	20.7%
0.6	3424.2	26.2%
1.5	1499.5	33.2%
3	800.9	46.8%
6	459.3	50.9%
12	200.9	57.2%
30	ND	ND

S_4

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	2810.2	14%*
0.6	1247.5	21.1%
1.5	845.5	24%
3	493.1	31.6%
6	316.1	42.9%
12	214	50.1%
30	ND	ND

S_5

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	4212.8	15.1%*
0.6	3312.5	22.5%
1.5	2411.5	27.4%
3	773.1	36.6%
6	532.3	46.1%
12	199.9	54.9%
30	ND	ND

*neglected because the percentage is lesser than 20%.

P.S/
All the samples viscosities where measured at the same conditions.
Spindle used for all the samples was (L_1).

4.Alginate antacid.

One of the primary treatments for gastroesophageal reflux disease (GERD) is the administration of alginate/antacid anti-reflux preparations. These provide a physical barrier on contact with the stomach contents in the form of a neutral floating gel or raft. This physical mode of action is quite distinct from the chemical neutralization of the bulk gastric contents provided by antacids alone, although alginate raft forming Preparations. The advantage of alginate/antacid combinations over antacids alone is that they provide longer lasting symptom relief, even though relief is rapid in both cases. Their rapid onset of action makes them more suitable for self-medication than pharmacologically acting acid suppressants such as H2-receptor antagonists or proton pump inhibitors This has also led to their successful use as a well tolerated non-systemic treatment for prevention of relapse in healed reflux esophagitis and for the treatment of heartburn in pregnancy. Alginate rafts may be formed in liquid products by the action of gastric fluid on a soluble alginate to form an insoluble gel of alginic acid. They may also be formed by the interaction of soluble alginate with metal ions released by acid from an insoluble antacid such as calcium carbonate. The simultaneous action of Gastric acid on a bicarbonate salt produces carbon dioxide, which should ideally be trapped inside the alginate gel to aid buoyancy of the raft. Several features of rafts formed by alginate/antacid anti-reflux preparations are useful in forming an effective long lasting barrier between corrosive gastric fluid and the esophageal mucosa. Such rafts would be expected to be cohesive, buoyant, voluminous, resistant to reflux into the esophagus and not easily broken up by movement in the stomach.[12]

4.1.GAVISCON

➢Composition:

- Each 10 ml contain:
- Sodium alginate 500mg.
- Sodium bicarbonate 267mg.
- Calcium carbonate 160mg.

➢Appearance: elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.

- Color: light pink.
- Odor: Aniseed.
- Taste: aniseed taste, sweet with a little pungent effect upon tasting.

4.2.PYROSIX.

➢Composition:

- Sodium alginate 5000g .
- Sodium bicarbonate 2670 g.

➢Appearance : elegant, uniform, becomes two phases upon standing and the particles are well distributed upon shaking.

➢Color: milky white.

➢Odor: Aniseed- like smell.

➢Taste: Aniseed with mild sweet taste.

4.3.Testing.

samples	density	Ph value
S_6	0.96	8.85
S_7	0.96	8.91

PAT and ANC for alginate containing antacids (S_6,S_7)

Brand	PAT(pH) 0.5N HCl		ANC(pH) 1.0N HCl		ANC mEq/g
	0 min	10 min	0 min	15 min	
S_6	8.60	5.64	9.09	1.31	20.49
S_7	8.47	4.51	8.88	1.27	20.70

Buffering capacity of alginate containing antacids (S_6, S_7)

Buffering Capacity (Rate of pH change of antacid suspension with time)

	0 min	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	50 min
S_6	8.85	4.09	4.15	4.22	3.39	3.36	3.06	2.52	ND	ND
S_7	8.91	6.12	6.17	6.24	5.48	5.30	4.27	2.79	2.47	ND

Viscosity Values:

S_6

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	3489	17.4%*
0.6	2393.3	23.9%
1.5	1379.3	27.4%
3	942.2	47.6%
6	611.2	61.1%
12	470.6	94%
30	ND	ND

S_7

Speed (RPM)	Viscosity mPa.s	Percentage %
0.3	3571	19.8%*
0.6	2085.6	28.9%
1.5	1558.1	36.6%
3	929.4	43.1%
6	5327.8	55.2%
12	446.9	81%
30	208.3	92.5%

*neglected because the percentage is lesser than 20%.

P.S/
All the samples viscosities where measured at the same conditions.
Spindle used for all the samples was (L_1).

5.Conclusion

- **Preliminary antacid test:**

- A pH greater than 3.5 was found for all the antacid brands analyzed in this experiment, The Preliminary Antacid Test (PAT) is not actually an efficacy or quality indicating test. Brand "S_3"rcorded the highest PAT pH with "S_1" recording the least value , the difference of which however is considered very statistically significant. The closest PAT value to "S_3" is that of "S_4" where the difference was not statistically significant. Having passed the PAT, all the sampled brands were deemed qualified as 'antacids' and therefore were subjected to the ANC and buffering capacity tests that distinguishes one product from the other with respect to efficacy.

- **Acid neutralizing capacity:**

- The ANC for the antacids analyzed (n =7) were determined and expressed as milliequivalent (mEq) of the antacid as mentioned in the USP[9]. The ANC of all the brands were determined to be in a range of 13.16 to 20.70 of antacid per dose. Brand "S_4" had the lowest ANC of 13.16 mEq/g whiles brand "S_7" had the highest ANC of 20.70 mEq/g. However other brands such as "S_1", "S_2", "S_5" and "S_6" had very good ANC values above 18. The USA-FDA specifies that the ANC for an antacid should not be less than 5 mEq per dose of the antacid. Based on this criteria, all brands of antacids sampled passed.

- **Buffering capacity:**

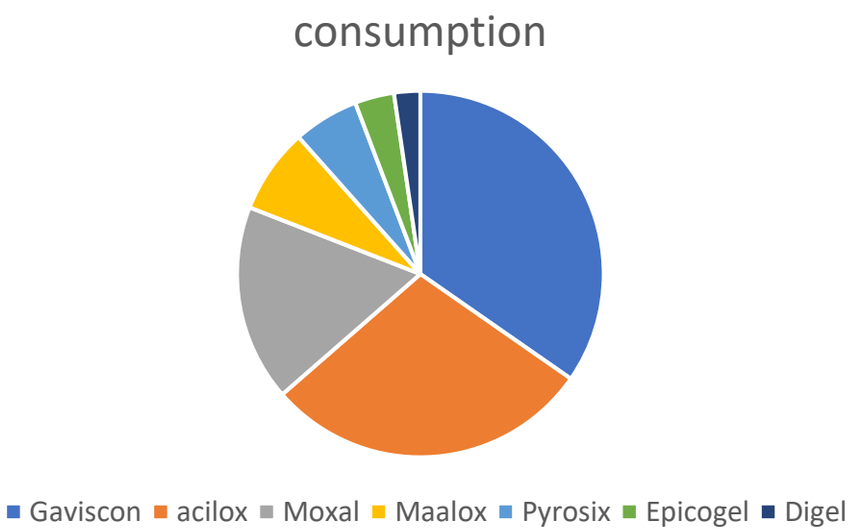
- The rate of pH change with time representing the Buffering capacity for each antacid was determined and compared. All the brands had their initial pH ranging from 7.91 – 8.91. Based on the data from the buffering capacity of the antacids analyzed, it is observed that brand "S_6" had buffering capacity being maintained for 35minutes whilst product "S_7", had buffering capacity maintained for 40 min. Product "S_7" had the highest initial pH of 8.91 and showed a consistently resilient change to pH with time followed by brand "S_6". The consistent data obtained indicates the superior stability of brand "S_7", followed by brands "S_1", "S_2", and "S_6". A demonstration of a high ANC and a longer buffering capacity by an antacid indicates its efficacy and quality.

5.Conclusion

- The study has shown that all the antacid brands analyzed (*n* = 7) had aluminum hydroxide and magnesium hydroxide as active acid neutralizing agents, and some of them containing simethicone or dimethicone as antifoam. All the brands qualified as antacids with each having PAT pH greater than 3.5. In addition, they all recorded ANC values above the acceptable limit of 5 mEq/g. The buffering capacities observed were however not consistent with the ANC except for brands "S_2" and "S_7" that demonstrated consistent ANC and buffering capacity to assure quality and efficacy in vitro. The current work has further shown that cost does not translate to quality as both expensive and low cost brands were found within the acceptable limits of antacid action. Antacids exert their effects by the combined action of their acid neutralization and buffering capacities. Therefore to improve human acceptance to the use of antacids, it is highly recommended for manufacturers to state ANC and BC values on labels or in drug information leaflets to assure medicine quality, efficacy and value for money.

6.Discussion.

- We made a survey asking 100 people above the age of 30 about which one of there 7 antacid samples they use and the answer was described in the chart below:



- First of all, We can notice that Gaviscon has the upper hand among the Seven samples, and this can be attributed to many reason like

✓ Advertising: Gaviscon has a very strong advertising base. For examples in T.V commercials, YouTube advertising, Facebook and Instagram commercials.

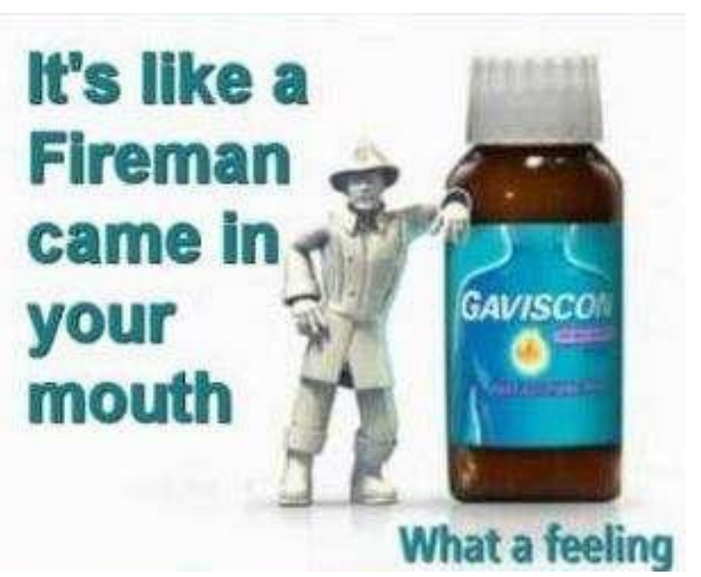
✓ From the previous study of Gaviscon sample we noticed that it has a high Acid neutralizing capacity (20.49) as well as it has a buffering capacity that maintained for 35 minutes, these two parameters indicates the good quality and effectiveness of Gaviscon as an antacid.

✓ Gaviscon contains Sodium Alginate which gives it an additional property by forming a floating raft on the top of the stomach to prevent the stomach content from backing up into the esophagus.

- Secondly we have Acilox plus , it is highly consumed by patient in Basra and this is basically due to its low price (2500 IQD), so its affordable for all patients and they can get back to buy it again with no compliance.
- Also its manufactured by pioneer company in Iraq which has a popularity in Basra.
- thirdly, Moxal plus, and its popularity is basically due to its low cost. And also Jolphar company has agood reputation among consumers in Basra.
- fourth of all, we have Maalox plus, It’s the most expensive one but it’s also consumed by a good average in Basra because of its effectiveness and also because its produced by Sanofi French company that has a good reputation in the pharmaceutical industry and it’s trusted by physicians.
- The rest of the antacids (Pyrosix, Epicogel and Digel) are not highly consumed in Basra according to our study.

<u>Q/ through out our experiment, we noticed that Pyrosix was the best antacid among the seven samples, but why its not so popular in Basra?</u>

-This is basically due to poor advertising.
We rarely see this product in commercials, so people wouldn't find out about this product easily like Gaviscon.



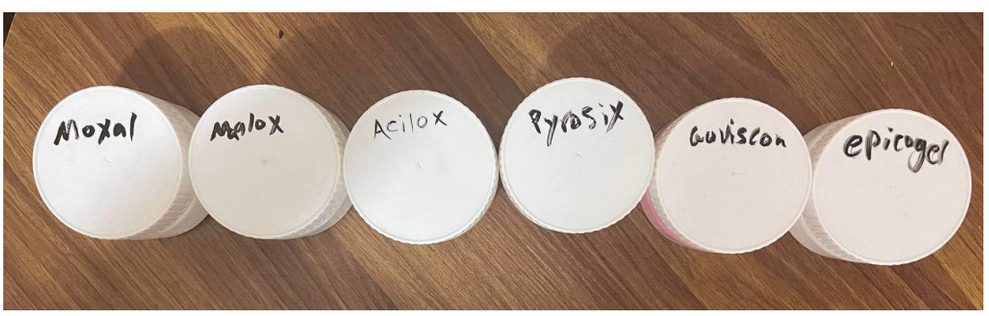
- ✓ The seven samples were personally tested on 4 people for two weeks , The following results were determined.
  - Pt.1/ 63 Y.O man with stomach ulcer.
  - Pt.2/ 32 Y.O female with H.Pylori.
  - Pt.3/ 26 Y.O female with GERD.
  - Pt.4/35 Y.O female Dyspepsia.

Pt.	S_1	S_2	S_3	S_4	S_5	S_6	S_7
Pt.1	✓	X	X	X	X	✓	✓
Pt.2	✓	X	✓	✓	✓	✓	✓
Pt.3	✓	✓	✓	✓	✓	✓	✓
Pt.4	✓	X	X	X	X	✓	✓

- ❑ Note/ Both Digel and Acilox did not have a rapid onset of action when administered (Digel delayed for 50 minutes and Acilox for 1 hour). That's why they are not considered as a first line treatment to relief hurt burn symptoms.

- These seven samples were also subjected to different circumstances in order to test their stability.
- For example they were left outdoors for 20 days and the following was noticed:

Gaviscon	No significant change.
Maalox	No change.
Acilox	Completely dried and became solid mass.
Moxal plus	No change.
Epicogel	The color tuned to yellowish white and the odor became stronger.
Pyrosix	No change.
Digel	No change.



Epicogel
After 17 days
outdoors

Epicogel
In normal
condition

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