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# ASSESSMENT OF GASTRIC VOLUME IN PARTURIENTS UNDER GOING ELECTIVE AND EMERGENCY CESAREAN SECTION IN YENEPOYA MEDICAL COLLEGE

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## Abstract

**Introduction:** Aspiration of gastric contents into the lungs can lead to pneumonitis/pneumonia or acute lung injury which may progress to adult respiratory distress syndrome (ARDS) requiring mechanical ventilation, or even death. Pregnant women are considered to be one of the full stomach patients irrespective of their starvation state, because of the both anatomical and physiological changes brought by pregnancy. Hence, women undergoing caesarean section are considered to be at risk of gastric content aspiration. In obstetric anaesthesia, in which urgent operative interventions are required in patients with questionable fasting status, an insight into the gastric volume and the content is advantageous, and has the ability to influence clinical decision in choosing the safe anaesthesia technique in them. Several studies have been done on measurement of antral cross-sectional area (CSA) for gastric volume assessment and also bedside ultrasonography for assessment of gastric volume and effective means of assessment of the risk of pulmonary aspiration. Therefore we conducted a study to determine the gastric volume in pregnant women undergoing caesarean section under spinal anaesthesia using bedside ultrasonography and to monitor patient post operatively to find an insight about the possible aspiration in them.

**Materials and methods:** After ethical committee approval and informed consent, 45 parturients in each group belonging to ASAPS II & II E, aged between 20 to 35 years, scheduled for elective and emergency caesarean section that required spinal anaesthesia were included. Both groups of patients were premedicated with inj. Ranitidine 50 mg IV and for parturients who required emergency caesarean section were administered inj. Metaclopramide10 mg slow IV to fasten the gastric motility. Fifteen minutes prior to the administration of spinal anaesthesia, all the patients were shifted to the anaesthesia procedure room, in the presence of a female nurse, positioned in $45^0$semi recumbent right lateral decubitus position. Ultrasonography was performed before administering spinal anaesthesia, with the aim of assessing the antral cross sectional area and thus, to estimate gastric volume. Given the depth of theantrum, 2-6 MHz curvilinear, low frequency transducer probe of ultrasound system - GE LOGIQ™ was used for gastric scanning. The probe was held in a longitudinal plane, placed at the left subcostal margin, and moved in a fanlike manner from the left toward the right subcostal area, over the epigastric region. The quantitative assessment of the gastric volume was performed by measuring the cross-sectional area (CSA) of the gastric antrum (antral CSA) between peristaltic contractions, using the free-tracing caliper of

the ultrasound unit. All the patients were followed up till 4 hours postoperatively if they had experienced nausea or vomiting.

**Results:** The mean antral cross sectional area ($mm^2$) was estimated for both the elective and emergency group. It was found that mean antral cross sectional area of elective group is 237.316 and that of emergency was 385.69 with the standard deviation of 54.677 and 52.699 respectively. By applying student's independent t test we could see the significant difference between the two groups ($p<0.001$). The correlation between NPO and antral cross sectional area was done separately in elective and emergency group. It was found that in elective group these two variables show negative correlation and having moderate correlation of -0.518. In case of emergency group the correlation between the factors are very high (-0.882) negatively.

**Conclusion:** This study provides an ultrasonographic estimation of gastric volume by measuring antral cross sectional area in term pregnant women who come for elective or emergency cesarean delivery under spinal anaesthesia. It also establishes CSA threshold values for both fasted and non-fasted term pregnant women. It can be a useful tool to guide clinical decision making when there is uncertainty about gastric contents to stratify the pulmonary aspiration risk in them.
**Key Words:** Pregnancy; pulmonary aspiration; gastric antral CSA; bedside ultrasonography; cesarean section.

## INTRODUCTION

Pulmonary aspiration is defined by the inhalation of oropharyngeal or gastric contents into larynx and the respiratory tract.[1]

Aspiration of gastric contents to the lungs accounts for at least 10% of deaths attributable to anaesthesia.[2] Silent regurgitation of small amount of gastric contents into the oropharynx occurs in 4-26% of all cases under general anaesthesia.[3]

Pulmonary consequences of gastric aspiration fall in three groups[1] a) Particle related, b) Acid related c) Bacterial.

Pulmonary aspiration was confirmed in 1 in 8600 anaesthetic procedures in a recent review.[4] Aspiration of gastric contents into the lungs can lead to pneumonitis/pneumonia or acute lung injury which may progress to adult respiratory distress syndrome (ARDS) requiring mechanical ventilation, or even death(1:99,441)[5]

More than 50% of deaths in anaesthesia, which were related to airway, as a consequence of aspiration and out weighing the much feared cannot intubate and cannot ventilate situation.[1]

Risk population include retention of gastric contents caused by pain, inadequate starvation, pregnancy, gastro-intestinal pathology resulting in reduced gastric emptying and Gastro esophageal reflux disease.[6]

Patients who are at risk of pulmonary aspiration had critical pH of 2.5 and critical volume of 0.4 ml/kg body weight or ~25ml in the adults. Mendelson's syndrome which was named after Curtis Mendelson, was described as the potential consequence of loss of airway reflexes under

anaesthesia and consequent aspiration of gastric contents.[7]

High gastric volume was found even after starvation for longer period. Though the complications following aspiration are fearsome, in many instances it may be prevented, as said by old proverb “prevention is better than cure”.

It is of great task to anaesthetize pregnant patients, as they pose difficulties to the anaesthetist, with the high risk of pulmonary aspiration of gastric content. More frequently they will come to the operating room for cesarean section than any other surgeries. Since the pregnant women are considered as one of the full stomach patients irrespective of their starvation state, because of the both anatomical and physiological changes brought by pregnancy. Hence, women undergoing cesarean section are considered to be at risk of gastric content aspiration. This risk increases when they present for emergency cesarean section with questionable NPO status.

As pregnant ladies have more chances of nausea, vomiting and hence the aspiration risk increases because of the hormonal changes and the increased incidence of gastritis because of iron, calcium supplementation with relaxed LES and the developing gravid uterus altering the normal angle of esophago-gastric junction.

## AIMS AND OBJECTIVES

Aim of this study is to determine the use of ultrasonography in the assessment of gastric volume and the possible aspiration risk in patients undergoing cesarean section under spinal anaesthesia.

**Objectives** are:

To find out the gastric volume by ultrasound guided measurement of cross section of the gastric antrum 15 minutes before cesarean section.

To compare incidence of nausea and vomiting postoperatively in patients undergoing elective and emergency cesarean section.

## MATERIALS AND METHODS

**Source of Data:** Parturients in Yenepoya Medical College Hospital, Deralakatte, Mangalore who were admitted in Department of Obstetrics and Gynecology during the period from July 2017 to May 2019 underwent elective / emergency cesarean section under spinal anaesthesia. The study was conducted in Department of Anaesthesiology, after obtaining the approval from the Institutional Ethics Committee (Protocol no. YUEC/2017/234) and written, informed consent from all the patients.

**Study Design**: Cross-sectional study

**Sample Size**: 90

Minimum sample size required was 45 per group with 0.6 effect size, 5% level of significance and power 80%. The sample size was calculated using G* Power software.[17]

**Sampling Technique**: Convenience sampling (convenience of the parturient, Availability of portable ultrasound machine and the investigator) Consenting parturients (ASA PSII and IIE) were divided in to two groups. Group El (Parturients underwent Elective cesarean section):

n=45

Group Em (Parturients underwent Emergency cesarean section): n=45

**Inclusion Criteria:**

- Parturients who underwent elective/emergency cesarean section
- Pregnant mothers 'between the age of 20 and 35 years
- American Society of Anaesthesiologists physical status (ASA PS) II & II E.

**Exclusion Criteria:** Parturients with Fetal distress, Hemodynamic instability, Disturbance of autonomic function

**Method:** After ethical committee approval and informed consent, 45 parturients in each group belonging to American Society of Anaesthesiologists physical status (ASA PS) II & II E, aged between 20 to 35 years, scheduled for elective and emergency cesarean section surgery that required spinal anaesthesia were selected.

A thorough preanaesthetic evaluation was conducted and routine investigations were checked before taking up the patient for cesarean section as per the institution protocols and practice guidelines.

All the patients who required elective cesarean section were kept nil per oral for solids for 8 hours and for clear liquids for 2hrs.

Both groups of patients were premedicated with inj. Ranitidine 50 mg IV and for parturients who required emergency cesarean section were administered inj. Metaclopramide 10 mg slow IV to fasten the gastric motility.

**Pre-Procedural assessment:**

In the immediate preanaesthetic evaluation period, patient's fasting status, history, examination findings were confirmed. Visualization of the whole stomach can be challenging. It is difficult to view the stomach if air is present, particularly the body of the stomach. The fundus is generally a deep structure that may also contain air and therefore can be difficult to visualize. Hence, the antrum is the optimal part of the stomach to scan for the following reasons:

- It is the most a menable and easily accessible part of the stomach
- It contains the smallest volume of air
- It maintains a consistent, identifiable shape
- It is thought that its assessment accurately represents the findings of the rest of the stomach.

In order to optimize the views of the antrum, the parturients should be in a $45^0$semi recumbent right lateral decubitus position; this helps air rise proximally toward the fundus, and fluid/semi fluid contents gravitate toward the antrum, for an accurate assessment.

Fifteen minutes prior to the administration of spinal anaesthesia, all the patients were shifted to the anaesthesia procedure room, in the presence of a female nurse, positioned in $45^0$semi recumbent right lateral decubitus position.

Standard ASA monitors were connected (3 lead ECG, NIBP, Pulse oximetry) and baseline readings were recorded. Intravenous access was secured with an appropriate sized cannula.

Ultrasonography was performed before administering spinal anaesthesia, with the aim of assessing the antral cross sectional area and thus, to estimate gastric volume.

**Technique:** Patients were placed in $45^0$ semi-recumbent, right lateral decubitus position. Given the depth of the antrum, 2-6 MHz curvilinear, low frequency transducer probe of ultrasound system - GE LOGIQ™ was used for gastric scanning. The probe was held in a longitudinal plane, placed at the left subcostal margin, and moved in a fanlike manner from the left toward the right subcostal area, over the epigastric region.

The antrum is generally seen in the parasagittal plane immediately to the right of the midline. All the measurements taken were of the resting stomach at the moment when peristaltic contractions ceased. The probe was turned clockwise or counter clock wise to improve the antral view. The quantitative assessment of the gastric volume was performed by measuring the cross-sectional area (CSA) of the gastric antrum (antral CSA) between peristaltic contractions, using the free-tracing caliper of the ultrasound unit. This free-tracing method is equivalent to the 2- diameter method of area measurement, and it is simpler and highly reproducible (high intrarater and interrater reliability).[14]

The cross-sectional antral area was measured employing the free-tracing method (FTM) and using calculations of the manually drawn lines as determined by the ultrasound caliper section. CSA was calculated as the product of AP×CC×p÷4, as described by Bolondi et al [The traditional two-diameter method (TDM)] using the preloaded software of the LOGIQ™. In a study using FTM and TDM, Kruisselbrink et al.[37] showed that the results of the measurements of both methods were similar.[14]The cutoff value of antral cross-sectional area of 340 mm2 was accepted as the diagnosis of an at-risk stomach according to the study by Bouvet etal.[13]

All the patients were observed postoperatively for 4 hours to know if they had experienced nausea or vomiting. Those who experienced were treated with inj. Ondansetron 0.15mg/kg IV and inj. Ranitidine 50 mg IV bolus.

**Statistical analysis:** Data so gathered was analyzed using Statistical Package for the Social Sciences (SPSS) Inc., Chicago, USA, Version 20.0. Student's unpaired t-test and Chi-square test were applied to find out the mean NPO difference between the two groups and Student's independent t-test applied to find out antral cross sectional area difference between the 2 groups. Karl Pearson's correlation will be used to find out the relationship between the NPO status and the antral cross sectional area of the stomach in both elective and emergency groups. A **p** value of **<0.05** was considered as the criteria for statistical significance.

## RESULTS

**Table 1: AGE DISTRIBUTION**

| Age group (Years) | Elective | | Emergency | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| 20 – 25 | 12 | 26.7 | 16 | 35.6 | 28 | 31.1 |
| 25 – 30 | 22 | 48.9 | 20 | 44.4 | 42 | 46.7 |
| 30 – 35 | 11 | 24.4 | 9 | 20 | 20 | 22.2 |
| Total | 45 | 100 | 45 | 100 | 90 | 100 |

X2=0.867p=0.648ns

90 subjects were taken for the study, 45 for elective group and the other 45 in emergency group. The age distribution of these two groups was in such a way that there was no significant difference between the age group. So we have nullified the age as a confounding factor. Most of the subjects were between 25 – 30 years of age. Nearly 48.9% of them were in the age group of 25 – 30 years in elective group and 44.4% of them were there in emergency group. Only 20% of the people were in the age group of 30 – 35 years in emergency group and 24.4% in Elective group. The mean age of Elective group was 27.67 yrs and that of emergency group was 27.04 yrs.

Fig 1: AGE DISTRIBUTION

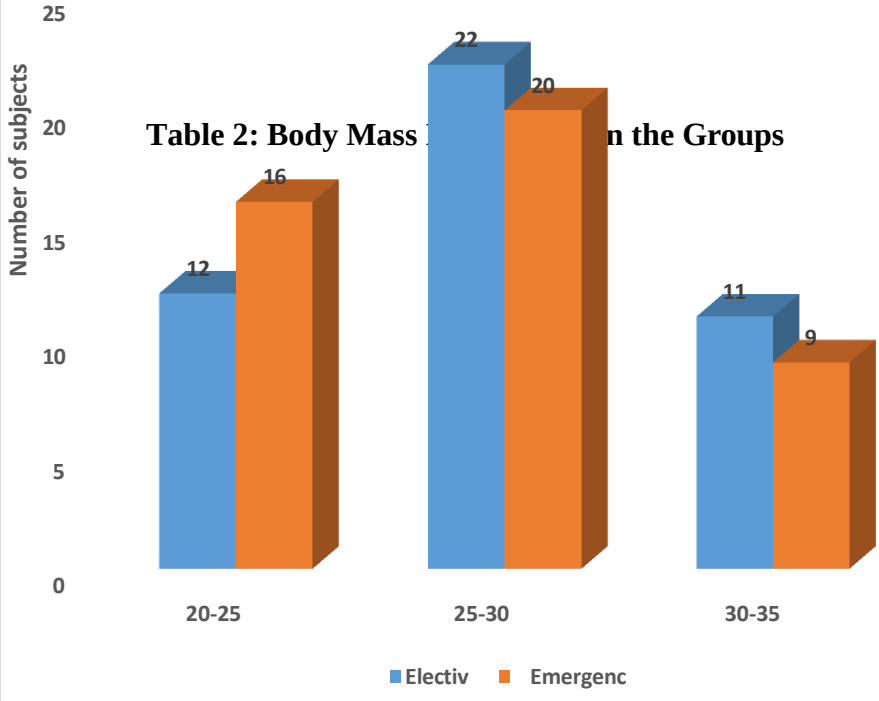
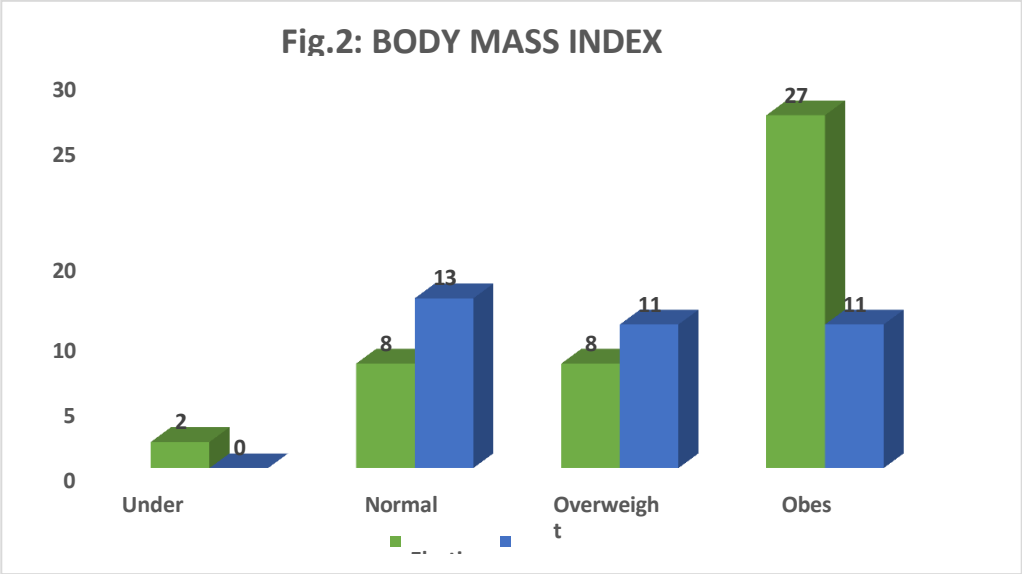



**Table 2: Body Mass ... n the Groups**

X2=4.414p=0.22ns




| | Elective | | Emergency | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Under nutrition(<18.5) | 2 | 4.4 | 0 | 0 | 2 | 2.2 |
| Normal (18.5-24.9) | 8 | 17.8 | 13 | 28.9 | 21 | 23.3 |
| Over weight(25-29.9) | 8 | 17.8 | 11 | 24.4 | 19 | 21.1 |
| Obese(>30) | 27 | 60 | 21 | 46.7 | 48 | 53.3 |
| Total | 45 | 100 | 45 | 100 | 90 | 100 |

**Table 3: Nausea & Vomiting Between the Groups**

| | | Elective | | Emergency | | Total | | p |
|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | |
| Nausea | Yes | 1 | 2.2 | 26 | 57.8 | 27 | 30 | <0.001 vhs |
| | No | 44 | 97.8 | 19 | 42.2 | 63 | 70 | |
| | | | | | | | | |
| Vomiting | Yes | 2 | 4.4 | 22 | 48.9 | 24 | 26.7 | <0.001 vhs |
| | No | 43 | 95.6 | 23 | 51.1 | 66 | 73.3 | |
| Total | | 45 | 100 | 45 | 100 | 90 | 100 | |

Of the 90 women in the study, 30% of them have had experienced nausea and 26.7% vomited. 57.8% in emergency group and only 2.2% in the elective group had experience of nausea. Only 2 out of 45 women in elective group vomited whereas as many as 22 of 45 in the emergency group vomited. The p value for both nausea and vomiting was found to be <0.001, which was clinically more significant between the groups with more incidence of nausea and vomiting among emergency group compared to elective.

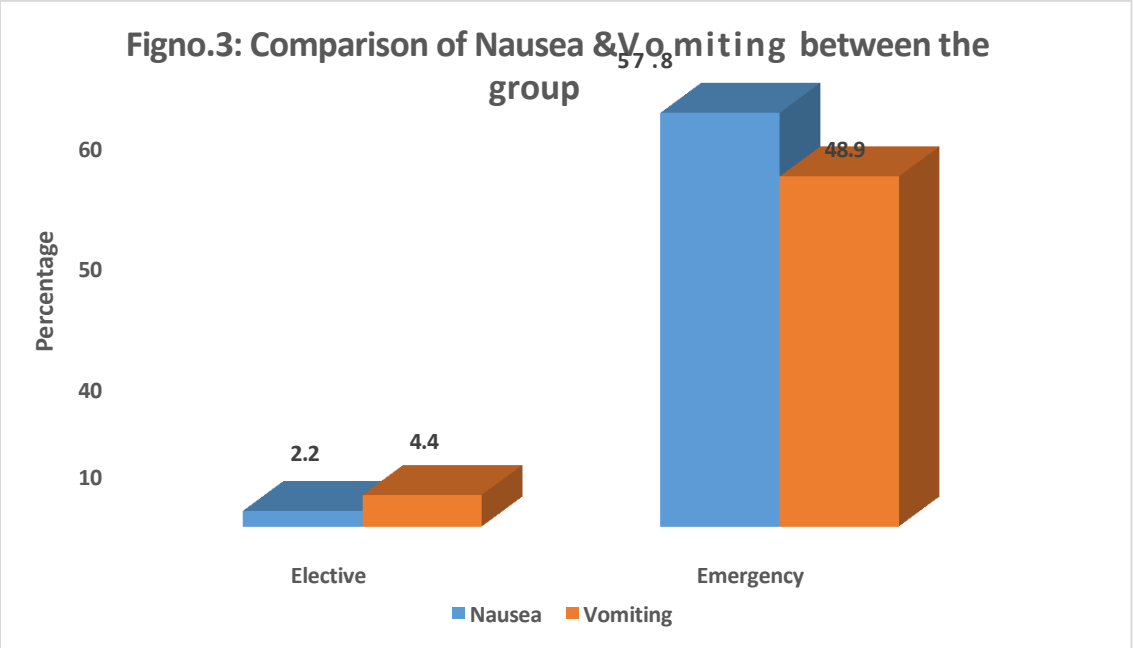


**Table 4: COMPARISON OF MEAN NPO BETWEEN THE GROUPS**

| Study group | N | Mean(Hours) | Std. Deviation | t |
|---|---|---|---|---|
| Elective | 45 | 10.911 | 1.621 | 18.874 |
| Emergency | 45 | 3.844 | 1.918 | p<0.001vhs |

Mean NPO of elective group was 10.911 hours with the standard deviation of1.621hrs and that of Emergency was 3.844 hours with the standard deviation of 1.918 hrs. When we tried to compare the mean NPO between the two groups by using student's unpaired t-test, it was found that there was significant difference between the two.(p<0.001)

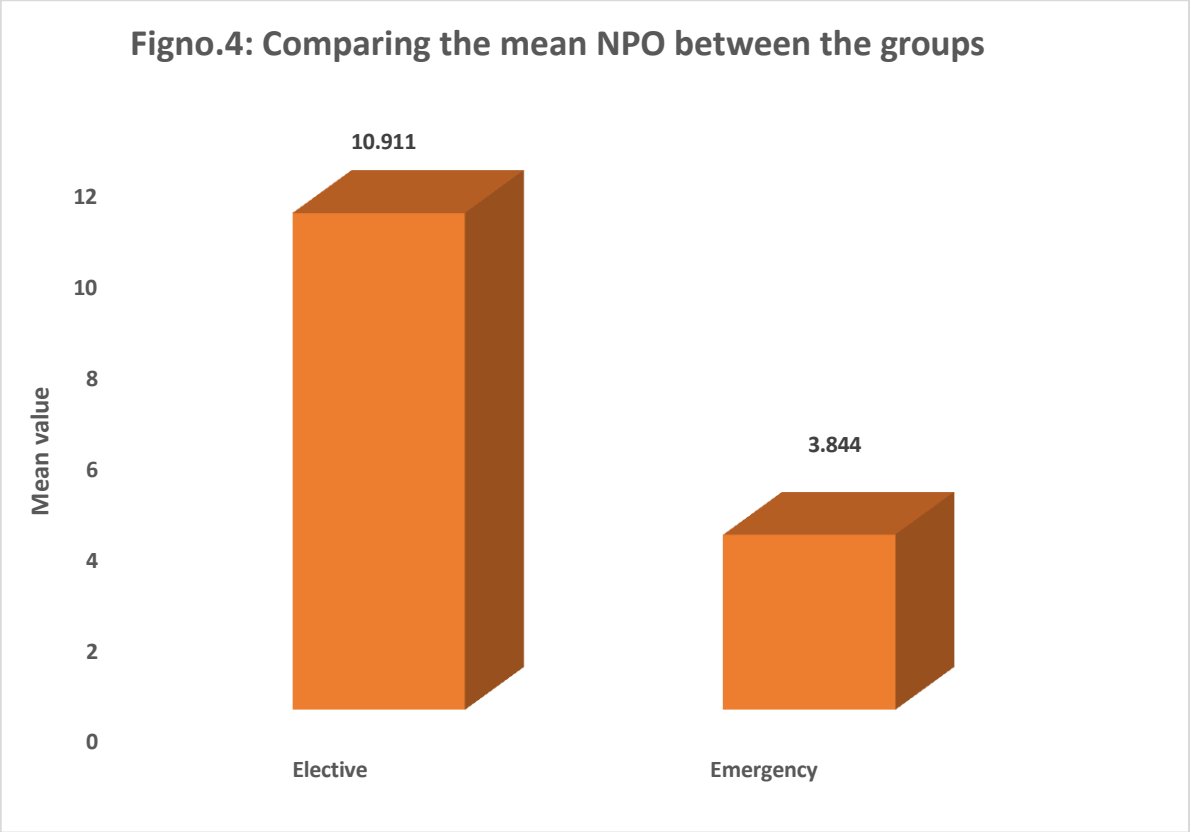


**Table 5: COMPARISON OF MEAN ANTRAL CROSS SECTIONAL AREA ($MM^2$) BETWEEN THE GROUPS**

| Study group | N | Mean ($mm^2$) | Std. Deviation | t |
|---|---|---|---|---|
| Elective | 45 | 237.316 | 54.677 | 13.107 |
| Emergency | 45 | 385.690 | 52.699 | p<0.001vhs |

The mean antral cross sectional area ($mm^2$) was estimated for both the elective and emergency group. It was found that mean antral cross sectional area of elective group was 237.316 and that of emergency was 385.69 with the standard deviation of 54.677 and 52.699 respectively. By applying student's independent t-test we could see the significant difference between the two groups (p<0.001)

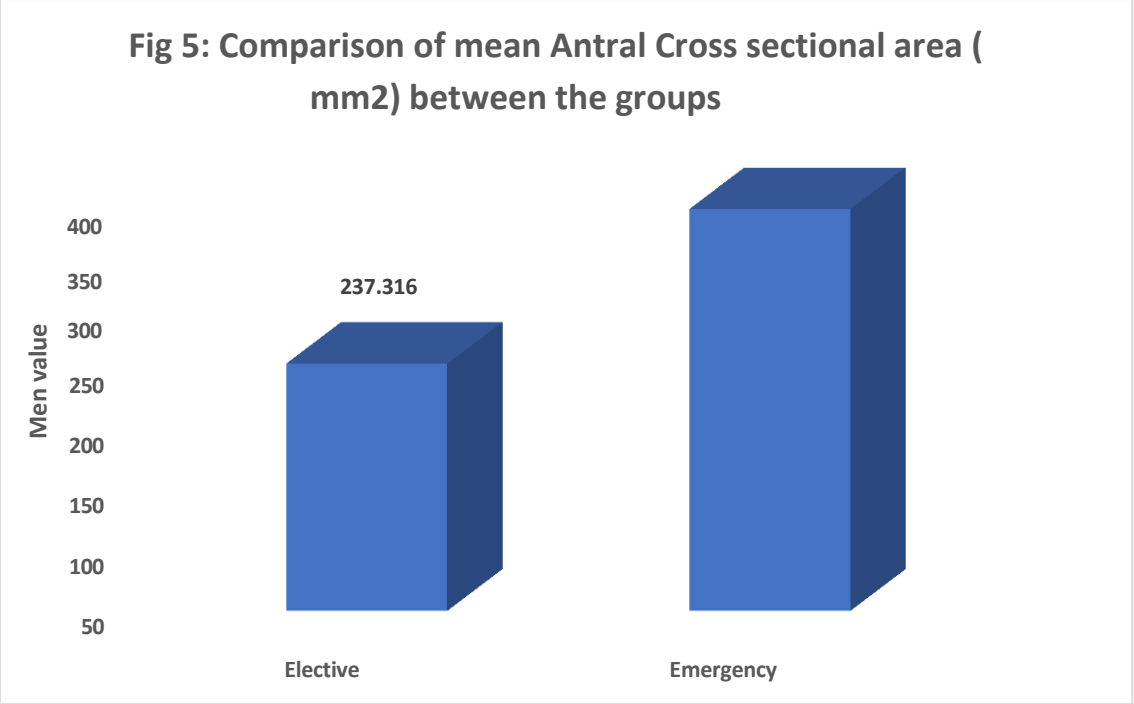


**Table 6a: Association of Nausea and Vomiting With Regard To NPO In Emergency Group**

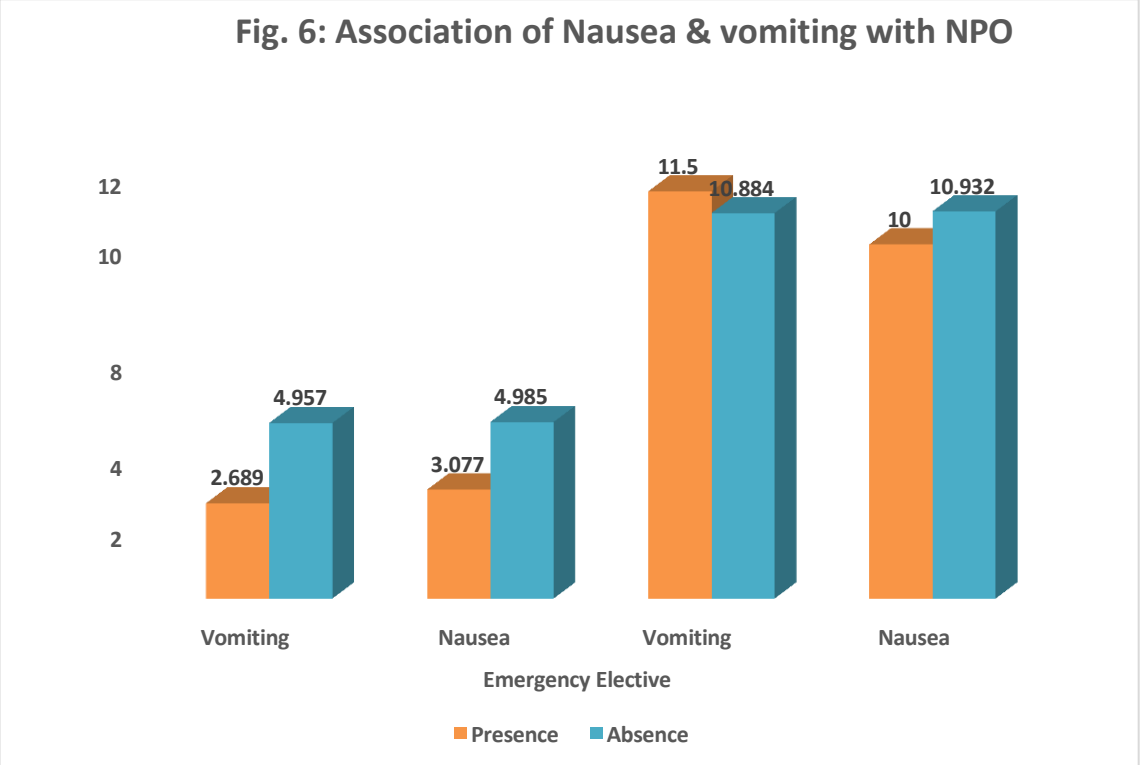
| Side effects | | N | Mean | Std. Deviation | t |
|---|---|---|---|---|---|
| Nausea | Yes | 26 | 3.077 | 1.495 | 3.524 |
| | No | 19 | 4.895 | 1.969 | p<0.001vhs |
| Vomiting | Yes | 22 | 2.682 | 1.359. | 4.911 |
| | No | 23 | 4.957 | 1.718 | P<0.001vhs |

While finding the association of nausea and vomiting with respect to NPO in emergency group, the mean NPO in terms of presence of nausea was 3.077(26 out of 45) and SD of 1.495 and with nausea absent it was 4.895(19 out of 45) with SD of 1.969 and the difference was found to be very highly significant (p<0.001). Similarly while finding the association of vomiting in terms of NPO the mean NPO when vomiting was present was 2.682 and that of absence was 4.957. The comparison of the mean NPO between the present and absence of vomiting was also very highly significant (p<0.001) which shows that the mean NPO score is less when these side effect arises.

**Table 6b: Association of Nausea and Vomiting With Regard To NPO in Elective Group**

| Side effects | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| Nausea | Yes | 1 | 10.000 | . |
| | No | 44 | 10.932 | 1.634 |
| Vomiting | Yes | 2 | 11.500 | 2.121 |
| | No | 43 | 10.884 | 1.621 |

In elective groups comparison is not possible since only one sample has the presence of nausea and 2 cases had incidence of vomiting. Graphical representation was shown below



| Side effects | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| Nausea | Yes | 2 | 253.695 | 24.063 |
| | No | 43 | 236.564 | 55.72 |
| Vomiting | Yes | 1 | 270.71 | - |
| | No | 44 | 236.557 | 55.069 |

**Table 7a: Association of Nausea and Vomiting With Regard To Antral Cross Sectional Area ($Mm^2$) In Emergency Group**

| **Side effects** | | **N** | **Mean** | **Std. Deviation** | **t** |
|---|---|---|---|---|---|
| Vomiting | Yes | 22 | 417.278 | 46.818 | 4.827 p<0.001 vhs |
| | No | 23 | 355.476 | 38.857 | |
| Nausea | Yes | 26 | 409.463 | 41.105 | 4.138 p<0.001 vhs |
| | No | 19 | 353.159 | 50.084 | |

While finding the association of vomiting and nausea with antral cross sectional area we could see that there is significant difference in the mean value with having nausea and not having in emergency group. The mean value having nausea is 409.463 $mm^2$ whereas without nausea mean value is small (353.159 $mm^2$) when compared to the one which has nausea. Similarly the mean value of antral cross sectional area when vomiting was there was 417.228 $mm^2$ and without vomiting the mean value was 355.476 $mm^2$ which was smaller compared to those having vomiting.

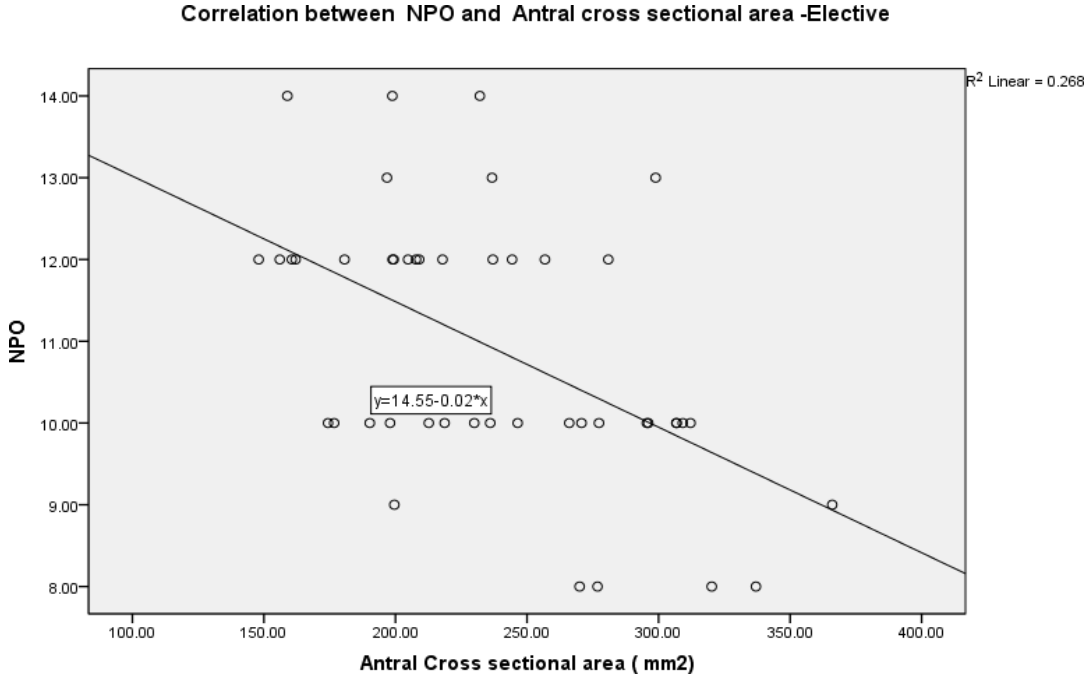
In elective group there in only 2 subjects having nausea and one subject having vomiting. Hence we cannot do any statistical test for the above table. But the mean antral cross sectional area in case of those who are having nausea and vomiting are 253.695 $mm^2$ and 270.71 $mm^2$ respectively. At the same time those who were not having these side effects hadtheirmeanvaluelesshaving236.557$mm^2$ and 236.564 $mm^2$ respectively for nausea and vomiting.

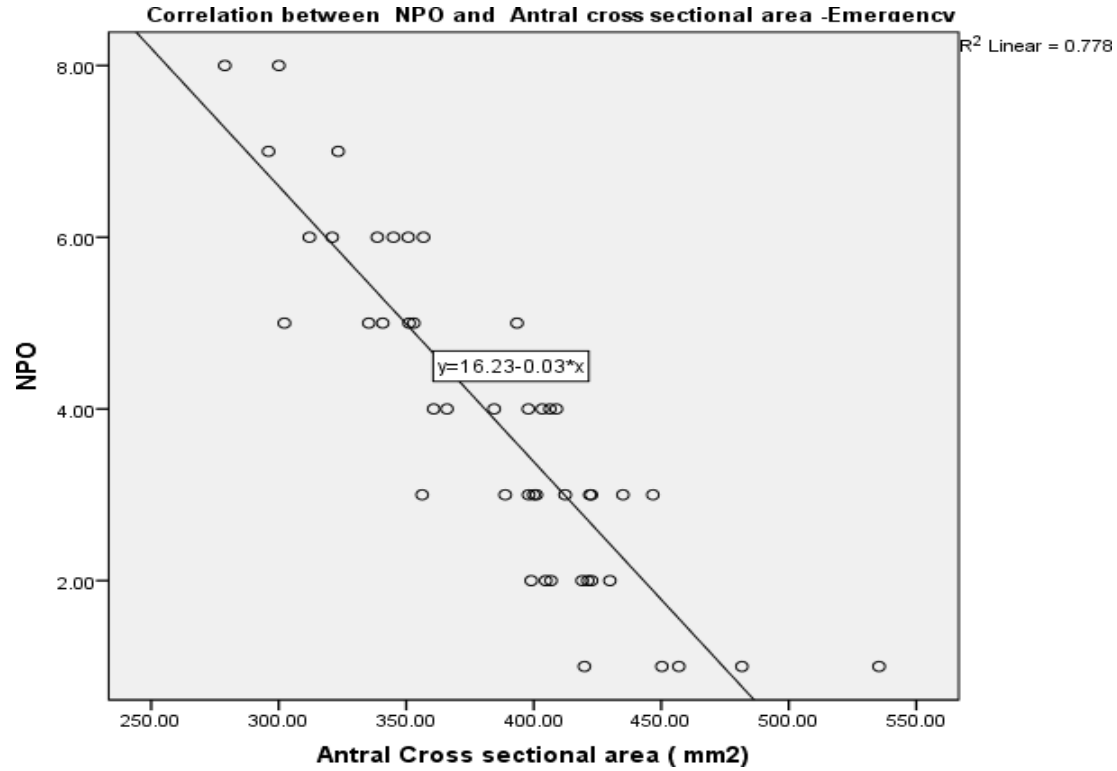
**Table 8: Correlation between NPO and Antral Cross Sectional Area**

| STUDY GROUP | ELECTIVE | EMERGENCY |
|---|---|---|
| r | -0.518 | -0.882 |
| p | <0.001vhs | <0.001vhs |

| | | |
|---|---|---|
| N | 45 | 45 |

The correlation between NPO and antral cross sectional area was done separately in elective and emergency group. It was found that in elective group these two variables show negative correlation and having moderate correlation of -0.518. In case of emergency group the correlation between the factors are very high (-0.882) negatively.



## DISCUSSION

The universal notion of "full stomach" in pregnant women and increased risk of aspiration is based on mostly of physiological changes during pregnancy, related to the increased gastric volume and intra-abdominal pressure, progesterone- induced decreased gastric motility, and gastro-esophageal sphincter tone. Anaesthesiologists consider pregnant women as "full stomach" and are at increased risk of aspiration and other complications, irrespective of their actual preoperative fasting status.

In this cross sectional study we found out that the gastric volume was more in pregnant women who underwent emergency cesarean section with less fasting time when compared to those who underwent the same procedure electively with proper fasting guidelines.

**DEMOGRAPHIC DATA**:

In this present study total 90 people were enrolled with 45 in each group of elective and emergency. All the 90 parturients met the inclusion criteria.

Demographics of the study population in each group were compared with respect to age and BMI.

The age distribution of these two groups was in such a way that there was no significant difference between the age group. Hence the age as a confounding factor has been nullified. The mean age of Elective group was 27.67 yrs and that of emergency group was 27.04 yrs.

According to the BMI distribution, 74.45% had BMI > 25 with 77.78% of elective group and 71.12% in emergency group were into that category.

Bouvet L, et al[47] conducted a study on 183 patients about clinical assessment of the ultrasonographic measurement of antral area for estimating preoperative gastric content and volume. They could measure the antral CSA in 180 of 183 patients and found a significant positive relationship between antral CSA and aspirated fluid volume. The cut off value for the diagnosis of risk stomach for the pulmonary aspiration of gastric contents was 340$mm^2$. In a similar study conducted by C. Rouget et al for assessing gastric volume in 43 women undergoing elective cesarean section under spinal anaesthesia found that the cut off value of cross sectional area of 340 $mm^2$was used for the rapid assessment of a risk of regurgitation. This holds good for our study also, as we found that the mean gastric antrum cross-sectional area of 385.690 $mm^2$ in those who underwent emergency cesarean section with no proper fasting time period indicating they were at high risk of gastric regurgitation and aspiration risk as it was well above the cut off value of 340 $mm^2$for risk stomach.

Ayhan Kaydu and Erhan Gokcek conducted a study with the aim of evaluating the efficacy of portable ultrasonography in the evaluation of gastric volume of the patients preoperatively in those who required general surgical intervention who are more vulnerable for regurgitation and aspiration mainly in CRF, Diabetes, Obesity etc, While we have done it in pregnant women who

underwent cesarean section under spinal anaesthesia. They had the secondary objective to find out the relationship between gastric antrum cross-sectional area and age/BMI, where as we have followed up our patients for 4 hours post operatively to assess if they have had nausea/vomiting.

Ayhan Kaydu et al included 120 patients in their study. A fasting period of more than 8 hours was determined in 91 patients (75.8%) and less than 8 hours was seen in 29 patients, where there was no universal distribution of study population between the two groups. We had equal distribution of study population with 45 parturients in each group where for elective cesarean section they have been kept nil per oral for>8 hours and the emergency group had variable fasting period which was<8 hours.

The mean antral cross-sectional area with the patient in supine position to be340±24.3 $mm^2$ was found in the study conducted by Ayhan Kaydu and Erhan Gokcek[42], where as in our study the patients were placed in right lateral decubitus position and the mean CSA was 237.316±54.677 $mm^2$ in the elective group and 385.690±52.699 $mm^2$among those who required emergency intervention.

In our study we assessed gastric antral cross sectional area in 90 pregnant mothers in the preoperative period, 15 minutes prior to administration of spinal anaesthesia and followed them up to 4 hours postoperatively to see if they develop nausea or vomiting. Since nausea and vomiting are symptoms of regurgitation, it gives us an idea of possible gastric content aspiration in those who had experienced it. We found that the mean gastric volume as measured by antral CSA was 409.463(±41.105) $mm^2$ and 417.278(±46.818) $mm^2$ in those who developed nausea and vomiting respectively among emergency group, which was above the cutoff value of 340$mm^2$ as was taken by the above two studies, whereas it was 253.695(+/- 24.063) $mm^2$ and 270.71 $mm^2$ among the elective cesarean group which was significant with p< 0.001.

Total 26 pregnant women (57.8%) in emergency group and only one (2.2%) in elective group had experienced nausea. It was 48.9% (22 people) and 4.4% (2) for vomiting in emergency and elective groups respectively. It was found to be statistically significant with p<0.001 among emergency group for both nausea and vomiting.

Ayhan Kaydu et al[42] found that as the fasting time is increased, the gastric antral CSA statistically decreased (p< 0.05), which was the same as found in our study as there was moderate correlation between NPO and antral CSA in those who underwent elective cesarean section(r=-0.518) and it was strongly correlated with in the emergency group(r = -0.882) with p < 0.001, which was statistically very significant. They also found a linear correlation with the increased gastric antral CSA and the increased age (r=0.209, P<0.05). In our study we have nullified age being a confounding factor between the two groups with mean age of 27.67 yrs in elective group and that of 27.04 yrs in emergency.

**Limitations of the Study**: The main limitations of our study are as follows:

1. Its single-centre nature of study
2. An anaesthesiology resident with basic level experience of using ultrasonogram did the assessment of gastric antrum cross-sectional area and inabilities to assess inter-observer agreement with respect to the antral cross sectional area.
3. We did not observe for the gastric volume post operatively to see the critical value for the aspiration risk due to the limited availability of ultrasound.
4. Other condition which may impede the gastric emptying was not taken into consideration.

## CONCLUSION

Pregnancy is considered to be a full stomach condition irrespective of the fasting status and at increased risk of pulmonary aspiration of gastric contents, which is a well-known cause of perioperative morbidity and mortality. The ability to evaluate for NPO (nil per oral) status and risk stratify patients scheduled for anaesthesia is a powerful skill set.

This study provides an ultrasonographic estimation of gastric volume by measuring antral cross sectional area in term pregnant women who come for elective or emergency cesarean delivery under spinal anaesthesia. In our study we found that those who had more antral cross sectional area experienced nausea and vomiting more frequently than those who had less CSA.

Hence it establishes CSA threshold values for both fasted and non-fasted term pregnant women. Thereby concluding that bedside gastric USG in the immediate preoperative assessment can provide valuable insight into the nature and volume of gastric contents before performing any anaesthesia not only for an urgent or emergent procedure where NPO status is unknown, even in elective cases where risk stratification of pulmonary aspiration can be done before in hand in case of conversion to general anaesthesia because of failed or partially acted spinal anaesthesia.

Although gastric USG should not replace strict adherence to current fasting guidelines or be used routinely in situations when clinical risk is clearly high or low, it can be a useful tool to guide clinical decision making when there is uncertainty about gastric contents. Further research is needed to investigate the feasibility of a predictive model to estimate gastric volumes based on the antrum CSA and patient variables in pregnant women.

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