

GESTATIONAL AGE-WISE AND SEX-WISE MORPHOLOGY OF HUMAN FOETAL STOMACH

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ABSTRACT

Introduction: Intra-uterine shape and position of the stomach shows variability due to the different growth rates of the stomach wall in various regions and changes in the positions of the neighboring structures. Diagnosis and treatment of fetal anomalies of stomach requires knowledge of developmental anatomy of stomach at different gestational ages. Limited data is available in the literature on fetal anatomy of stomach. No data on morphological parameters of human foetal stomach was reported on Indian population.

Materials and Methods: Morphological parameters of 52 foetal stomach specimens of 13 – 36 weeks gestational age and of both sexes were observed for positional and shape variations according to gestational age and sex.

Results: Typical rounded or crescent shape was observed in 82 % of cases. The other shapes observed include advanced enlargement type, cascades, short body type, sliding hiatal hernia type, lobulated and hourglass shapes.

Conclusion: The present study forms database for the morphological parameters of human foetal stomach in India at different gestational ages as this is the first reported study.

KEY WORDS: Foetal stomach, Gestational Ages, Hiatal Hernia, crescent shape stomach.

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INTRODUCTION

Diagnosis and treatment of fetal anomalies of stomach requires knowledge of developmental anatomy of stomach at different gestational ages. Limited data is available in the literature on fetal anatomy of stomach and the data that is available was based on obstetric ultrasound by means of which it can be visualized as early as 9th week of gestation and macroscopically measured after 10th week [1,2]. Anatomical dis-

sections provide more precise and reliable data when compared to the data obtained by radiological methods.

Variations, pathologies and anomalies of stomach observed in adults could be related to developmental changes in intrauterine period [2,3]. The data on morphological and morphometric parameters of developing human fetal stomach by autopsy studies was first reported in the literature by Esra Cetin et.al., in 2006 [4]

based on observations in 160 human embryos and fetuses. No data was reported on Indian population. This study was conducted with an aim to contribute data on morphological parameters of human fetal stomach at different gestational ages in the local population. This type of data facilitates diagnosis and treatment of variations, anomalies and pathology of fetal stomach.

MATERIALS AND METHODS

The present study on morphological observations on human fetal stomach at different gestational ages was conducted as a sample study. Shape and situation of foetal stomach with respect to abdominal quadrants was observed in situ. The data was analysed to find out the sex-wise and gestational age-wise differences in morphological features.

This work was conducted at the department of Anatomy, S.V. Medical College, Tirupati with the co-operation of Department of Pathology, SVIMS, Department of Anatomy, Department of Obstetrics and Gynecology, S.V. Medical College Tirupati, Andhra Pradesh, India.

A total of 52 dead and aborted human fetuses of 15 to 36 weeks gestational age and both sexes with normal foetal morphology were obtained from Govt. Maternity Hospital, Tirupati with relevant clinical history. The fetuses were preserved by injecting 10% formalin solution into the pleural, peritoneal and cranial cavities. The extremities were preserved by multiple injections technique.

Fetuses were assigned to one of the two groups according to their gestational ages: Group 1 (13–25 weeks: second trimester), Group 2 (26–37 weeks: third trimester). Fetuses were also stratified into six groups according to their gestational age in months; fetuses aged 13–16, 17–20, 21–24, 25–28, 29–32 and 33–36 weeks were assigned to 4, 5, 6, 7, 8 and 9 months groups, respectively (Table.1).

The stomach is exposed by opening the abdominal cavity. The shape of stomach, its localization with reference to four quadrants formed by vertical and horizontal planes passing through umbilicus and relations were observed in situ.

Table 1: Gestational age (Month-wise) and sex-wise distribution of specimens.

Gestational age	Male	Female	Total
13-16 wks (4months)	0	2	2
17-20 wks (5months)	3	2	5
21-24 wks (6months)	3	3	6
25-28 wks (7 months)	5	5	10
29-32 wks (8 months)	8	6	14
33-36 wks (9months)	10	5	15
Total	29	23	52

Fig. 1: Measuring the angle of fetal stomach.

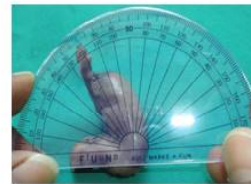


Fig. 2: Typical shape.



Fig. 3: Advanced enlargement



Fig. 4: Cascades



Fig. 5: Short body



Fig. 6: Sliding Hiatal hernia



Fig. 7: lobulated stomach



Fig. 8: hour glass shaped stomach

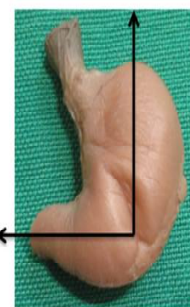


Fig. 9: types of stomachs-based on angle – 26 wks – 29 wks – 32 wks.

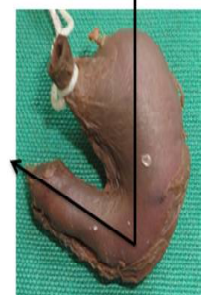
Type 1: (>90°)



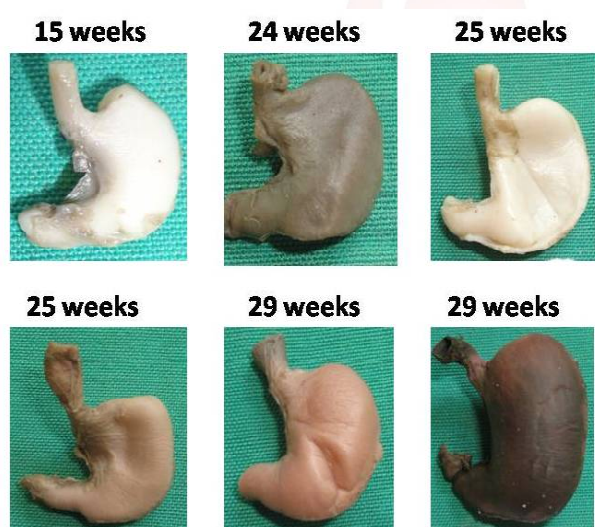
Type 2: (90°)



Type 3: (<90°)



Later the stomach was separated from duodenum, esophagus and its ligaments. The organs were washed in running water and dried. Angle of the stomach i.e the angle between the axes passing through antrum and body of the stomach was measured using protractor (Fig.1).

Fig.10: Obtuse angled stomach ($>90^\circ$).**Fig. 11:** Right angled stomach (90°).**Fig.12:** Acute angled stomach ($<90^\circ$).

RESULTS

In the present study location of stomach was observed with reference to various quadrants in trimester-wise and sex-wise groups. The percentage incidence of cases where the stomach occupied upper right and left quadrants is 76.9% (40/52) and that of upper left quadrant is 23.1%

(12/52). When analyzed trimester-wise there is no significant difference in the incidence of location between 2nd and 3rd trimester groups. When analyzed sex-wise there is no difference between the sexes in 2nd trimester group and higher incidence in male fetuses in 3rd trimester for upper right and left quadrant location.

When the shapes of stomach were analyzed in the present study typical shape was observed in 82% (Fig.2), advanced enlargement type in 2% (Fig.3), cascade in 2% (Fig.4), short body type in 4% (Fig.5), sliding hiatal hernia type in 6% (6 %; Fig.6), other shapes like lobulated and hour-glass in 4% (Fig.7&8).

Fetal stomachs were classified into three types with respect to the angle of stomach as described by Esra Cetin et.al., [4]

Type 1: Obtuse-angled type, angle of stomach is greater than 90° (Fig.9)

Type 2: Right-angled type, angle of stomach is 90° (fig.9).

Type 3: Acute-angled type, angle of stomach is smaller than 90° (Fig.9).

In the present study the incidence of type 1 (40.4%;Fig.10) and type 3(42.3%;Fig.12) are of equal incidence when compared to type 2(Fig.11). The incidence of type 1 is more common in 2nd trimester and type 3 is more in third trimester (Table.2).

Table 2: Trimester- wise percentage incidence of types of stomach.

Group (trimester)	Type 1 (obtuse-angle)	Type 2 (right-angled)	Type 3 (acute-angled)	Total
Second trimester (13-25 weeks)	10 (19.2%)	3 (5.8%)	4 (7.7%)	17
Third trimester (26-37 weeks)	11 (21.2%)	6 (11.5%)	18 (34.6%)	35
Total (13-37 weeks)	21 (40.4%)	9 (17.3%)	22 (42.3%)	52

DISCUSSION

According to literature [1,5,6] the normal location of stomach during fetal period is in left upper quadrant. In the present study percentage incidence of location of stomach in upper right and left quadrants is 76.9% and that of upper left quadrant is 23.1%.. Esra Cetin et.al.,[4] reported 81% incidence for the location of stomach in right and left quadrants with 2/3 in left and 1/3 in right upper quadrants and

19% incidence in left upper quadrant. The position in these quadrants showed significant differences among trimester groups in their study. The observations in the present study are in agreement with those reported in literature [4] by Esra Cetin et.al., based on autopsy studies and is contradicting with the studies based on sonographic [1,5] and contrast radiological [6] methods.

In the present study location in upper right and left quadrants is more or less equal in 2nd and 3rd trimester groups (76.5% vs 77.1%) and is in agreement with the reports by Esra Cetin et.al., [4] for these groups. The present study on location of fetal stomach supports the statement of Esra Cetin et.al. [4] that its location in upper right and left quadrants to be kept in mind during gestational ultrasound.

In the present study typical shape was observed in 82 % of cases. The other shapes observed include advanced enlargement type, cascades, short body type, sliding hiatal hernia type, lobulated and hourglass shapes.

Based on the angle of stomach the incidence of type 1- Obtuse angled type (40.4%) and type 3 – Acute angled type (42.3%) are of higher incidence when compared to type 2 – Right angled type (17.3%). The incidence of type 1 is more common in 2nd trimester and type 3 is more in 3rd trimester in the present study which is in agreement with that reported by Esra Cetin et.al. [4].

The classification adopted by Hawass et.al., [6] is based on contrast studies of 162 aborted fetal stomachs of 7.5 to 26 weeks gestational age and certain morphometric parameters. Accordingly he classified them in to standard type, horizontal type and steer horn type. They reported 90% incidence of standard shape which is the most frequent pattern followed by steer horn of 3% incidence and a horizontal pattern of 2% incidence. The values obtained in the present study are in agreement with that of Hawass et.al. [6] for typical shape.

In our study there is no statistically significant differences in the morphological parameters between the sexes. Esra Cetin et.al. [4] also did not find statistically significant differences in the parameters between males and females.

CONCLUSION

In the literature there is only one reported study on human foetal stomach morphology. The present study is the second of its kind and it forms the data base for foetal stomach morphology in Indian population.

Conflicts of Interests: None

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