



## HISTOLOGICAL DIFFERENTIATION OF STRUCTURAL COMPONENTS IN HUMAN FOETAL THYMUS AT DIFFERENT GESTATIONAL AGES.

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**ABSTRACT** **Aim & Objectives:** Estimation of development and differentiation of various tissues and organs, helps in assessment of gestational age of the foetus. To study the histological differentiation of cellular components of human thymus at different gestational age.

**Methods:** A total 40 human foetuses ranging between age 12-32 gestational weeks were included. Based on to the gestational age (weeks), all the collected foetuses were divided into five groups, i.e. 9-12 weeks (Group 1), 13-16 weeks (Group 2), 17-20 weeks (Group 3), 21-24 weeks (Group 4) and 25-40 weeks (Group 5). The appearance and histogenesis of the various cellular components were noted and analyzed

**Results:** Appearance of cortex and medulla was started in the 14th week, differentiation of cortex and medulla was commenced at 14<sup>th</sup> week and was well distinct after a 17<sup>th</sup> week of gestation. Lobulation of thymus was commenced 13<sup>th</sup> week, Hassall's corpuscles were appeared in 16.5th week of gestation and was well distinguished between 18<sup>th</sup> to 23rd weeks of gestation.

**Discussion:** The estimation of the time of appearance of the various cellular components of the developing thymus helps in estimation of gestation age of the foetus. Structural changes such as differentiation of cortex & medulla, lobulation, the appearance of Hassall's corpuscles happened with in the 17<sup>th</sup> week of gestation.

**KEYWORDS :** Thymus, Cortex, Medulla, Hassall's Corpuscles, Histology.

### INTRODUCTION

Thymus, a key organ of the mammalian immune system, which is also an organ of primary central lymphoid. Thymus is a bilobed structure and is composed with cortex and medulla. At the 8<sup>th</sup> week of gestation, two lobes of thymus unite at midline and in the dispersedly arranged reticulum (which is epithelial in origin) small lymphocytes soon appeared about at 9<sup>th</sup> week (1). The lobulation of thymus gland occur at 10<sup>th</sup> week of gestation. Differentiation of cortex and medulla happens at 11<sup>th</sup> -13<sup>th</sup> week of gestation. Various studies have different opinions on thymic corpuscles appearance i.e. 8-16<sup>th</sup> week of gestation (2, 3).

A detail anatomical knowledge on morphological, histogenesis and histodifferentiation features of the normal thymus is important to analyses the thymus associated pathologies. This study aimed to assess the cellular differentiation of human thymus at different gestational ages.

### Materials and methods

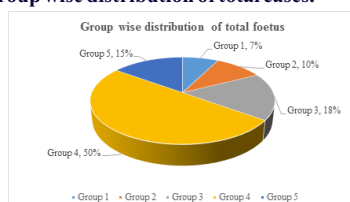
The present study was conducted in Department of Anatomy, Osmania Medical College, Hyderabad during March 2017 to April 2018. A total 40 human foetuses ranging between age 9-34 gestational weeks were collected from Department of obstetrics and gynaecology, Osmania general hospital, Hyderabad.

Foetuses were collected within 4-5 hours of birth to avoid postmortem changes and immediately fixed in 10% formalin. Gestational age of the fetus was calculated from the first day of last menstrual age fertilization. Based on to the gestational age (weeks), all the collected foetuses were divided into five groups, i.e. 9-12 weeks (Group 1), 13-16 weeks (Group 2), 17-20 weeks (Group 3), 21-24 weeks (Group 4) and 25-40 weeks (Group 5).

The tissue sample was fixed in, processed to prepare paraffin embedded blocks and 4-5 micron thick sections were cut. The slides were stained with Haematoxylin and Eosin. The slides were studied with the binocular research microscope, using powers 10x, 40x, 100x and 400x. The appearance and histogenesis of the various cellular components were noted and analyzed.

### RESULTS

**Figure 1: Group wise distribution of total cases.**



**Table 1: Appearance of Thymic components at various gestational age group foetuses.**

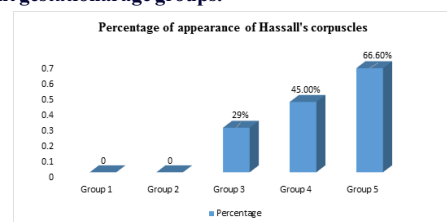
Group	Cortex		Medulla		Cortico medullary junction	
	Number	%	Number	%	Number	%
Group 1 (n=3)	0	0%	0	0%	0	0%
Group 2 (n=4)	1	25%	1	25%	1	25%
Group 3 (n=7)	1	14.2%	1	14.2%	1	14.2%
Group 4 (n=20)	9	45%	9	45%	5	25%
Group 5 (n=6)	4	66.6%	4	66.6%	4	66.6%

**Table 2: Details of formation of trabeculae and lobulation in thymus of various gestational age group foetuses.**

Group	Trabeculae		Lobulation	
	Number	%	Number	%
Group 1 (n=3)	1	33.3%	0	0%
Group 2 (n=4)	2	50%	1	25%
Group 3 (n=7)	3	42.8%	3	42.8%
Group 4 (n=20)	9	45%	9	45%
Group 5 (n=6)	4	66.6%	4	66.6%

In Group 1 foetus, Cortex, medulla, Cortico medullary junction and lobulation was not appeared. Whereas trabeculae (33.3%) was appeared. In group 2, Cortex appeared in 25% foetus, medulla in 25% foetus, Corticomedullary junction in 25% foetus, Trabeculae in 50% foetus and lobulation in 25% foetus. In group 3, Cortex, medulla and corticomedullary junction was appeared in 14.2% cases. Whereas trabeculae and lobulation was seen in 42.8% cases. In group 4, Cortex, medulla, trabeculae and lobulation was appeared in 45% cases. Whereas corticomedullary junction was seen in 25% cases. In group 5, all the thymic components were seen in 66.6% cases (Table 1 & 2). Appearance of Hassall's corpuscles were seen in 29% of foetuses of group 3, 45% in group 4 and 66.6% in group 5 (Figure 2).

**Figure 2: Appearance of Hassall's corpuscles in thymus at different gestational age groups.**



## Discussion

Foetal age estimation after death is one of the changing concern to the clinician. Majority factors and methods were available to estimate the age of foetus i.e. CR & CH length and appearance of ossification centers of bones etc. In accompany with that histologic examination for the appearance of various organs and their tissue plays crucial role in the estimation of age of a dead foetus (3). This study focused on histological estimation of appearance of thymic components at different gestational ages.

In Present study, Cortex and medulla appearance started in 14<sup>th</sup> week of gestation. The differentiation of cortex and medulla commenced at 14<sup>th</sup> week of gestation and was well distinct after 17<sup>th</sup> week of gestation. The findings of this study is more than the findings of Hamilton and Mossman (11<sup>th</sup> weeks), Ghali et al (11<sup>th</sup> week), Arey (12<sup>th</sup> week), Von Gaudecker B et al (12<sup>th</sup> week), and correlating with the studies of Haar (14<sup>th</sup> week), Lobach & Haynes (14<sup>th</sup> week), Prabhavathy (14<sup>th</sup> week). Study by Vijayalakshmi et al stated that differentiation started at 16<sup>th</sup> week of gestation (4-11).

In this study lobulation of thymus commenced at 13<sup>th</sup> week of gestation. Present finding are correlating with the studies of Ghali et al, (10<sup>th</sup> week), Bashi khan et al, (10<sup>th</sup> week), Ajita et al, (12<sup>th</sup> week), Hayward (12<sup>th</sup> week) and Haar (14<sup>th</sup> week). Study by Vijayalakshmi et al, stated lobulation was started at 12<sup>th</sup> week and ended at 15<sup>th</sup> week of gestation (5, 8, 11 12-14).

In this study, Hassall's corpuscles appeared in 16.5<sup>th</sup> week of gestation and was well distinguished between 18<sup>th</sup> to 23<sup>rd</sup> weeks of gestation. The present findings are correlating with studies of Fawcett (8<sup>th</sup> week), Hamilton and Mossman (8<sup>th</sup> week), Gilhus et al, (9<sup>th</sup> week), Arey (10<sup>th</sup> week), Ghali et al, (11<sup>th</sup> week), Sawant (12<sup>th</sup> week), Bashir khan et al, (13<sup>th</sup> week), Varga et al, (13<sup>th</sup> week). Study by Ajitha et al, (15<sup>th</sup> week), Liberti et al, (16<sup>th</sup> week) and Vijayalakshmi et al, (18<sup>th</sup> week). Liberti et al, stated that greatest differentiation of Hassall's corpuscles observed between 16<sup>th</sup>-19<sup>th</sup> week and 20<sup>th</sup>-23<sup>rd</sup> week (4-6, 11-13, 15, 16 ). Bashir khan et al reported the growth to occur during 18<sup>th</sup>- 24<sup>th</sup> week. Study by Ajita et al and Krishnamurthy et al stated that Hassall's corpuscles were enormously increase in number and size during 17<sup>th</sup>-24<sup>th</sup> weeks.

## CONCLUSION

Histological examinations is one of the major factor which plays a key role in the estimation of age of dead foetus. Cortex and medulla appearance started in 14<sup>th</sup> week of gestation. The differentiation of cortex and medulla was commenced at 14<sup>th</sup> week of gestation and was well distinct after 17<sup>th</sup> week of gestation. Lobulation of thymus was commenced 13<sup>th</sup> week of gestation. Hassall's corpuscles appeared in 16.5<sup>th</sup> week of gestation and was well distinguished between 18<sup>th</sup> to 23<sup>rd</sup> weeks of gestation.

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