

## Histomorphological study of wall thickness of fallopian tubes in Bangladeshi Female

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### Abstract:

The fallopian tubes convey the ova from the ovaries, transmit spermatozoa and provides the appropriate environment for fertilization and transports the developing embryo to the uterus. Tubal pregnancy, tuberculosis, inflammation, tumor are the common pathology of the fallopian tubes. Complete or partial bilateral tubal block or adhesions may develop from clinical conditions which lead to infertility. Appropriate histomorphological knowledge about the fallopian tube is essential for proper diagnosis and management of tubal diseases and infertility cases. This is a cross sectional, descriptive type of study which was carried out in the Department of Anatomy, Sir Salimullah Medical College (SSMC), Dhaka from Jan 2011 to Dec 2011. The number of sample was sixty two pairs of cadaveric human fallopian tubes which were collected from unclaimed dead bodies of the morgue of Dhaka Medical college. Among the studied samples, the lowest age was 2 years and the highest age was 65 years. The samples were divided into four different age groups. They were group A or prepubertal group (2-12years), group B or reproductive group (13-45 years), group C or perimenopausal group (46-51years) and post menopausal group (52-65 years). Histomorphological studies were carried out on 24 relatively fresh samples, 6 samples from each group. There was statistically significant difference found when values were compared between different age groups and also not significant between different age group. This study has revealed an age related change in wall thickness of fallopian tube.

**Key words:** Fallopian tube, thickness, ageing.

### Introduction:

The fallopian tubes are two in number. It is about 10-12cm long situated in the edge of the mesosalpinx which is the upper free margin of the broad ligament of the uterus. The tube passes laterally and superiorly and consists of four main

parts intramural, isthmus, ampulla and trumpet shaped infundibulum. Numerous mucosal finger like folds, 1mm wide called fimbria, are attached to the end of the infundibulum<sup>10</sup>. Tubes consist of an external serosa, intermediate muscular layer and inner mucosal layer. Fallopian tube is the temporary but the initial bed for the fertilized ova. The tube

accommodates the developing embryo and nourishes it with nutrition during the first week of life before implantation. The extra uterine implantation occurs mainly in the ampulla of the fallopian tube. The most common disorders in this paired structures are tuberculosis, acute and chronic salpingitis, salpingitis, benign tumors and cysts, malignant tumors. Infertility is a common sequelae of the above mentioned diseases. In assisted reproductive techniques (ART) the fallopian tubes are utilized by infertile couples to conceive. Methods of ART into the fallopian tubes are GIFT (gamete intra fallopian transfer) and ZIFT (zygote intra fallopian transfer)<sup>8</sup>. Ligation of the fallopian tubes is a surgical method of birth control which can be either abdominal tubal ligation or laparoscopic tubal ligation. It is a permanent device for population control<sup>7</sup>. A clear knowledge of the anatomy of the fallopian tube is a pre requisite for the diagnosis and treatment of fallopian tube diseases. In the treatment of infertility and in ART clear conception of anatomy regarding fallopian tubes is essential. The present study was performed to find out the histomorphological feature and age related changes of wall thickness of fallopian tube.

#### Materials & methods:

The present study was performed on 62(sixty two) pairs of cadaveric human fallopian tube whose age ranged from 2 to 65 years. Samples were collected from unclaimed dead bodies within 12 to 36 hours of death which were autopsied on different dates in the morgue of the Department of Forensic Medicine of Dhaka Medical College (DMC), Dhaka. Approximate age & sex were noted down from the morgues record book at the time of collection of the samples. Then the samples were brought to the Department of Anatomy, Sir Salimullah Medical College, Dhaka. The study was carried out in the Department of Anatomy, Sir Salimullah Medical Dhaka from Jan 2011 to Dec 2011. The samples were divided into four age groups; group A (2-12years) or prepubertal group, group B (13-45years) or reproductive group, group C (46-51years) or perimenopausal group, group D(52-65 years) or postmenopausal group.

**Table: 1 Study group distribution in different age groups (According to Kumar & Malhotra<sup>6</sup> 2008)**

Study groups	Age range (in years)	No. of samples (n =62 62x2=124)
Group A (prepubertal )	02-12	07x2
Group B (reproductive )	13-45	30x2
Group C(perimenopausal )	46-51	15x2
Group D (postmenopausal )	52-65	10x2

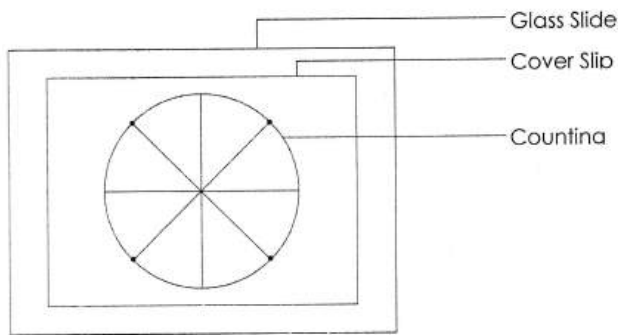
#### Histomorphological study:

For histomorphological study only right sided fallopian tube was chosen due to time limitation. Six samples were selected for histological study from each group. Fallopian tubes were sectioned from the uterine end to the ovarian end transversely with the help of a sharp BP blade. Pieces of tissue measuring 1cm from the middle of the isthmus and the ampulla and the whole portion from infundibulum and intramural part were taken. Thus total four pieces of blocks were prepared from each fallopian tube. Four slides were prepared from each group. Thus total of twenty four (6x4=24) histological slides were taken from each group. Finally, ninety six (24x4=96) slides were selected for the whole study. The fallopian tubes were fixed in 10% formol saline solution. The tissues were kept in formol saline solution over night. Then dehydration were done with ascending grades of alcohol(70% to 100%), cleared with xylene, infiltrated and embedded in paraffin. Paraffin blocks were cut at 5 $\mu$ m thickness and were stained with Haematoxillin and Eosin stain<sup>1</sup>.

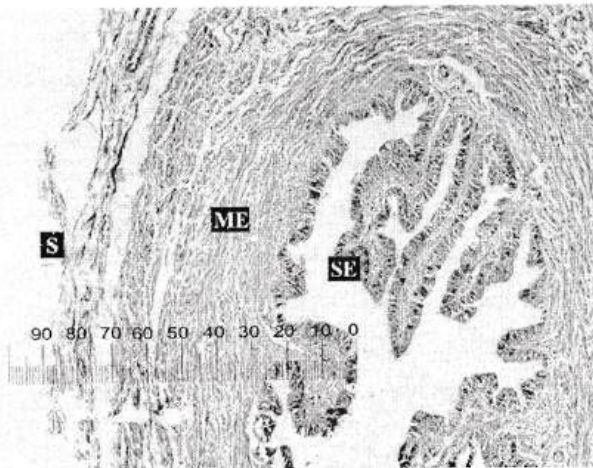
#### Measurement of total wall thickness of the different parts of the fallopian tube:

A piece of transparent plastic sheet (about the size of a cover slip) was divided into 4 equal quadrants by drawing two straight lines at right angles to each other. Then it was placed over the histological slides properly in such a way that the crossing point of the two straight lines was placed at the centre of the lumen of the fallopian tube. So the cross sectional area of each part of fallopian tube was divided into 4 equal parts. A point was marked at the middle of the outer margin of each quadrant. The thickness of the wall of each quadrant was measured from that pre-fixed point with the help of measuring scale and were measured thrice. The values were calculated by

simple arithmetic means. For measuring the tubal wall thickness, an ocular micrometer was put into the eyepiece of the microscope. The stage micrometer was put on the stage for standardization of the ocular micrometer. Objective $\times 10$  and eyepiece $\times 10$  i.e. the total magnification of 100 was maintained. After standardizing the ocular micrometer with the stage micrometer for the particular objective and eyepiece, each study slide was placed under the objective and the thickness of the wall was measured in terms of ocular micrometer divisions. The number of ocular micrometer divisions could then be converted into absolute value in  $\mu\text{m}$ .



**Fig 1: Diagrammatic representation of the method measuring the wall thickness of the intramural part, Isthmus, ampulla and infundibulum of the fallopian tube<sup>2</sup>.**



**Fig 2: Photomicrograph of microscopic field superimposed with ocular micrometer for measurement of the total thickness of the wall of the fallopian tube (ME-Muscularis Externa, SE-Surface Epithelium)<sup>2</sup>.**

## Results:

### Total wall thickness of intramural part and isthmus of the right fallopian tubes in different age groups

The mean( $\pm$  SD) total thickness of the intramural part of the right fallopian tubes were  $584.50 \pm 60.67 \mu\text{m}$  in group A,  $1002.00 \pm 114.25 \mu\text{m}$  in group B,  $826.62 \pm 69.04 \mu\text{m}$  in group C and  $726.45 \pm 93.73 \mu\text{m}$  in group D. The highest value were found in group B and the lowest value were found in group A. The differences in mean( $\pm$  SD) total thickness of the intramural part of the right fallopian tubes were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, group A vs C, group B vs D and group B vs C and also significant ( $P < 0.05$ ) in between group A vs D but not significant ( $P > 0.05$ ) between group C vs D. The mean( $\pm$  SD) total thickness of the isthmus of the right fallopian tubes were  $742.98 \pm 106.9 \mu\text{m}$  in group A,  $1060.38 \pm 115.96 \mu\text{m}$  in group B,  $860.05 \pm 58.57 \mu\text{m}$  in group C and  $726.45 \pm 93.73 \mu\text{m}$  in group D. The differences in mean ( $\pm$  SD) total thickness of the isthmus of the right fallopian tubes were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, group B vs C and group B vs D and also significant ( $P < 0.05$ ) in between group A vs C and group C vs D but not significant ( $P > 0.05$ ) between group A vs D.

### Total thickness of the ampulla and infundibulum of the right fallopian tubes in different age groups

The mean( $\pm$  SD) total thickness of the ampulla of the right fallopian tube were  $1077.15 \pm 93.73 \mu\text{m}$  in group A,  $1294.25 \pm 58.57 \mu\text{m}$  in group B,  $1110.55 \pm 132.24 \mu\text{m}$  in group C and  $1010.22 \pm 49.45 \mu\text{m}$  in group D. The highest value were found in group B and the lowest value were found in group D. The differences in mean ( $\pm$  SD) total thickness of the ampulla of the right fallopian tubes were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, group B vs C and group B vs D but not significant ( $P > 0.05, P > 0.50$ ) between group A vs C, group A vs D and group C vs D. The mean( $\pm$  SD) total thickness of the infundibulum of the right fallopian tubes were  $1152.30 \pm 118.56 \mu\text{m}$  in group A,  $1452.90 \pm 70.85 \mu\text{m}$  in group B,  $1177.35 \pm 113.14 \mu\text{m}$  in group C and  $1093.85 \pm 86.29 \mu\text{m}$  in group D. The highest value were found in group B and the lowest value were found in group D. The

differences in mean ( $\pm$  SD) total thickness of the infundibulum of the right fallopian tubes were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, group B vs C and group B vs D but not significant ( $P > 0.05, P > 0.10$ ) between group A vs C group A vs D and group C vs D.

**Table 2** Mean ( $\pm$ SD) total thickness of the intramural part and isthmus of the right fallopian tubes in different age group  
Total thickness ( $\mu\text{m}$ )

Age group	Intramural part Mean $\pm$ SD	Isthmus Mean $\pm$ SD
A (n=6)	584.50 $\pm$ 60.67 (501.00-651.30)	742.98 $\pm$ 106.95 (601.20-851.50)
B (n=6)	1,002.00 $\pm$ 114.25 (901.80-1,202.40)	1,060.38 $\pm$ 115.96 (901.80-1,202.00)
C (n=6)	826.62 $\pm$ 69.04 (701.40-901.80)	860.05 $\pm$ 58.57 (801.60-951.90)
D (n=6)	726.45 $\pm$ 93.73 (601.20-851.70)	726.45 $\pm$ 93.73 (601.20-851.70)

	<i>P</i> value	<i>P</i> value
A vs B	<0.001***	<0.001***
A vs C	<0.001***	<0.05*
A vs D	<0.05*	>0.50 <sup>ns</sup>
B vs C	<0.01**	<0.01**
B vs D	<0.001***	<0.001***
C vs D	>0.05 <sup>ns</sup>	<0.05*

**Table 3** : Mean ( $\pm$ SD) total thickness of the ampulla and infundibulum of the right fallopian tubes in different age groups

Age group	Total thickness ( $\mu\text{m}$ )	
	Amp Mean $\pm$ SD	Infundibulum Mean $\pm$ SD
A (n=6)	1,077.15 $\pm$ 93.73 (1,002.00-1,252.50)	1,152.30 $\pm$ 118.56 (1,002.00-1,302.60)
B (n=6)	1,294.25 $\pm$ 58.57 (1,202.40-1,352.70)	1,452.90 $\pm$ 70.85 (1,352.70-1,553.10)
C (n=6)	1,110.55 $\pm$ 132.24 (1,002.00-1,302.60)	1,177.35 $\pm$ 113.14 (1,052.10-1,352.70)
D (n=6)	1,010.22 $\pm$ 49.45 (951.50-1,052.10)	1,093.85 $\pm$ 86.29 (1,002.00-1,252.50)

	<i>P</i> value	<i>P</i> value
A vs B	<0.001***	<0.001***
A vs C	>0.50 <sup>ns</sup>	>0.50 <sup>ns</sup>
A vs D	>0.10 <sup>ns</sup>	>0.10 <sup>ns</sup>
B vs C	<0.01**	<0.001***
B vs D	<0.001***	<0.001***
C vs D	>0.05 <sup>ns</sup>	>0.10 <sup>ns</sup>

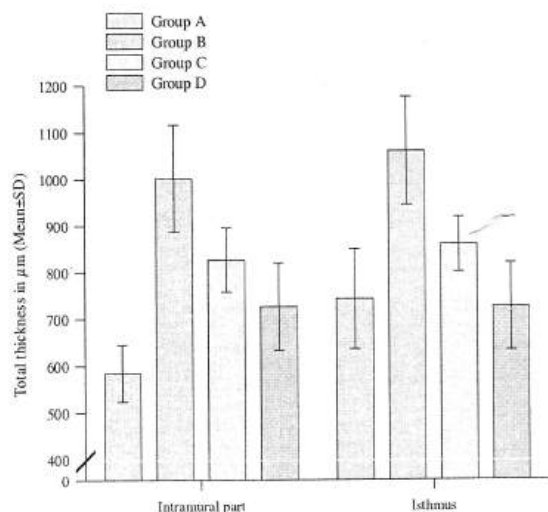
Figures in parentheses indicate range. Comparison between age groups done by One-way ANOVA (PostHoc), ns = not significant, \*\*/\*\* = Highly significant.

Group A : Age 6-12 years

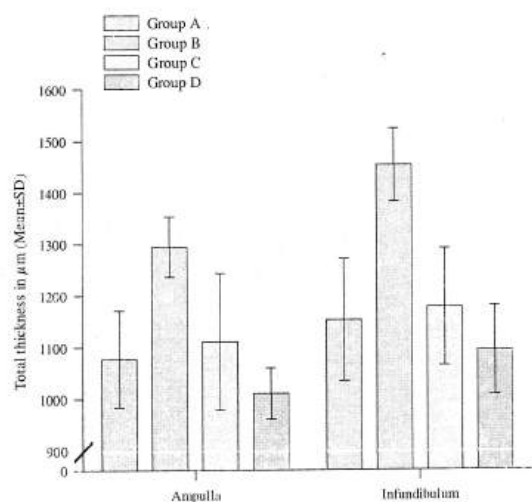
Group B : Age 13-45 years

Group C : Age 46-51 years

Group D : Age 52-65 years



**Fig. 3** Mean ( $\pm$ SD) total thickness of the intramural part and isthmus of the right fallopian tubes in different age groups showing height value in group B and lowest value in group A in intramural part and group D in isthmus.



**Fig 4:** Mean ( $\pm$ SD) total thickness of the ampulla and infundibulum of the right fallopian tubes in different age groups showing height value in group B and lowest value in group D.

### Discussion:

In the present study the total wall thickness of the intramural part of the fallopian tubes were highest in reproductive age (group B) and lowest in prepubertal age (group A). No literature were available about the total thickness of the intramural part of the fallopian tube for which no comparison could be done. The present study shows the total wall thickness of the isthmus, ampulla and infundibulum of the fallopian tubes were highest in reproductive age (group B) and lowest in post menopausal age (group D). The differences in mean ( $\pm$  SD) total wall thickness of intramural part of fallopian tubes were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, group A vs C, group B vs D and group B vs C and also significant ( $P < 0.05$ ) in between group A vs D but not significant ( $P > 0.05$ ) between group C vs D. The wall thickness of isthmus were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, B vs C, B vs D and also significant ( $P < 0.05$ ) in group A vs C and C vs D but not significant ( $P > 0.05$ ) in group A vs D. The wall thickness of ampulla and infundibulum were highly significant ( $P < 0.001, P < 0.01$ ) between group A vs B, B vs C and B vs D but not significant ( $P > 0.10, P > 0.50$ ) between group A vs C, A vs D and group C vs D. This findings coincided with that of the findings of Bardawil (2008)<sup>4</sup>, Shaw (2003)<sup>9</sup>, Blaustein (2002)<sup>3</sup>. The findings of the Hena (2003)<sup>5</sup> reported lower values that of the present study.

### Conclusion:

The study revealed an age related changes of wall thickness in different parts of the fallopian tube. To establish a standard data similar study with larger sample size in different age groups and more advanced methods are recommended.

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