



Original Research Article

Comparative histological study of fallopian tube in pre and post-menopausal women in tertiary care center of Bihar: An observational and prospective study

Javed Alam¹, Md Jawed Akhtar¹, Binod Kumar^{1,*}, Rajiv Ranjan Sinha¹,
Avanish Kumar¹

¹Dept. of Anatomy, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India



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ABSTRACT

Introduction: Infertility an on-going reproductive problem and tubal pathologies are considered as leading causes. Ectopic pregnancy (tubal), salpingitis, genital tuberculosis are serious and very common fallopian tubal pathologies in women of reproductive age group which incidence have been increased in past few decades. Better understanding of fallopian tube anatomy, physiology, function and sperm epithelial interaction is a necessity and also nature of epidemiology and histological pattern is important.

Materials and Methods: Observational and prospective study done on randomly selected 150 females either pre-menopause and post-menopause. Their fallopian tubes as specimen were collected with greatest care and precautions either from Obstetrics & Gynaecology or Pathology Department of IGIMS, Patna. Samples were processed in Histology section of the Department of Anatomy, IGIMS, Patna. The slides were studied under the compound microscope. Data collected from this study was presented in tabular form. Statistical analysis was done using Microsoft Excel Software.

Results: Patients were mostly reproductive age group, 26-30 years (26%) and 31-35 years (20.6%) and most of them had completed their family and desired to have contraception mostly tubal ligation. 40 years and above age group patients had menopause and were mostly complaint of dysfunctional uterine bleeding. Samples received by hysterectomy with B/L Salpingo-oophorectomy (43.3%), B/L tube ligation with caesarean section (43.3%), U/L Salpingo-oophorectomy (7.3%), B/L tube ligation (6%). In most of these cases the fallopian tubes were normal. In pre-menopausal patients most of the samples were obtained during pregnancy (63.02%) because caesarean section with or without tube ligation was very common. Followed to interval phase (21.70%) of menstrual cycle because it was the most preferred stage for any planned gynaecological surgery. 11 Premenopausal women while 6 post-menopausal women gave the history of I.U.C.D use during their reproductive years. Patients with past history of oral contraceptives and those with present history of its use in both young and old women.

Conclusions: This study concluded that the histology of fallopian tube was normal and the results were consistent with previous similar studies. Histological examination of fallopian tube was normal despite of any past history of IUCD or OCP use or different phases or cyclical changes of menstrual cycle in pre-menopausal women.

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1. Introduction

The major function of fallopian tubes is; transport of ova and sperms to the site of fertilization and provision of a favourable environment for the process of fertilization and early development of a fertilized ovum to take place. (L.

Mastroianni 1977).¹

Recent global demographic surveys indicate that infertility remains an on-going reproductive problem, of which tubal pathologies are considered as one of the leading causes. Better understanding of fallopian tube anatomy, its physiology, function and sperm epithelial interaction is becoming a necessity in this age of advance reproductive

* Corresponding author.

E-mail address: drbgsingh@yahoo.com (B. Kumar).

technologies.

It has been documented that, the ciliated and non-ciliated cells of the fallopian tube undergo cyclic changes with the menstrual cycle similar to those occurring in the endometrium. Further, each portion of the fallopian tube appears to be preferentially regulated by hormones that cause a distinct regionalization of activities depending on the day in female menstrual cycle. The changes in tubal epithelium was emphasized in 1928 by Novak Everett.² He described an increasing height of the epithelium in the proliferative phase of the menstrual cycle.

The incidence of ectopic pregnancy has markedly increased in the past few decades and fallopian tube is the most common site affected. Tubal pregnancy remains the most common cause of maternal mortality in the first trimester of pregnancy. A greater understanding of the aetiology of tubal ectopic pregnancy is critical for the development of improved preventive measures, advancement in diagnostic methods and treatment, which in turn entirely depends on how well we understand the normal tubal anatomy and histology in detail.

Fallopian tube inflammation also called as salpingitis, is the most common and serious infection in women of reproductive age group. An estimated 10-12 per thousand new cases occur in our country every year, most commonly in female's age 15-25 years, and about 1-2% of sexually active women are affected annually. The true incidence of acute salpingitis is not known because most of the cases are subclinical and the clinical diagnosis of acute salpingitis is imprecise, resulting in the former being a substantial public health burden.

Novak E (1952) found incidence of genital tuberculosis in a particular community still higher than that reported in literature. Tuberculosis still remains one of the major health hazards in India and more so in Bihar. Karan (1960) while working in south Bihar, found the incidence of tuberculous tubal infection to be about 2% in the city dwellers and 1.65% in the rural population. It is also believed that figures of north Bihar are more densely populated would not be much different. It was realized that study of fallopian tubes, may be able to throw some more light on the nature epidemiology and histological pattern of this important problem.

Although numerous exhaustive works have been done in this area with copious scientific literatures available, for most of these studies, lower animals or, subhuman primates have remained favoured experimental animals' models, with very limited studies based on specimens of human fallopian tube.

Moreover, fallopian tubes are the organs not easily accessible for study and clinical examination, with ultrasonography or any other cross-sectional imaging studies, providing only a limited visualization of the normal tubes, making histological study of the resected samples, a

major way of studying, in detail, the normal anatomy of the tubes.

2. Aim and Objectives of the Study

Aim of the present study was to examine histological pattern of fallopian tubes in each gynaecology specimen received for histopathology. Histological changes in tubal epithelium due to IUCD or oral contraceptive pills and sterilization procure had been compared and discussed. The cycles as well as early pregnancy had been studied. The musculature of the different parts of the tube, the folding pattern of tubal mucosa and the presence of sphincter in both uterine and abdominal Ostia had not been extensively studied in this part of the country. The present work may be looked as an endeavour to partially meet this challenge.

3. Materials and Methods

3.1. Study design

This was an observational and prospective study. 150 females either premenopause and postmenopause were randomly selected from the Obstetrics & Gynaecology department of IGIMS from December 2018 to May 2019 (Total 18 months). Their uterine tubes as specimen were collected either from Obstetrics & Gynaecology Department or Pathology Department of IGIMS, Patna. This study was approved from Institutional ethics Committee of IGIMS, Patna. Informed consent was taken from all study subjects.

3.2. Inclusion criteria

1. Female of premenopausal age admitted for tubectomy.
2. Female of postmenopausal age admitted for hysterectomy.
3. Women who had given consent for this study.

3.3. Exclusion criteria

1. Women who had not given consent for this study.
2. Premenopausal or postmenopausal women suffering from any pathology including neoplastic condition.

Uterine tube samples were collected from 150 patients. Out of 150, 106 samples were of pre-menopausal women and 44 samples were of post-menopausal women. The resected samples, after being collected were handled with greatest care and precautions. Samples were processed in Histology section of the Department of Anatomy, IGIMS, Patna. The slide was studied under the compound microscope.

An attempt made to elucidate and show the histological patterns to reassess the histological features of the uterine tube, removed during various surgeries like, hysterectomy with B/L salpingo-oophorectomy, tubal ligation and U/L salpingo-oophorectomy.

Since fallopian tubes are seldom the site of primary disease, most of the fallopian tube's specimens were received as a part of the standard surgical protocols with the primary pathologies lying elsewhere in the female genital tract. The specimens have been collected either as salpingectomies, as a part of pan hysterectomy operation, sterilization procedures (tubal ligation), or from the surgeries for the removal of tubo-ovarian masses, from the department of obstetrics and gynaecology and from the department of pathology, IGIMS, Patna.

3.4. Statistical analysis

Data collected from this study as presented in tabular form. Statistical analysis was done using Microsoft Excel Software.

4. Results

Table 1: Showing age distribution of cases

Age Group in Years	No. of Patients	Percentage
15 to 20	2	1.3%
21 to 25	17	11.3%
26 to 30	39	26%
31 to 35	31	20.6%
36 to 40	17	11.3%
41 to 45	13	8.6%
46 to 50	12	8%
50 to 55	09	6%
56 to 60	03	2%
61 to 65	07	4.6%
Total	150	100.00

Table 2: Showing categories of operations from which the sample has been taken

Category of Operation	No. of Cases	Percentage
Hysterectomy with B/L Salpingo-oophorectomy	65	43.3%
U/L Salpingo-oophorectomy	11	7.3%
Tubal Ligation	09	06%
Tubal ligation with caesarean section	65	43.3%
Total	150	100

5. Discussion

In Table 1, indicates clustering of cases in the age group of 26 to 30 years (26%) and 31 to 35 years (20.06%). This signifies the women in reproductive age group and also completed their family and desire some sort of contraception, which in these cases is mostly tubal ligation.

Table 3: Showing stages of menstruation among pre-menopausal women

Stage of menstrual cycle	No. of Patients	Percentage
Interval phase	23	21.70%
Pre-menstrual phase	6	5.66%
Menstrual phase	0	0%
Post-menstrual phase	10	9.43%
During pregnancy	67	63.20%
Total	106	100%

Table 4: Showing history of IUCD

Category of Patients	Past history of IUCD use	Present history of IUCD use
Pre-menopausal	4	7
Post-menopausal	6	0

Table 5: Showing past history of oral contraceptive use

Category of Patients	Past history of OCP use	Present history of OCP use
Pre-menopausal	2	5
Post-menopausal	2	0

Age group 40 years and onwards, indicates menopausal women and had mostly complaint of dysfunctional uterine bleeding which had the manifestation of many underlying gynaecological disorders.

Table 2 showed samples had been received by hysterectomy with B/L Salpingo-oophorectomy (43.3%), B/L tube ligation with caesarean section (43.3%), U/L Salpingo-oophorectomy (7.3%), B/L tube ligation (6%). In most of these cases the fallopian tubes were normal, as they were not the primary sites of pathology and were removed as part of the standard surgical protocol.

Table 3 showed that in pre-menopausal patients most of the samples were obtained during pregnancy (63.02%) because caesarean section with or without tube ligation was very common. Followed to interval phase (21.70%) of menstrual cycle because it was the most preferred stage of the cycle when any gynaecological surgery is planned.

Table 4 showed 11 Premenopausal women while 6 post-menopausal women gave the history of I.U.C.D use during their reproductive years. Although past history of I.U.C.D use does not affect the study of post-menopausal women's fallopian tube samples much, but its role does hold importance when it comes to the study fallopian tube samples of premenopausal women. The mechanism of contraception is by inducing an inflammatory reaction in the upper genital tract of the women. Presence of I.U.C.D not only changes the microenvironment of the uterine cavity but also that of the fallopian tubes, along with its effect on tubal motility. It also acts as risk factor for PID, inducing various pathological changes in the normal histology of the tubes.

Table 5 showed patients with past history of oral contraceptives and those with present history of its use in both young and old women.

On histological examination, it was found that the isthmic part of tube, the muscular wall was thick and well developed in most of the cases and had three layers of longitudinal and circular smooth muscles in its wall. This finding was in accordance with the findings of Lisa et al. (1954)³ and Ham & Cormack (1974).⁴

Sweeny et al. (1962),⁵ stated that in the intramural part an additional internal longitudinal layer of smooth muscle observation could not be found in any of the specimen, same as in the present work.

Many authors such as Verhage et al. (1979),⁶ Ham & Cormack (1979),⁴ Navak (1979),⁷ had stated that the muscularis gradually becomes thinner and thinner as we trace the muscle coat from interstitial to the fimbriated end of the tubed. This finding was confirmed in the present work.

The musculature was thickest in the intramural part while it is thinnest in the infundibular part. In the ampullary and the infundibular part of the uterine tube, there was considerable intermingling of the muscle fibres. The ampulla consists of two layers, one longitudinal and one circular, while the infundibular part is the thinnest with only single layer of longitudinal muscle fibres. These finding were consistent with William & Warwick (1980),⁸ Romanes (1979)⁹ and Ham & Cormack (1979).⁴

Circular muscle fibres were distinctly seen in the intramural or interstitial part and there was no obvious degree of intermingling among smooth muscle fibres. A sphincter at the abdominal ostium of the tube had been described by White Law (1953) and Woodruff & Pauerstein (1979)¹⁰ in their experimental study, but it was not histologically evident in present work.

In the isthmus, the arrangement of muscle fibres showed a clear inner circular and an outer longitudinal layer, with circular fibres outnumbering the longitudinal fibres. Circular fibres were more numerous in both intramural and isthmic parts with an additional internal longitudinal muscle coat, which was seen to be limited to these two parts only. On the other hand, the arrangement of the inner circular and outer longitudinal layer was not as clear in the ampulla, moreover, the circular and the longitudinal fibres were found to be practically equal in thickness. Ampulla also showed some intermingling of the muscle fibres.

According to Jennifer and Amy (2002)¹¹ fibrosis of the tubal plicae was noticed. The degree of fibrosis increased proportionately with patient age, with mild to moderate fibrosis occurring at an average age of 28 years and severe fibrosis at an average age of 42 years.

The epithelium of the uterine tube has been described a columnar and ciliated by many authors and investigators like Ham & Cormack (1979),⁴ William & Warwick (1980),⁸ Romanes (1987).⁹

There are secretory or “peg” cells in between the columnar ciliated cells, which have also been mentioned by the afore mentioned authors. The peg cells are non-ciliated. The height of the epithelium and the proportion of ciliated to non-ciliated secretory cells vary considerably in different parts of the tube (Kelly, Wood and Enders (1984).¹² These two types of cells undergo changes according to the phases of the menstrual cycle under the effects of oestrogen and progesterone.

Jennifer and Amy (2002)¹¹ seen that Cytological atypia of the epithelial cells was noted. Cytological atypia and epithelial tufting were associated with each other and together were more common in an older population.

Whitefield (1980)¹³ has also advocated that during pregnancy uterine tubes become hyperaemic and congested. On microscopic examination, the surface of the epithelium irregular due to minute projections of the cytoplasmic processes of the non-ciliated cells. Ham, A.W (1979)⁴ has also expressed similar findings in the tubal epithelium, making the surface appear somewhat irregular by the protrusion of the secretory cells.

With dark stained nucleus, a few clear cells remain scattered in the epithelial membrane close to the basement membrane, studied by A.W Ham (1979),⁴ William & Warwick (1980).⁸ Similar cells close to the basement membrane have also been encountered in the present work. It is quite possible that these are young secretory cells, giving rise to mature peg cells at a later date.

Another type of cell, called as intercalary cells have also been mentioned in the literature (Pauerstein & Woodruff (1979).¹⁰ They considered that these cells may be the precursors of the secretory cells or exhausted remnants of them. Such intercalary cells have not been encountered in the present study.

Although Ferenczy A, Richart RM (1974)¹⁴ have found the ciliated cells in humans to be apparently randomly and equally distributed throughout the isthmic, ampullary, and fimbriated portions.

Patek E, Nilsson L, Johannisson E (1972)¹⁵ have found ciliated cells numerous and preferentially located at the apical portions of the plicae, especially in the fimbriae and ampulla. Ciliated cells in the isthmus are less frequent and occur in short strands. Ciliated cells are even scantier in the intramural tubal segment.

5.1. Blood vessels in the muscle coat

In the present work, interstitial and the isthmic parts showed maximum number of blood vessels as compared to moderate number of vessels seen in the region of ampulla and infundibulum. The blood vessels were less in number in some specimens.

Lymphocytes and plasma cells were found surrounding blood vessels in the muscular coat the tube and had been found both in the pregnant tubes as well as the non-pregnant

tubes. This finding was supported by many workers like Hellman (1979) and Khorsed (1966), who found it in 30 to 40% of the tubes.

In this study round cell infiltration was found in a very few numbers of cases. Many spindle shaped cells resembling smooth muscle were found abundantly in the isthmus region.

5.2. Mucosal layer

Mucosal layer lining the lumen of the fallopian tube was thrown into multiple and series of folds called “plicae” and consists of a lining epithelium and an underlying connective tissue layer, the lamina propria, consisting of blood vessels. These plica displays secondary and tertiary projections. This finding was in accordance with the findings of Novak (1979),⁷ Ham and Cormack (1979),⁴ William and Warwick (1980),⁸ Romanes (1987),⁹ Kelley, Wood and Enders (1984),¹² Whitefield (1980),¹³ Leeson and Leeson (1976).¹⁶

The plica was quite few in the isthmus region. They were abundantly found in the ampullary region and moderate in the lateral end of the tube.

The mucosal layer with its characteristics called plicae were abundant in ampulla and infundibulum of the premenopausal women while plicae were thin atrophied and lamina propria was fibrosed in postmenopausal women.

The lining epithelium of the tubal mucosa is of simple columnar variety. Both ciliated and non-ciliated types of columnar epithelium were found lining the tube. Ciliated columnar epithelium is most abundant in the ampulla, where ciliary beating aids in propulsion of ovum towards the uterus and preventing its entry into the pelvic cavity. Non-ciliated columnar epithelium is most abundant in the isthmus region and it mainly consists of secretory cells responsible for producing tubular fluid under the effect of oestrogen and progesterone. Progesterone plays role in increasing the number of these cells while oestrogen is responsible for increasing the number, height and the secretory activity of these cells.

In the interval phase, the epithelium was uniformly tall, the ciliated cells were broad and non-ciliated secretory cells were narrow in the premenstrual stage, attenuated cells were lower. The secretory cells showed a fundus herniation into the lumen of the tube. During pregnancy the epithelium were columnar and even pseudo stratified.

In majority of the post-menopausal cases, the epithelial cells were cubical or, cubo-columnar throughout and local complexity was diminished in patents using IUCD.

6. Conclusions

This study concluded that the histology of fallopian tube was normal and the results were consistent with previous

similar studies. Histological examination of fallopian tube was normal despite of any past history of IUCD or OCP use. Normal histological pattern of specimens was observed and it was according to the different phases or cyclical changes of menstrual cycle in pre-menopausal women.

7. Source of Funding

Self.

8. Conflict of Interest

None.

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Author biography

Javed Alam Junior Resident

Md Jawed Akhtar Assistant Professor

Binod Kumar Additional Professor

Rajiv Ranjan Sinha Additional Professor

Avanish Kumar Professor and Head

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