



Laparoscopic Assessment of the Tubo Ovarian Relationship in Unexplained Infertility

**Islam Mohammed Abdel Gawad Hadwa ^{a*}, Manal Abdel Raof Farahat ^a,
Abd Elghaffar Saeed Dawood ^a and Lamiaa Mohammed Al Ahwal ^a**

^a *Department of Obstetrics and Gynecology, Faculty of Medicine, Tanta University, Tanta, Egypt.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2022/v34i331276

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/80359>

Original Research Article

Received 12 December 2021
Accepted 09 February 2022
Published 08 March 2022

ABSTRACT

Background: Unexplained infertility is usually a diagnosis of exclusion. Thus, there must be an absence of an identifiable cause of infertility despite thorough testing and medical investigation demonstrating tubal patency, normal semen parameters, regular ovulation, normal ovarian reserve, and a normal endometrial cavity.

Aim: This study aims to assess the prevalence of abnormal tubo-ovarian relationship in women with unexplained infertility by using laparoscopy.

Methodology: This was a prospective study which was conducted on 30 couples with unexplained infertility. Evaluation of the tubo ovarian relation with laparoscopy for patient with unexplained infertility who desire spontaneous pregnancy. The main object of the corrective procedure is to get free mobile fallopian tube along with satisfactory tubo-ovaian relation.

Results: There were 53.3% of cases had disturbed tubo-ovarian relation, many corrective measures done by laparoscopy, such as adhesiolysis for 30% of cases, excision of cysts for 6.7% of cases, MSH for 16.6% of cases and cauterization of endometriotic patches for 16.6% of cases. In the present study a pregnancy rate of 53,3% (9/16) was seen in cases that showed disturbed tubo ovarian relation and required operative intervention higher than other cases with no detected pathology (4/14) 47.7%. We were able to achieve a higher conception rate among cases owing to operative procedure.

Conclusions: The ovum pick up by the fimbrial end of the tube is an essential determining factor for female infertility. The present study confirmed that laparoscopy provided a precise diagnosis of tubo ovarian factor and may switch the initial treatment of unexplained infertility.

Keywords: Laparoscopic assessment; Tubo ovarian relationship; unexplained infertility; adhesiolysis.

1. INTRODUCTION

Infertility is one of the most frequent medical issues that affects adults of reproductive age. Although the estimated frequency is between 10% and 15%, due to the social stigma associated with this diagnosis, the true prevalence is likely higher. Between 15% and 37% of couples experiencing infertility have infertility with no known etiology, according to studies [1]. Unexplained infertility is described as a couple's failure to conceive without a definitive explanation after 12 months of trying, or 6 months in females over 35 years old [2].

Diagnostic laparoscopy is the last stage in figuring out what's causing your infertility, and it's also a common treatment for detecting infertility [3]. Some surgeons believe that a single adhesive band is more likely than a series of adhesive connections to create clinical blockage [4]. Procedures that reduce the amount of adhesions without eradicating all of them may actually increase the risk of blockage. Adhesion lysis that is incomplete is common, especially in individuals with large, matted adhesions [5]. Subfertility may be caused by pelvic adhesions caused by pelvic infections, endometriosis, or previous surgery [6]. Even if HSG is normal, pelvic adhesions can cause tubal dysfunction. Peri adnexal adhesions, which encase the sperm, may be the only cause of infertility.

The patent tube's fimbriae prevent the oocyte from being caught by normally functioning fimbria. Furthermore, periovarian adhesions may interfere with follicular growth [7].

As a result, diagnostic laparoscopy is critical in selecting the best management strategy. After checking out other possible etiologies, consider adhesiolysis for any patient who has had chronic pelvic pain for more than 6 months or infertility for more than a year. Adhesions are more common in patients with localized pelvic discomfort than in those with broad symptoms. Adhesions can, however, be seen in women with generalized discomfort. Although adhesiolysis cannot always be blamed for the discomfort, it does frequently result in a reduction in symptoms

[8]. The study's goal is to use laparoscopy to determine the incidence of aberrant tubo-ovarian relationships in women with unexplained infertility.

2. PATIENTS AND METHODS

This was a prospective study which was conducted at the department of obstetrics and gynecology of Tanta University on 30 couples with unexplained infertility after approval from local ethical committee informed consent was taken from all participants. They were enrolled in this study from January 2019 till August 2020. The inclusion criteria were Patients with infertility duration more than 2 years with regular cycles, patients aged 25 _35 years and body mass index 20 up to 24 Kg/m², normal hysterosalpingography and normal semen analysis. The Exclusion criteria were patients with history of abdominal surgery or chronic systemic diseases, Ultrasonography suggestive of fibroid, adenomyosis, chocolate cyst, or tubo-ovarian mass, hormonal abnormalities known to cause anovulation such as, hyperprolactinemia, and polycystic ovarian syndrome, couples with abnormal semen analysis and presence of intrauterine abnormalities.

Before coming to the hospital for the laparoscopy, follow these instructions: After midnight the day before your procedure, do not eat, drink (even water), or smoke. - On the day of surgery, wear low-heeled shoes. Because of the anesthesia, she may feel groggy and unsteady on her feet. - Avoid wearing jewelry. (Wedding rings are permitted.) - Dress in loose-fitting garments. After surgery, she would have stomach soreness and cramping. Remove any nail polish before surgery.

In situations of infertility and pelvic pain, endoscopic procedures such as laparoscopy are often utilized to evaluate the abdomen and pelvic organs. Laparoscopy is a diagnostic and therapeutic procedure for pelvic and abdominal disorders performed in the same sitting [9].

Under general anesthesia during proliferative phase of the menstrual cycle to exclude current

pregnancy and to minimize bleeding at operative laparoscopy according to American Fertility Society classification [10]. Several 0.5-1cm incisions are used in laparoscopic surgery. Each incision serves as a conduit into which a trocar is placed. During the process, a unique camera was passed through the trocars. The abdomen is inflated with carbon dioxide gas to provide a working and viewing space for the surgeon at the start of the procedure. Her head was lower than her feet, and the case was slightly slanted. Images from the abdominal cavity were sent to high-resolution video displays in the operating room via the laparoscope. On the monitor throughout the operation, the surgeon could see comprehensive images of the abdomen. The surgeon was able to do the same operations as traditional surgery but with smaller incisions thanks to this technique. During a laparoscopic procedure. The fimbrio-ovarian relationship was evaluated in all cases by measuring the length of the ovary.

The prevalence of disturbed tubo-ovarian relationship was evaluated. If there were any relationship abnormalities liable for correction they were treated. The abnormalities noted at laparoscopy and their incidence in our present study were as follows:

1. Tubal kinks due to serosa-to-serosa adhesion (13.3%).
2. Peri tubal adhesions causing problem in tubal mobility and adhesions in the pouch of Douglas (POD) causing hindrance to reservoir function and egg pickup (16.6%).
3. Pedunculated fimbrial cysts, which can block the fimbrial opening of respective fallopian tube like a ball valve causing temporary tubal block (6.7%).
4. ovary adherent to lateral pelvic wall (3.3%).

Squeezing, manipulation, and hydrotubation (SMH) approach was used to repair tubal kinks caused by serosa to serosal adhesion, which resulted in a shortening of the effective tubal length. Forceps blades are used to milk the tubal walls without injuring them. The forceps release the tubal kinks by breaking the serosa to serosal adhesions. From the cornu to the fimbriae, tubes were milked. As a result, any muck that had built up inside the tube was flushed out. The tubes were returned to their original length. The remains were washed out using dye hydrotubation. Multiple instruments were needed to stretch the tube or the ovary on one side and adhering structures on the other side of peritubal

adhesions and ovarian adhesions to the lateral pelvic wall. The adhesion bands, often known as adhesion bands, are a type of it.

Pedunculated fimbrial cysts were mentioned in particular. Because the tubes were always patent, it was impossible to diagnose them using standard tubal patency tests. The tubal wall's circular and longitudinal muscles alternated contractions caused a negative pressure inside the fallopian tube, sucking the oocyte and follicular fluid towards the abdominal ostium. The pedunculated fimbrial cyst, which normally floats in follicular fluid, may be dragged to the abdominal ostium of the fallopian tube and temporarily obstruct that tubal orifice, preventing egg pickup. Diathermy or scissors were used to easily remove tubal cysts.

The reliance on laparoscopy for endometriosis diagnosis supports the viewpoint that the presence of identifiable lesions in the pelvis is the most important diagnostic method for endometriosis, rather than approaching endometriosis as a menstrual cycle-dependent, chronic, inflammatory, systemic disease that frequently manifests as pelvic pain. Various laparoscopic surgeries for endometriosis include adhesiolysis, excision/ablation of endometriotic implants. In most cases, the cases went home not long after laparoscopy. The cases were waiting until the anesthesia has worn off and the healthcare provider has made the case was not experiencing any side effects from the procedure.

Follow up for six successive months for the occurrence of pregnancy was done.

2.1 Statistical Analysis

Using SPSS software, the acquired data was organized, tabulated, and statistically analyzed (Statistical Package for the Social Sciences, version 19, SPSS Inc. Chicago, IL, USA). The range, mean, and standard deviation were determined for quantitative data. The Chi-square test was used to compare two groups and more for qualitative data, which describes a categorical set of data by frequency, percentage, or proportion of each category (χ^2). The student t-test was used to compare the means of two groups of parametric data from independent samples. For the purposes of interpreting the findings of tests of significance, the significance level was set at $p < 0.05$ [11].

3. RESULTS

Age years and body mass index (BMI) among the studied females are shown in Table 1.

Infertility history of the studied 30 females with unexplained infertility Table 2.

Laparoscopic findings of the studied 30 females with unexplained infertility.

Laparoscopic management and occurrence of pregnancy of the studied 30 females with unexplained infertility Table 4.

Occurrence of pregnancy in relation to infertility type, symptoms and duration of infertility among the studied 30 females with unexplained infertility Table 5.

Occurrence of pregnancy in relation to laparoscopic findings and management among the studied 30 females with unexplained infertility Table 6.

Laparoscopic findings of tubo-ovarian relationship in relation to age BMI and obstetric history of the studied of the studied 30 females with unexplained infertility Table 7.

Table 1. Age years, BMI and Obstetric history among the studied 30 females with unexplained infertility

Variables	The studied females with unexplained infertility (n=30)	
	N	%
Age years:		
<30	19	63.3
≥30	11	36.7
Range	22-38	
Mean±SD	27.07±4.08	
Median	26.00	
BMI:		
Range	20.19-23.00	
Mean±SD	21.90±1.00	
Median	21.96	
Gravidity:		
G0	16	53.3
G1	4	13.3
G2	7	23.3
G3	2	6.7
G4	1	3.3
Parity:		
P0	18	60.0
P1	9	30.0
P2	3	10.0
Abortion:		
No abortion	22	73.3
A1	6	20.0
A2	1	3.3
A3	1	3.3
Living birth:		
No	18	60.0
L1	11	36.7
L2	1	3.3
Ectopic pregnancy:		
No	29	96.7
E1	1	3.3

Table 2. Infertility history of the studied 30 females with unexplained infertility

Variables	The studied females with unexplained infertility (n=30)	
	N	%
Infertility type:		
Primary	16	53.3
Secondary	14	46.7
Infertility duration (years):		
Range	2.20-4.40	
Mean±SD	3.19±0.68	
Median	3.05	
Infertility symptoms:		
Asymptomatic	14	46.7
Chronic pelvic pain	4	13.3
Dysmenorrhea	3	10.0
Dysmenorrhea & chronic pelvic pain	2	6.7
Dyspareunia	6	20.0
Dyspareunia & dysmenorrhea	1	3.3

Table 3. Laparoscopic findings of the studied 30 females with unexplained infertility

Variables	The studied females with unexplained infertility (n=30)	
	N	%
Laparoscopic finding:		
Detected pathology	17	56.7
Normal	13	43.3
Endometriosis:		
Mild	7	23.3
Minimal	6	20.0
No	17	56.7
Tubo-ovarian relationship:		
Disturbed	16	53.3
Normal	14	46.7
Tubo-ovarian pathology:		
-None	14	46.7
-Ovarian adhesion to lateral pelvic wall	1	3.3
-Pedunculated fimbrial cyst	2	6.7
-Periovarian adhesion	3	10.0
-Peri tubal adhesion	4	13.3
-Peri tubal adhesion+ everted fimbriae	1	3.3
-Terminal tubal block	1	3.3
-Tubal kink	4	13.3

Table 4. Laparoscopic management and occurrence of pregnancy of the studied 30 females with unexplained infertility

Variables	The studied females with unexplained infertility (n=30)	
	N	%
Laparoscopic management:		
-Adhesiolysis & Cauterization of patches	2	6.7
-Cauterization of patches	1	3.3
-Excised diathermy of tubal cyst	2	6.7
-Hydrotubation, squeezing, milking & patches cauterization	1	3.3

Variables	The studied females with unexplained infertility (n=30)	
	N	%
-Laparoscopic adhesiolysis	7	23.3
-None	13	43.3
-Squeezing, manipulation, hydrotubation, adhesiolysis & patches cauterization	1	3.3
-Squeezing, manipulation, hydrotubation & adhesiolysis	3	10.0
Pregnancy occurrence:		
+ve	13	43.3
-ve	17	56.7

Table 5. Occurrence of pregnancy in relation to infertility type, symptoms and duration of infertility among the studied 30 females with unexplained infertility

Variables	Occurrence of pregnancy among the studied females with unexplained infertility (n=30)						χ^2 P
	Positive		Negative		Total (n=30)		
	n	%	n	%	N	%	
Infertility type:							
Primary	7	43.8	9	56.3	16	53.3	0.002
Secondary	6	42.9	8	57.1	14	46.7	0.961
Infertility symptoms:							
-Asymptomatic	6	42.9	8	57.1	14	46.7	1.105
-Chronic pelvic pain	2	50.0	2	50.0	4	13.3	0.954
-Dysmenorrhea	1	33.3	2	66.7	3	10.0	
-Dysmenorrhea & chronic pelvic pain	1	50.0	1	50.0	2	6.7	
-Dyspareunia	3	50.0	3	50.0	6	20.0	
-Dyspareunia & dysmenorrhea	0	0	1	100	1	3.3	
Variables	Occurrence of pregnancy among the studied females with unexplained infertility (n=30)						χ^2 P
	Positive		Negative		Total (n=30)		
♦Duration of infertility (years):							
Range	2.20-4.40		2.30-4.20		2.20-4.40		1.458
Mean±SD	3.34±0.61		2.98±0.72		3.19±0.68		0.156

Table 6. Occurrence of pregnancy in relation to laparoscopic findings and management among the studied 30 females with unexplained infertility

Variables	Occurrence of pregnancy among the studied the studied females with unexplained infertility (n=30)						χ^2 P
	Negative		Positive		Total (n=30)		
	N	%	n	%	n	%	
Laparoscopic finding:							
Detected pathology	8	47.1	9	52.9	17	56.7	1.475
Normal	9	69.2	4	30.8	13	43.3	0.225
Endometriosis:							
Mild	4	57.1	3	42.9	7	23.3	0.341
Minimal	4	66.7	2	33.3	6	20.0	0.843
No	9	52.9	8	47.1	17	56.7	
Tubo-ovarian relationship:							
Disturbed	7	43.8	9	56.3	16	53.3	2.330
Normal	10	71.4	4	28.6	14	46.7	0.127
Tubo-ovarian pathology:							
-None	10	71.4	4	28.6	14	46.7	6.487

Variables	Occurrence of pregnancy among the studied the studied females with unexplained infertility (n=30)						χ^2 P	
	Negative		Positive		Total (n=30)			
	N	%	n	%	n	%		
-Ovarian adhesion to lateral pelvic wall	0	0	1	100	1	3.3	0.484	
-Pedunculated fimbrial cyst	1	50.0	1	50.0	2	6.7		
-Periovarian adhesion	2	66.7	1	33.3	3	10.0		
-Peritubal adhesion	2	50.0	2	50.0	4	13.3		
-Peritubal adhesion+everted fimbriae	0	0	1	100	1	3.3		
-Terminal tubal block	1	100	0	0	1	3.3		
-Tubal kink	1	25.0	3	75.0	4	13.3		
Laparoscopic management:								7.669 0.363
-Adhesiolysis & Cauterization of patches	1	50.0	1	50.0	2	6.7		
-Cauterization of patches	1	100	0	0	1	3.3		
-Excised diathermy	1	50.0	1	50.0	2	6.7		
-Hydrotubation, squeezing, milking & patches cauterization	1	100	0	0	1	3.3		
-Laparoscopic adhesiolysis	3	42.9	4	57.1	7	23.3		
-None	9	69.2	4	30.0	13	43.3		
-Squeezing, manipulation, hydrotubation, adhesiolysis & patches cauterization	1	100	0	0	1	3.3		
-Squeezing, manipulation, hydrotubation & adhesiolysis	0	0	3	100	3	10.0		

Table 7. Laparoscopic findings of tubo-ovarian relationship in relation to age BMI and obstetric history of the studied of the studied 30 females with unexplained infertility

Variables	Laparoscopic finding of tubo-ovarian relationship among the studied the studied females with unexplained infertility (n=30)						χ^2 P
	Disturbed		Normal		Total (n=30)		
	n	%	n	%	n	%	
Age years:							
<30	11	57.9	8	42.1	19	63.3	0.433
≥30	5	45.5	6	54.5	11	36.7	0.510
Range	22-34		22-38				
Mean±SD	28.71±4.70		27.50±3.50				
t-test	0.809						
P	0.425						
BMI:							
Range	20.19-23.12		20.31-23.29				
Mean±SD	21.99±1.02		21.82±1.00				
t-test	0.475						
P	0.638						
Gravidity:							
No gravida	10	62.5	6	37.5	16	53.3	6.180
G1	1	25.0	3	75.0	4	13.3	0.186
G2	2	28.6	5	71.4	7	23.3	
G3	2	100	0	0	2	6.7	
G4	1	100	0	0	1	3.3	
Parity:							
No parity	11	61.1	7	38.9	18	60.0	1.205
P1	4	44.4	5	55.6	9	30.0	0.547
P2	1	33.3	2	66.7	3	10.0	

Variables	Laparoscopic finding of tubo-ovarian relationship among the studied the studied females with unexplained infertility (n=30)						χ^2 P
	Disturbed		Normal		Total (n=30)		
	n	%	n	%	n	%	
Abortion:							
No abortion	12	54.5	10	45.5	22	73.3	2.058
A1	3	50.0	3	50.0	6	20.0	0.561
A2	0	0	1	100	1	3.3	
A3	1	100	0	0	1	3.3	
Ectopic pregnancy:							
No	15	51.7	14	48.3	29	96.7	0.905
E1	1	100	0	0	1	3.3	0.341

Table 8. Laparoscopic findings of tubo-ovarian relationship in relation to obstetric history and symptoms of the studied 30 females with unexplained infertility

Variables	Laparoscopic finding of tubo-ovarian relationship among the studied the studied females with unexplained infertility (n=30)						χ^2 P
	Disturbed (n=16)		Normal (n=14)		Total (n=30)		
	n	%	n	%	n	%	
♦Infertility type:							
Primary	10	62.5	6	42.9	16	53.3	1.158
Secondary	6	37.5	8	57.1	14	46.7	0.282
♦Infertility duration (years):							
Range	2.30-4.40		2.20-4.30		2.20-4.40		
Mean±SD	3.31±7.40		3.07±0.62		3.19±0.68		
t-test	0.965						
P	0.343						
♦Infertility symptoms:							
-Asymptomatic	4	25.0	10	71.4	14	46.7	11.824
-Chronic pelvic pain	2	12.5	2	14.3	4	13.3	0.037*
-Dysmenorrhea	2	12.5	1	7.1	3	10.0	
-Dysmenorrhea & chronic pelvic pain	2	12.5	0	0	2	6.7	
-Dyspareunia	6	37.5	0	0	6	20.0	
-Dyspareunia & dysmenorrhea	0	0	1	7.1	1	3.3	

Table 9. Laparoscopic findings of tubo-ovarian relationship in relation to laparoscopic findings and endometriosis of the studied 30 females with unexplained infertility

Variables	Laparoscopic finding of tubo-ovarian relationship among the studied the studied females with unexplained infertility (n=30)						χ^2 P
	Disturbed (n=16)		Normal (n=14)		Total (n=30)		
	n	%	n	%	n	%	
♦Laparoscopic finding:							
Detected pathology	16	100	1	7.1	17	56.7	26.218
Normal	0	0	13	100	13	43.3	0.0001*
♦Endometriosis:							
Mild	7	43.8	0	0	7	23.3	14.362
Minimal	5	31.3	1	7.1	6	20.0	0.001*
No	4	25.0	13	92.9	17	56.7	

Laparoscopic findings of tubo-ovarian relationship in relation to obstetric history and symptoms of the studied 30 females with unexplained infertility Table 8.

Laparoscopic findings of tubo-ovarian relationship in relation to laparoscopic findings and endometriosis of the studied 30 females with unexplained infertility Table 9.

4. DISCUSSION

Unexplained infertility is a taxing diagnosis for both the patient and the clinician, The treatment is empirical and depend on the availability of resources [12].

In cases of unexplained infertility, laparoscopic surgery provides diagnostic findings that are helpful in the overall management of the cases and enable some patients to become pregnant without the physical, psychological, and financial burden associated with ART. In cases treated with laparoscopic surgery prior to ICSI, the chance of success is not affected but even increased by repositioning the ovary correcting tubo-ovarian relationship [13].

The fallopian tube serves a number of purposes in achieving pregnancy: it must be patent with an intact endosalpinx, it must be long enough to reach the pelvic floor, it must be mobile to reach the released egg and create a negative pressure within itself, and the fimbria must be normal and free to direct the egg toward the tubal ostium [14].

Tubal kinks and, as a result, a shortening of the effective tubal length can occur as a result of chemical inflammation caused by endometriotic blood in the pelvis, where the tubes float after menstruation. This proinflammatory state can promote adhesive disease, which leads to infertility, even in minor or mild endometriosis [15].

The effective length of the fallopian tubes is shortened as a result of tubal kinks. As a result, tubal fimbriae do not reach the pelvic floor and so do not pick up eggs. In cases of secondary infertility, tubal abnormalities can occur as a result of post-abortive or puerperal infections [16].

Fimbrial pathology is a type of tubal abnormality that can result from moderate or minor endometriosis or another mild form of pelvic infection [17].

Endometriosis is the most common cause of minor tubal abnormalities.

In cases of infertility and pelvic pain, laparoscopy is routinely performed to examine the abdomen and pelvic organs. Laparoscopy is a diagnostic and therapeutic procedure for pelvic and abdominal disorders performed in the same sitting [18].

The fimbrio-ovarian relationship was examined in all patients during laparoscopy by measuring the length of the free ovarian border between the ovarian ligament and the fimbria ovarica, which includes the corpus luteum (the ovulation border). Non-traumatizing graspers were used to hold the fimbriae, and their capacity to reach the ovulation site was used as proof of effective ovum collection.

The prevalence of disturbed tubo-ovarian relationship was evaluated.

If there are any relationship abnormalities liable for correction, they were management.

Squeezing, manipulation, and hydrotubation (SMH) approach was used to repair tubal kinks caused by serosa to serosal adhesion, which resulted in a shortening of the effective tubal length. The forceps release the tubal kinks by breaking the serosa to serosal adhesions. From the cornu to the fimbriae, tubes were milked. As a result, any muck that had built up inside the tube was flushed out. The tubes were returned to their original length. The remnants were washed out with dye hydrotubation, and the tubes were opened when a free spill occurred.

Peritubal adhesions and ovarian adhesions to the lateral pelvic wall were then removed using a palpating rod or endoscopic scissors, restoring the normal tubo-ovarian relationship.

Diathermy or scissors were used to easily remove pedunculated fimbrial cysts.

Detected endometriosis via laparoscopy managed by excision/ablation of endometriotic implants.

Laparoscopy is the best diagnostic procedure of female infertility as out lined by the WHO guideline [18].

In the present study, we tried to evaluate the tubo-ovarian relation by laparoscopy so that

diagnosis and management of conditions with disturbed tubo-ovarian relation in unexplained infertility have been done.

In the current study, evidence of pelvic pathology was detected in (17/30) 56.6% of patients, while normal pelvis was found in (13/30) 43.3% of cases.

The most common pathology was pelvic endometriosis, which accounted for 43.3% of all pelvic illness. From 30 patients we detected minimal and mild endometriosis by 20% and 23%, respectively totally (13/30) 43.3% of cases. These results were approximately similar to those quoted from Gad et al. [19], Pantou et al. [20] and Kansouh et al. [21].

Gad et al. [22] reported that laparoscopic diagnosis of endometriosis was reported in 33 (33%) patients with unexplained infertility and chronic pelvic pain.

Pantou et al. [20] study revealed 30 out of the 62 (48.38%) women with unexplained infertility diagnosed with endometriosis following laparoscopic investigation.

Kansouh et al. [21] study On laparoscopy, 46% of cases had no apparent disease; 22 and 16% showed minor and mild endometriosis, respectively.

Where in a study done by Kemoto et al. [23]. In the laparoscopy group, endometriosis was found in 62.7% of patients with unexplained infertility. This discrepancy may be explained by that his study performed on large number of cases.

In the present study cases with pathologies disturbing the tubo-ovarian relation was (16/30) 54.3%.

These results were approximately similar to those quoted from Bhandari et al. [24]. Where from 198 patients with unexplained infertility included in the study, 103 (52%) had pathological findings at laparoscope.

In present study, these tubo ovarian pathology were Tubal kink (4/30) 13.3%.

Pedunculated fimbrial cyst (2/30) 6.7%.

Peritubal adhesion (5/30)16.6%.

Periovarian adhesion (3/30) 10.0%.

Ovarian adhesion to lateral pelvic wall (1/30) 3.3%.

These results were approximately similar to those quoted from Siddhartha et al. [25] who Laparoscopy was used to assess 1,726 patients who had previously been diagnosed with unexplained infertility. These patients ranged in age from 26 to 37 years old and had been infertile for 5 to 7 years. As laparoscopic finding were Tubal kinks (15%), Peritubal adhesions (4%), Pedunculated fimbrial cysts (6%).

Approximately, similar to a study conducted by Meena et al. [23] that showed incidence of Peritubal adhesion seen in 16.6% of cases.

And similar to a study conducted by De Cicco et al. [26] that in 21.7% of patients, we discovered pelvic adhesions; in 12% of instances, we discovered Fallopian tube involvement; and in the remaining 8.8% of cases, the ovaries were more engaged.

Also similar to the study of Pantou et al. [27] who showed (23.3%) were diagnosed with periadnexal and pelvic adhesions.

El Gharib et al. [28] study also reported that 30 cases of unexplained infertility underwent Laparoscopic examination revealed that pelvic and peritubal abnormalities were also found in 13.56% of cases with unexplained infertility.

The discovered abnormalities of our present study were (46.4%) higher than the findings of the study conducted by Kim GS et al. [23] Tubal sacculation, constriction, fibrosis, and kinking are all reported with segmentation. Due to different inclusion criteria, the previous study excluded patients with endometriosis signs or symptoms, but the current study did not.

Even Marcoux et al. [29], Kennedy et al. [30] and Tulandi et al. [31] those who oppose standard laparoscopy in the investigation of infertility should not rule out the possibility that laparoscopic adhesion lysis or pelvic endometriosis implants removal results in a higher fecundity rate.

As regard, the spontaneous pregnancy rate in the present study where 30 patients underwent laparoscopy the total pregnancy rate was (13/30) 43.3%. A pregnancy rate of (9/30)30% was seen in cases that showed disturbed tubo-ovarian relation and required operative intervention,

these spontaneous pregnancies achieved within the first 6 months.

In the present study a pregnancy rate of 53,3% (9/16) was seen in cases that showed disturbed tubo-ovarian relation and required operative intervention higher than other cases with no detected pathology (4/14) 47.7%.

The present study results are compared with a study results by Kansouh et al. [21] where laparoscopy was done in 250 patients with unexplained infertility. A pregnancy rate of (35.2%) 88 cases was seen in cases that required operative intervention.

As regard pregnancy result's, the present study was compared with a study by Tsuji et al. [32], where 57 infertile patients with normal HSG findings underwent diagnostic laparoscopy at Kinki University Hospital. Diagnostic laparoscopy revealed pathologic abnormalities. A pregnancy rate of 44.4% was seen in cases that required operative intervention.

The role of laparoscopy in the detection and treatment of minimal to mild and moderate endometriosis (47.6%), as well as the performance of adhesiolysis in the presence of severe peritubal adhesions, explains this increase in pregnancy rate.

Balash et al. [22] the difficulties in persuading a woman with a normal HSG to undergo an invasive surgery such as laparoscopy are highlighted in a debate piece evaluating the utility of traditional methods of infertility evaluation. He claims that clinicians are increasingly believing that ART is suitable even without laparoscopy, and that this shift in attitude toward laparoscopy symbolizes a shift in the examination and treatment of infertile couples from a "diagnostic work-up" to a "prognosis-oriented approach."

Pantou et al. [20], El-Gergawy et al. [33] observed that laparoscopy is a valuable tool that can yield substantial diagnostic results, allowing us to prevent IVF overuse in patients with unexplained infertility who have failed IVF efforts multiple times (110).

The tubo-ovarian relationship was carefully assessed, and remedial steps were performed. The fundamental goal of the treatments was to provide a freely mobile Fallopian tube with sufficient length and fimbrial function, as well as a satisfactory tubo-ovarian relationship.

5. RECOMMENDATIONS

Laparoscopy should be carried out to all women with unexplained infertility to look for any disturbance of tubo ovarian relation when all other examination has returned normal results.

Large scale studies are needed to confirm these results.

6. CONCLUSION

The ovum picked up by the tube's fimbrial end is a critical determinant of female infertility. The current investigation confirmed that laparoscopy gave a precise diagnosis of tubo-ovarian factor and that it may be used as a first-line treatment for infertility.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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