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Reproductive Outcomes after Diagnostic Laparoscopy in Primary Infertility

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ABSTRACT

Background: Primary infertility is an important issue in the area of reproductive health, causing physical, emotional, and social suffering to couples. Accurate diagnosis of pelvic pathology is important in improving fertility success. Diagnostic laparoscopy allows the inspection of pelvic structures and the potential correction of associated pathologies, which might improve the chances of both conception and maintaining pregnancy. **Objective:** To determine reproductive outcomes after diagnostic laparoscopy in women with primary infertility. **Study Design:** Cross sectional study. **Duration and Place of Study:** This study was conducted from September 2023 to December 2024 in the Department of Obstetrics and Gynaecology Lady Reading Hospital Peshawar. **Methodology:** A total of 115 women aged 25 to 40 years with primary infertility were included using consecutive sampling. Diagnostic laparoscopy was performed under standard operative conditions. Pelvic findings such as endometriosis, adhesions and ovarian pathology were identified and treated where required. Patients were followed for one year. Reproductive outcomes including positive pregnancy test, live birth and regular menstrual cycle were recorded. Chi square test was applied for stratification and a p value of ≤0.05 was considered significant. **Results:** The mean age of patients was 32.78 ± 4.50 years and mean duration of infertility was 5.12 ± 2.93 years. Positive pregnancy test was observed in 50.40% patients, live birth in 30.40%, and regular menstrual cycle in 85.20%. **Conclusion:** Diagnostic laparoscopy is an effective procedure for improving reproductive outcomes in women with primary infertility.

INTRODUCTION

Infertility is a common reproductive health concern that affects a large population of couples worldwide and is described as the inability to conceive after one year of unprotected sexual intercourse.[1] Primary infertility refers to women who never conceived in their lives. There are various causes associated with infertility which may include ovulation dysfunction, tubal damage, mullerian anomalies, endometriosis, and male factors.[2] Hormonal dysfunction, pelvic inflammatory disease and lifestyle factors are also important causes.[3] Infertility causes psychologic distress and an emotional toll on the involved couples, which often leads to a visit to the doctor.[4] Prompt diagnosis and treatment of the causes are important, as it often improves the chances of conception.

Diagnostic laparoscopy is considered a crucial instrument in the work-up of patients with primary infertility because it offers a direct visualization of the pelvic structures.[5] The procedure is beneficial for the identification of conditions such as tubal obstruction, pelvic adhesions, endometriosis and ovarian pathology which may not be possible using non-invasive techniques.[6] However it is worth stating that laparoscopy is a minimally invasive surgical procedure which is usually done under general anesthesia. The procedure is not only beneficial for the diagnosis of a particular condition but also for the performance of minor surgical therapies including the management of endometrioses.[7] Most physicians would agree that the procedure is beneficial for patients with idiopathic or longstanding infertility.

The outcome of reproduction after diagnostic laparoscopy remains a significant marker of its clinical relevance for patients with primary infertility. The positive pregnancy test remains a form of early outcome as most women experience natural or assisted reproduction after laparoscopy.[8] The live birth rate remains a significant outcome because it measures the success of the continuation of the pregnancy. There are improvements observed within the menstrual cycle among patients after the treatment of the underlying pelvic disease.[9] This procedure increases the potential for reproduction among patients through the restoration of normal anatomy of the pelvis and the reduction of the inflammatory disease.[10] However, the outcome of

reproduction remains influenced by age, the duration of the disease of infertility, and the severity of the disease. In a study by Mahtab NT, et al. has shown that frequency of positive pregnancy test was 40.3%, live birth 25.5% and regular menstrual cycle was 94.6% after diagnostic laparoscopy in primary infertility.[11]

There is limited local information with respect to reproductive results of diagnostic laparoscopy in patients with primary infertility. Although there is a large number of patients who have undergone laparoscopy, its definite effect on the rate of pregnancy and live birth has not been documented. The purpose of this study is to determine the effect of diagnostic laparoscopy on fertility in real life. The results of this study could serve as an indication to patients with primary infertility of the efficacy of laparoscopy.

METHODOLOGY

The study was carried out as a cross sectional design in the Department of Obstetrics and Gynaecology at Lady Reading Hospital Peshawar over a period starting from 01-09-2023 to 01-12-2024. Ethical permission for conducting the study was obtained from the institutional ethical review committee of the hospital vide reference number 888/LRH/MTI dated 17-08-2023 prior to initiation of the research work. A total sample size of 115 patients was included. The number of participants was estimated by using WHO sample size calculation software with confidence level kept at 95 and margin of error of 8, while expected frequency of live birth after diagnostic laparoscopy was taken as 25.5%.[11] Patients were enrolled through non-probability consecutive sampling technique. Women aged between 25 and 40 years, married, presenting with primary infertility and having husbands with normal semen parameters were included. Normal semen parameters meant sperm concentration ≥15000000/ml and total motility ≥40 on laboratory examination. Primary infertility was taken as failure to achieve pregnancy after 12 months or more of regular unprotected intercourse. Patients having history of pelvic surgery, pelvic infection or ovulatory dysfunction were excluded from the study. Written informed consent was taken from each patient before inclusion. Confidentiality was ensured and patients were informed about the procedure, risks and follow-up requirements.

Baseline demographic variables including age, weight and duration of infertility were recorded. Relevant clinical history was taken and general physical examination was performed. All patients underwent diagnostic laparoscopy under standard operative conditions. At the start of the procedure, urinary bladder was catheterized. A fine needle was introduced through the umbilicus and carbon dioxide gas was insufflated at a rate of 1 to 6 liter per minute, maintaining intra-abdominal pressure between 14 and 20 mmHg. Gas flow was continuously observed using flow meters. Two additional incisions of approximately 1 cm were made, one near the umbilicus and one at the bikini line for insertion of assisting instruments. Detailed inspection of uterus, fallopian tubes, ovaries and surrounding pelvic structures was carried out. Laparoscopic procedures were performed by consultant gynecologists having at least 3 years of post-fellowship experience and adequate expertise in laparoscopy. Pelvic findings such as endometriosis, Polycystic Ovaries (PCO) and adhesions were identified and managed accordingly during the same procedure where required. All patients were followed for a duration of 1 year after diagnostic laparoscopy. Reproduction outcomes were documented during follow-up visits and recorded by the researcher herself on the study proforma. Positive pregnancy test was considered when urine pregnancy test showed positive result using monoclonal and polyclonal immunoassay sensitive to 50 mIU/ml. Live birth was defined as delivery of a live baby. Regular menstrual cycle was considered when cycle length was between 21 and 35 days and menstrual flow lasted more than 2 days and less than 7 days.

Data were entered and analyzed using IBM SPSS version 26. Quantitative variables such as age, duration of infertility and weight were expressed as mean ± standard deviation. Qualitative variables including positive pregnancy test, live birth and regular menstrual cycle were presented as frequencies and percentages. Reproduction outcomes were stratified with respect to age, duration of infertility and weight. Post-stratification chi square test was applied and p value ≤0.05 was taken as statistically significant.

RESULTS

The patient demographics revealed that mean age of patients was 32.78 ± 4.50 years, while mean weight was recorded as 61.63 ± 8.81 kg, and the duration of infertility was found to be 5.12 ± 2.93 years (as shown in Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	32.78 ± 4.50
Weight (kg)	61.63 ± 8.81
Duration of Infertility (years)	5.12 ± 2.93

Regarding reproduction outcomes after diagnostic laparoscopy in primary infertility, it was observed that positive pregnancy test was achieved in 58 cases representing 50.40% of the study population, whereas live birth occurred in 35 patients which constitute 30.40% of cases. Regular menstrual cycle was reported in 98 patients accounting for 85.20% of the participants (as shown in Table-II).

Table II

Frequency of Reproduction Outcomes After Diagnostic Laparoscopy in Primary Infertility

Reproduction Outcomes	Frequency	% age
Positive Pregnancy Test	58	50.40%
Live Birth	35	30.40%
Regular Menstrual Cycle	98	85.20%

When demographic factors were analyzed in relation to reproduction outcomes, the association of age with positive pregnancy test showed that among patients aged ≤35 years, 41 patients (55.4%) had positive pregnancy test while 33 (44.6%) had negative results, whereas in patients aged >35 years, 17 cases (41.5%) showed positive pregnancy test and 24 (58.5%) were negative with p-value of 0.152. For weight categories, patients with weight ≤60 kg showed 30 cases (50.8%) with positive pregnancy test and 29 (49.2%) with negative results, while those with

weight >60 kg had 28 patients (50.0%) in each category with p-value of 0.928. Duration of infertility ≤5 years group demonstrated 32 cases (51.6%) with positive pregnancy test and 30 (48.4%) without, compared to >5 years group showing 26 (49.1%) positive and 27 (50.9%) negative results with p-value of 0.785. For live birth outcome, patients aged ≤35 years had 26 cases (35.1%) with live birth and 48 (64.9%) without live birth, while those aged >35 years showed 9 cases (22.0%) with live birth and 32 (78.0%) without, having p-value of 0.141. Weight ≤60 kg group had 20 patients (33.9%) achieving live birth and 39 (66.1%) not achieving it, whereas weight >60 kg group showed 15 cases (26.8%) with live birth and 41 (73.2%) without with p-value of 0.407. Regarding duration of infertility, ≤5 years group had 19 patients (30.6%) with live birth and 43 (69.4%) without, compared to >5 years group having 16 cases (30.2%) with live birth and 37 (69.8%) without live birth, with p-value of 0.958. Concerning regular menstrual cycle outcome, age ≤35 years group showed 62 patients (83.8%) achieving regular menstrual cycle and 12 (16.2%) not achieving it, while age >35 years group had 36 cases (87.8%) with regular cycle and 5 (12.2%) without with p-value of 0.561. Weight ≤60 kg category demonstrated 48 patients (81.4%) with regular menstrual cycle and 11 (18.6%) without, whereas weight >60 kg group showed 50 cases (89.3%) achieving regular cycle and 6 (10.7%) not achieving it with p-value of 0.231. Duration of infertility ≤5 years group had 54 patients (87.1%) with regular menstrual cycle and 8 (12.9%) without, compared to >5 years group showing 44 cases (83.0%) with regular cycle and 9 (17.0%) without regular cycle, having p-value of 0.539 (as shown in Table-III).

Table III

Association of Demographic Factors with Reproduction Outcomes After Diagnostic Laparoscopy

Demographic Factors		Positive Pregnancy Test		p-value
		Yes n(%)	No n(%)	
Age (years)	≤35	41 (55.4%)	33 (44.6%)	0.152
	>35	17 (41.5%)	24 (58.5%)	
Weight (kg)	≤60	30 (50.8%)	29 (49.2%)	0.928
	>60	28 (50.0%)	28 (50.0%)	
Duration of Infertility (years)	≤5	32 (51.6%)	30 (48.4%)	0.785
	>5	26 (49.1%)	27 (50.9%)	
Live Birth				
		Yes n(%)	No n(%)	
Age (years)	≤35	26 (35.1%)	48 (64.9%)	0.141
	>35	9 (22.0%)	32 (78.0%)	
Weight (kg)	≤60	20 (33.9%)	39 (66.1%)	0.407
	>60	15 (26.8%)	41 (73.2%)	
Duration of Infertility (years)	≤5	19 (30.6%)	43 (69.4%)	0.958
	>5	16 (30.2%)	37 (69.8%)	
Regular Menstrual Cycle				
		Yes n(%)	No n(%)	
Age (years)	≤35	62 (83.8%)	12 (16.2%)	0.561
	>35	36 (87.8%)	5 (12.2%)	
Weight (kg)	≤60	48 (81.4%)	11 (18.6%)	0.231
	>60	50 (89.3%)	6 (10.7%)	
Duration of Infertility (years)	≤5	54 (87.1%)	8 (12.9%)	0.539
	>5	44 (83.0%)	9 (17.0%)	

DISCUSSION

The findings of the study showed that 50.40% (n=58) of the patients had a positive pregnancy test result after diagnostic laparoscopy. This can be explained by the fact that the procedure allows for the direct visualization and treatment of pelvic pathologies such as endometriosis, adhesions, and tubal defects, which are primary causatives of infertility. By correcting these anatomical abnormalities during the procedure, the procedure is able to restore the normal pelvic anatomy and tubal patency, hence improving fertility. However, the rate of live births was 30.40% (n=35), which is lower than the rate of positive pregnancy test results, indicating that not all pregnancies result in successful deliveries. This can be explained by the fact that there are various complications such as early pregnancy loss, ectopic pregnancy, and other complications of pregnancy and childbirth, which occur after conception and before delivery. Regular menstrual cycles were achieved in 85.20% (n=98) of the patients after undergoing diagnostic laparoscopy, indicating that the correction of pelvic pathology has a positive impact on the endocrine and ovarian functions. This is because the removal of endometriotic lesions and adhesions reduces the levels of inflammation and oxidative stress in the pelvic milieu, hence having a positive impact on the hypothalamic-pituitary-ovarian axis and hence the restoration of regular ovulatory cycles.

The present study findings showed positive pregnancy test rate of 50.40% (n=58) which is comparable with pregnancy rates reported by Jamali S *et al.* [12] who observed 54.9% pregnancy rate after laparoscopic surgery, and Doğan Bayrak A *et al.* [13] who found β-hCG positivity in 55.3% of primary infertile patients. However, these rates are higher than 32% clinical pregnancy rate reported by Słabuszewska-Jóźwiak A *et al.* [14] in endometriosis patients and 41.5% pregnancy outcome observed by Vijayaragavan B *et al.* [15] in stage I and II endometriosis cases. The variation in pregnancy rates could be attributed to differences in patient selection criteria, severity of pelvic pathologies encountered, and duration of follow-up period used in different studies as Vijayaragavan B *et al.* [15] specifically included only early stage endometriosis patients while present study included all types of pelvic pathologies detected during diagnostic laparoscopy. The live birth rate of 30.40% (n=35) in current study reflects the gap between positive pregnancy test and successful delivery outcome. Jamali S *et al.* [12] reported that 83.15% of pregnancies reached term while 16.85% ended in abortion which indicates similar pattern of pregnancy losses between conception and delivery. This difference between conception and live birth rates occurs due to early miscarriages, biochemical pregnancies, and other pregnancy complications that prevent successful delivery. Regular menstrual cycle was achieved in 85.20% (n=98) patients in present study which demonstrates beneficial effect of laparoscopy on menstrual function. This finding is supported by Jamali S *et al.* [12] who reported that 84.6% of pregnancies occurred after cauterization of polycystic ovaries suggesting that surgical correction of ovarian pathology improves hormonal balance and

ovulatory function. The restoration of regular cycles occurs because laparoscopic treatment removes endometriotic implants, adhesions, and corrects ovarian pathologies like polycystic ovaries which subsequently normalizes hypothalamic-pituitary-ovarian axis function. Regarding demographic associations, age showed no significant association with positive pregnancy test (p=0.152) or live birth (p=0.141) in current study though younger patients ≤35 years showed higher rates. This is contrary to Vijayaragavan B *et al.* [15] who found younger age as favorable factor for achieving pregnancy after laparoscopy. The non-significant association in present study may be due to relatively small sample size or limited age variation among study participants compared to broader age ranges included in other studies.

The current investigation contains some limitations, which should be mentioned. This is a single-center trial, and the results might lack generalizability to larger populations, considering the possibility of differences in patient populations and practices among various healthcare settings. This trial had a sample of 115 patients, which is relatively small and might lack sufficient statistical power to identify any associations with demographic variables and reproductive outcomes. This trial did not assess any long-term follow-ups after the laparoscopy procedure, which might provide more information on long-term reproductive outcomes.

CONCLUSION

The conclusion of the current research work is that diagnostic laparoscopy is an effective procedure in the enhancement of reproductive outcomes in patients with primary infertility. The procedure has been shown to have positive effects in the attainment of positive pregnancy outcomes and live births in addition to the restoration of regular menses in the majority of the patients.

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