

Original article

Anatomical Causes of Infertility Diagnosed Using Imaging Tests in A Group of 100 Women

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ABSTRACT

Background and aims. The demographics of infertility differ dramatically from one region to another. Therefore, details about the causes and distribution of infertility of different localities and regions are essential for any effective management strategy. This study aimed to evaluate the distribution of the causes of infertility in a women population attending a tertiary healthcare facility. **Methods.** A cross-sectional observational study conducted in a gynecology clinic on female patients who came for infertility consultation or treatment between June -2019 and December-2020. The cause of infertility was diagnosed by the history, examination and investigation. Data were arranged in tables, and the frequency of each factor was calculated and therefore the prevalence was estimated using SPSS 25. **Results.** secondary infertility (53%) was more prevalent than primary infertility (47%). Pelvic inflammatory disease was the leading cause (40%) and it was associated with tubal factor infertility. Second cause was polycystic ovarian syndrome (PCOS) (33%). Infertility causes changed as the age of marriage increased. In females married for less than 5 years, PCOs was the main cause of infertility. **Conclusion.** Causes of infertility in women change according to the age group and the age of marriage. This study shows that PID is the most common cause of infertility in females followed by PCO. A significant association between infections and tubal factor infertility was found.

Keywords: Infertility, Women, Anatomical, PCO.

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INTRODUCTION

Infertility is estimated to affect around 9% of all married couples in reproductive age around the world [1]. The distribution of infertile population varies greatly from one region to another depending on genetic, environmental, political, and socioeconomic factors [2]. As the major changes in lifestyle led to a general improvement in the quality of life, providing more and better academic and professional opportunities [3] which have changed the determinants of birth rates and demographics of

infertility, e.g., prevalence of primary and secondary infertility, average age of infertility, etc.

Indeed, the demographics of infertility and the attitudes toward it vary between developing and developed countries [4], for example seeking medical care for infertility is more prevalent in developing countries while secondary infertility is more prevalent in developed countries [5], this could be attributed to infectious diseases and malnutrition which might be prevalent in those regions [6-7]. Furthermore, the average age of diagnosis with secondary infertility is

higher than that of diagnosis with primary infertility [8] which could be explained by the delay that usually proceeds the suspension of infertility as the couple usually excludes infertility since pregnancy occurred before.

Also, the reduction of infectious causes of infertility i.e., sexually transmitted diseases, and the emergence of other causes e.g., obesity, hypertension, and diabetes can also change the patterns and rates of infertility among women [9].

There is an ongoing debate about the “acceptable” time without conception before considering infertility [10], and therefore a definition of infertility that is based on the time without conception might include fertile couples who simply need more time to conceive, or exclude couples with an underlying cause of infertility and subsequent delay of diagnosis and possible intervention and treatment. Indeed, the causes of infertility can be time dependent i.e., need time before they prevent conception e.g., obesity, malnutrition, diabetes and other causes of secondary infertility in which case the female’s ability to conceive is gradually reduced until she becomes infertile and require intervention, or be independent of time i.e., congenital causes such as polycystic ovaries and in such cases the female is already made infertile by her condition [5]. This emphasizes the role of proper diagnostic criteria and clinical definitions in detecting, and preventing or treating infertility.

The causes and prevalence of infertility in Libya is poorly covered and – to our knowledge – only one research has been published about this subject [11]. So, the objective of this research was to study the patterns and rate of infertility due to a disease in reproductive organs in a group of females in western Libya specifically to understand the nature and prevalence of causes of infertility in this region.

METHODS

This is a prospective cross-sectional observational study of female women attending a gynecology clinic for infertility consultations, the diagnosis of infertility was based on through history taken directly from the

patient and confirmed with imaging tests, the three tests used in this study were; Hysterosalpingography, Hysteroscopy, and Laparoscopy. This study involved cases that were diagnosed during or prior to the study period which lasted from June – 2019 until December of the same year.

Inclusion criteria was all women in reproductive age are defined to be infertile according the definition of infertility (see above), while the exclusion criteria were cases with established male factor or combined factor infertility, premature ovarian failure, or hypoplastic uterus.

Initially information was obtained directly from the patients included; age, occupation, level of education, and duration of infertility which was described as the period in which they tried to conceive but couldn’t. Transvaginal sonography (TVS) was done to all cases as a screening test for the different underlying causes of infertility. Three imaging tests were used a confirmation test for different causes of infertility; Hysterosalpingography (HSG), Hysteroscopy, and Laparoscopy. HSG was performed when Pelvic Inflammatory Disease (PID) was excluded or treated which was demonstrated by a good spontaneous or induced ovulation for at least two consecutive cycles. Laparoscopy was done when HSV results showed peri tubal adhesions, or uni- or bilateral tubal block. Hysteroscopy was done in the cases of unexplained infertility or when HSG results showed submucous or myometrial polyps.

Using SPSS 25 IBM software, the convenient statistical tests were used according to the type of data, the means and standard deviations of continuous data was calculated and presented. As for categorical and demographic data was presented in tables and graphs as well as their proportions. Chi-square test was used to test the difference of age and primary or secondary infertility groups. Also, the association between age groups and each of the identified underlying causes was calculate using t-test.

RESULTS

Demographics

The study included 100 female patients all with an established diagnosis of infertility and an identified underlying cause. The mean age was 31 years (SD = 8 years). 44 women were in the second age group (between 21 and 30 years old), which was the most common age group, followed by the third age group (between 31 and 40 years old) 33 women, and the fourth age group (older than 40) 23 women, the least common age group in the study was the first age group (younger than 21) 3 women (Table – 1).

Table 1. Age distribution of the study group (n = 100)

Age group	Frequency
< 20 years	3
21 - 30 years	41
31 - 40 years	33
>40 years	23

Of the 100 women included 52 were employed at the time of the study and the remaining 48 didn't have an occupation. The majority of women 57 had a college or higher education degree, 27 of them had middle institute diploma, while 14 of them only had secondary school diploma, and the remaining 3 only had primary education. (Table – 2)

Table 2. Level of education in the study group

Level of education	Frequency	Percent
Primary	2	2.0
Secondary	14	14.0
Middle institutes	27	27.0
Higher education	57	57.0
Total	100	100.0

Infertility; The majority of the study population was married for less than 5 years at the time of diagnosis 65, and the rest 35 was married for more than 5 years.

Secondary infertility was more common 53 cases, and primary infertility was 47 cases (Figure 1).

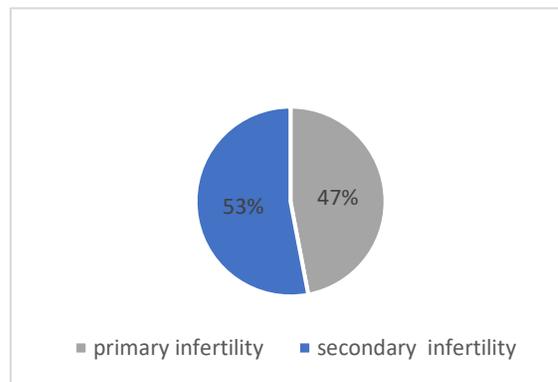


Figure 1. Types of infertility in the study group (n = 100)

Transvaginal ultrasonography TV

Results are shown in (Figure 2), Pelvic Inflammatory Disease PID was the most common cause of infertility 37 patients (37%), followed by Poly Cystic Ovarian Syndrome PCOS 33 patients (33%), around 16 (16%) of the patients had normal TVS, uterine anomalies were found in 6 patients (6%) of the cases, endometriosis was found in 5 patients (5%) of the patients, leiomyomas were present in 2 patients (2%), and the least common finding was endometrial polys only in 1 case (1%).

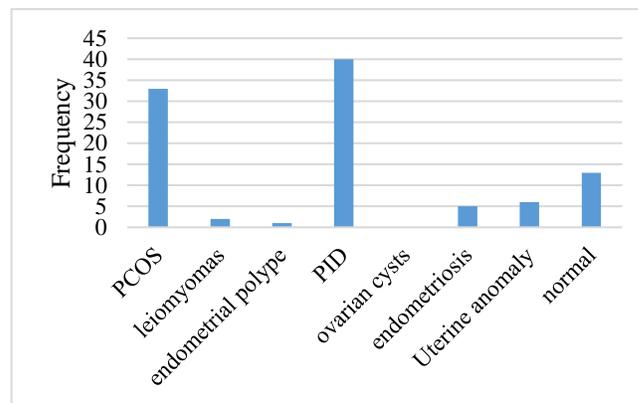


Figure – 2 Results of TVS (n = 100)

PCOS was the most common cause of infertility in the age between 21 – 30 years old, and PID was the most common cause from the age 21 and above,

leiomyomas and polyps were only reported in women above the age of 40. It can be seen from (Figure 3) that the number of PCO cases decreased with older age groups and PID increased.

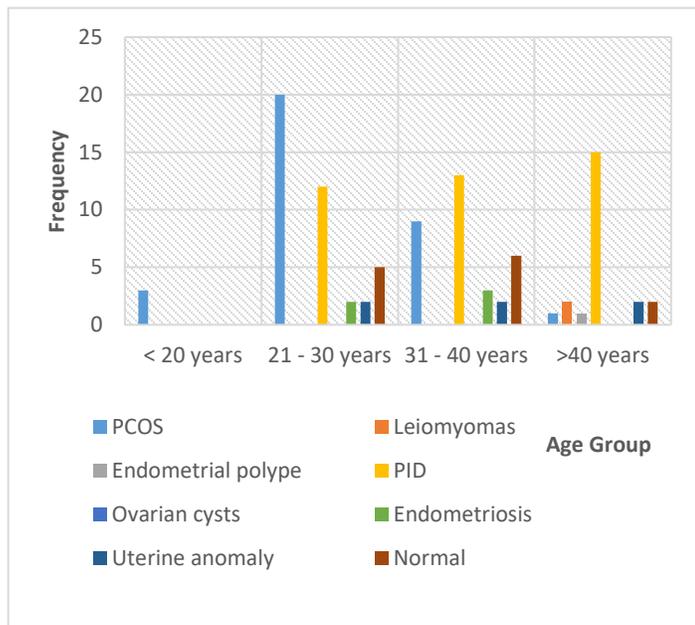


Figure 3. Distribution of causes of infertility for every age group (n = 100)

Hysterosalpingography HSG

55 cases agreed to undergo investigative hysterosalpingiography HSG, 2 patients (3.6%) had unilateral tubal block, 10 patients (21.8%) had bilateral tubal block, 18 cases had (32.7%), 11 patients (20%) had uterine anomalies, adhesions were found in 5 (9.1%), and the remaining cases 9 had normal HSG (16.4%), the results are given (Figure 4).

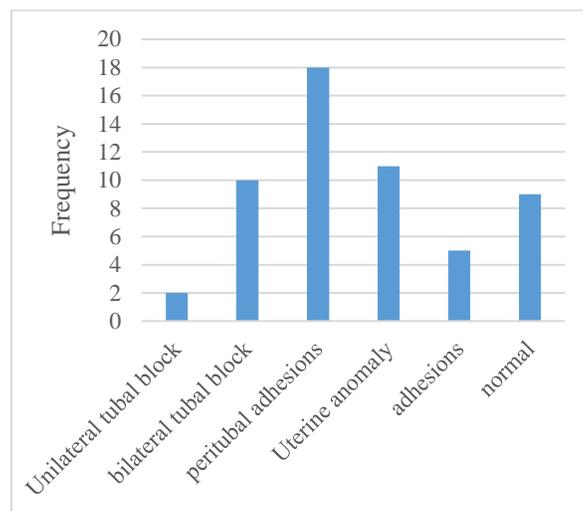


Figure 4. Findings of hysterosalpingography which was conducted to confirm the cause of infertility in 55 patients

Hysteroscopy

59 patients were candidats for hysteroscopy, 8 of them (13.6%) had polyps, 9 had adhesions (15.3%), a septum was seen in 13 (22%), the other 29 (49.2%) had anormal hysteroscopy, and no leiomyomas. results are shown in (Figure 5).

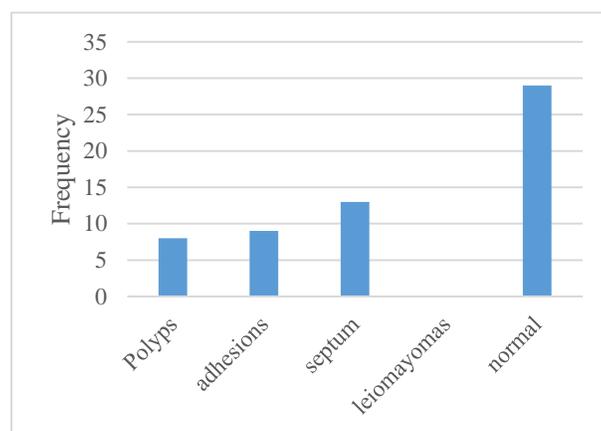


Figure 5. Investigative hysteroscopies conducted in 59 patients from the study population

Laparoscopy

62 patients were candidates to laparoscopy, Leiomyoma was seen in only one patient (1.6%), 8 patients (12.9%) had endometriosis, 13 patients (21%) had tubal blocks, 8 patients (12.9%) had a uterine

anomaly. Laparoscopy detected 8 (12.9%) cases with PID meaning that the PID exclusion criteria didn't include those cases. 1 (1.6%) had an ovarian anomaly, and the remainign patient (1.6%) had normal laparoscopy. (Figure 6)

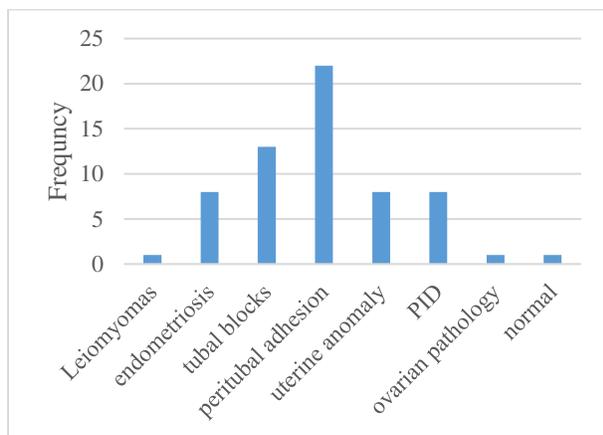


Figure 6. Confirmatory Laparoscopy conducted for 62 patients from the study population who had positive imaging findings

Laparoscopy showed that tubal block was present in around (52%) of the patients diagnosed with PID through TVS which was as accurate as laparoscopic examination which revealed 38 cases of PID.

DISCUSSION

This study approaches infertility in women from a clinical standing point i.e., presentation and diagnosis, as opposed to the more common epidemiological approach in the literature [10-11]. However, the general demographics of infertile women were included in the study, the mean age was 31 years (SD \pm 8 years) lower than the results of a similar retrospective study conducted in the same region¹¹. The number of cases increased with the increase of age, a classic finding infertile population. Higher education levels were consistently associated with and increase in the number of cases, this could be attributed to the delayed age of marriage and conception common among academics and academic women [3], but it is worth mentioning that completing education, obtaining college degree or higher institute

diploma – is becoming an necessity for all citizens in Libya [12] meaning that this association is more general and could common finding to all studies that include adults beyond the age of graduation.

An interesting finidng of our study was that secondary infertility was more common than primary infertility, although slightly higher, this differs from the findings of other epidemiological studies of infertility [9-11], this difference may be due to the difference in the design between this study and other studies, As they included endocrinological reasons and unexplained caues of infertility, this study only included cases with confirmed clinical diagnosis of infertility based on their imaging tests meaning that only women with anatomically detectable causes of infertility were studied. This probably means that the study population is different and the findings are more specific to a subgroup of infertile patients.

TVS – the baseline investigation in this study, showed that PID was the most common finding 37%. PID has always been among one of the most common causes of infertility in women [4,11-12] but this is the first study to find a population in which PID is the most common cause, this again may be due to the study desgin which didn't include other endocrinological causes. The term PID was used to encompass all the infectious and non-infectious casues, most of the literature consider the individual infectious causative organisms and disorders of PID.

The second most common causes PCO 33%, an epidemilogical study conducted in the same region also showed that PCO was the second most common causes of infertility [11].

TVS didn't reveal any abnormalities in 15% of the patietns, those cases were candidates for hysteroscopy to have a clearer visual identifcation of the cause of infertility.

Other causes of infertility identified through TVS were a minority (14%) of the study group, the causes being uterine anomalies, endometriosis, liemyomas, and endometrial polys. Those factors with which firtility is possible and common¹⁴⁻¹⁸ which is probably why the

prevalence was lower comparing to other damaging causes of infertility such PID.

Hysteroscopy showed that majority of the candidates had no abnormalities. Other hysteroscopic findings had nearly equal distribution, this finding is consistent with the regional findings [18].

HSG was performed after the recovery of the PID cases, despite good ovulation damage to the uterus and fallopian tubes caused by different causes of PID was seen, this association is consistent with findings from other studies [19].

Perhaps the most interesting finding in this laparoscopy which was indicated for patients with no PID based on the criteria of good spontaneous or induced ovulation continuing for at least two cycles, laparoscopy still showed clear evidence of PID in 8 patients, raising the number of PID patients in the study group to 48, the additional cases were among the 16 cases were unsuspected either because they were asymptomatic, which is likely since a large proportion of PID patients may be asymptomatic [20]. Also, TVS didn't detect PID. The calculated positive predictive value for the above mentioned criteria is 83% similar to findings of similar studies [21].

CONCLUSION

Secondary infertility is more common with abnormalities of reproductive organs. Also, older age groups develop more reproductive problems with age. With the increasing level of awareness in society, more people seek professional medical help and to treat infertility in the proper and useful way. Proper imaging techniques and multiple diagnostics strategies are important to reach an accurate and reliable diagnosis for the development of proper and convenient treatment plan and follow up.

Clinicians should always investigate the uterus, fallopian tubes and ovaries in the seemingly normal patients as normal TVS may reveal the actual damage caused to those organs by PID or endometriosis, which might be the actual cause or an additional cause of infertility.

Disclaimer

The article has not been previously presented or published and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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