Etiology and Risk Factors of Infertility among Omani Couples: A Tertiary Care Experience

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Abstract

Objectives: This study aimed to investigate the etiology and risk factors of infertility among Omani couples aged of 18-49 years.

Methods: A quantitative cross sectional retrospective study in which 259 infertile couples attending tertiary care infertility clinic in a university hospital, between January 2015 to December 2022 were selected. The data collected from hospital information system (HIS) after the formal ethical approval, was analyzed using SPSS version 25 with descriptive indicators. Main outcome measures included male and female infertility etiological and other risk factors.

Results: The mean age of the women was 37 and 43 years for primary and secondary infertility respectively. Up to 40% of women were obese or overweight. Secondary infertility (61%) was more prevalent than primary infertility (39%). Polycystic ovarian syndrome (PCOS) (21.6%), fibroids (16.0%), endometriosis (7.8%), tubal block (14%) were the main female infertility factors. There was a robust association between BMI and PCOS and a significant correlation between advanced age and fibroids. Asthenozoospermia was the most common male infertility factors observed in (46.3 %) of males, whereas oligospermia was found in 14.6% of males

Conclusion: The study identified advancing age, increasing BMI with an association to the PCOS and anovulatory disorders in females. This indicates that preventing and raising awareness about modifiable risk factors would help bring in better fertility outcomes.

Keywords: Infertility; Male Infertility; Female Infertility; Risk Factors; Polycystic Ovarian Syndrome; endometriosis.

Introduction

Infertility is a global health issue affecting millions of people of reproductive age and is a multifactorial worldwide public health problem.[1] According to WHO one in six people (17.5%) are globally affected by infertility.[2]A systematic review and metanalysis on worldwide prevalence, risk factors and psychological impact of infertility among women covering thirty-two study's findings reported evidence of significant psychological impact mainly depression (46.25%) among infertile women.[3] Infertility among middle Eastern couples is a significant health concern with varying prevalence and multiple contributing factors.[4-6]. The prevalence, etiology, and predisposing factors of infertility in this region are influenced by a combination of biological, environmental, and sociocultural issues.[4-9] Overall infertility rates are increasing in the Middle East countries with multiple factors affecting both genders.[3,4,6] Prevalence of infertility rates in Iran is overall 8-11.3%; of which 4.6-18.3 % is primary, whereas 3-8% is secondary.[4]

Sociocultural factors such as obesity, high BMI, consanguinity, vitamin D deficiency, age over 35 and lifestyle such as alcohol consumption, smoking as well as social stigma were also reported as predisposing factors of infertility. [6,10,11] Couples with long term infertility expressed apparent fear of divorce.[8] Feelings like shame, stigma, and social isolation were also a barrier among couples trying to conceive. In addition, access to infertility treatment is limited in some regions of the country, leading to financial burden and stress for couples seeking treatment [7].

Ovulation disorders are reported as the prominent etiological factors in females, however, endometriosis, tubal factors and uterine abnormality are also common.[4] Literature review identified fallopian tube block or damage, endometriosis, ovarian insufficiency, pelvic adhesion, thyroid problem, cancer, chemotherapy, cesarean section, amenorrhea, delayed puberty, obesity, tobacco and alcohol use, genetic abnormalities, vitamin D deficiency as factors influencing infertility.[12]In a study from Dhulikhel Hospital from Nepal, almost half of all infertility cases (48.8%) had only a female factor. Further, half of these female cases (52.12%) had an ovulatory cause.[13] The most reported male etiological factor was varicocele (28.3%-49.4%), whereas, other factors like cryptorchidism, and stress were also major factors for male infertility. [6,10] In Iran, male factors accounted for 23.9% of cases, with abnormalities in sperm analysis accounting for 22.7% of cases and other sexual dysfunction accounting for 1.2%. Infertility was classified as combined in 26.6% of cases, with unexplained causes accounting for 14.4%.[13]

In Oman, infertility incidence rates have recently increased as compared to the rates reported in the previous years[14]. The world population prospect's report in 2022, revealed alarming data in three successive years between 2020 to 2022. The fertility rate for Oman in 2022 was 2.662 births per woman, a 2.46% decline from 2021 when it was 2.729 births per woman, which showed a 2.4% decline from 2020 data. Further, in Oman demography depicts many modifiable risk factors such as obesity and hypothyroidism. Identification of risk factors can thus help to prevent infertility by paying attention to such modifiable risk factors. A recent study reported 60% chance of developing anxiety and 40% chance of developing depression among those couples when compared to normal population.[2] Recent study among Omani women with polycystic ovarian syndrome and infertility also reported major psychological challenges of negative emotions feeling lonely, neglecting to attend family gathering and social events. [15] Thus, for such a globally increasing physical, psychological, and economic impact, identifying the prevalence of risk factors of infertility in Oman, and investigating, and initiating early treatment significantly reduces the impact on national health indices. Therefore, our study was aimed to investigate the etiology and risk factors of infertility, specifically with respect to female and male factors among the Omani couples aged 18-49 years.

Methods

Design and settings: A retrospective cross-sectional study was done using the hospital records of infertile patients who attended the infertility clinic in a tertiary Hospital in the Sultanate of Oman. This is the tertiary medical faculty in the capital of Oman, where most of the couples with infertility are referred to from all over the country.

Sample and Sampling: A retrospective sample of 259 infertile couples were studied based on inclusion criteria such, as age 18–49 years Omani females and males who were diagnosed with infertility from 1st of January 2015 up the 31st of December 2022. An ethical approval from the medical research and ethics committee (MREC), the institutional review board was obtained in April 2023 (MREC #2972) before data collection.

Data Collection and Analysis: Data was collected from Hospital Information System (HIS), the electronic medical record system used in the facility. Collected data included demographic information such as patient's age, height, and weight. Additionally, specific risk factors related to each gender were studied. Female factors included menstrual cycle history, regularity of cycles, hormonal evaluation (Follicle stimulating hormone (FSH), Luteinizing Hormone (LH), Thyroid function test, Prolactin, testosterone), previous surgeries, uterine abnormalities, fallopian tubes abnormalities, and ovarian abnormalities. Male risk factors consisted of semen abnormalities including sperm count, sperm motility, percentage of abnormal forms. This study was conducted from 1st of June 2023 to the 31st of December 2023. The collected data were analyzed using SPSS program (Statistical Package for Social Sciences, version 23). Mean, Standard Deviation (SD), and median values were calculated for the age of all patients. Body mass index (BMI) was computed using patients' weight and height, and a bar chart was utilized to illustrate the categorized BMI variables.

Results

In 259 subjects, the mean age of female partner was respectively, 37 ±7.05 years and 43 ± 5.45 years for primary and secondary infertility patients. 24.4% of the infertile group were found to be overweight and 15.2 % were obese. (Figure 1) Secondary infertility was more common, accounting for 61.0% of cases, compared to primary infertility of 39% cases among the infertile patients. Majority of infertile women (75.8%) reported to have a regular menstrual history, whereas the remaining (24.2%) reported irregular menstrual cycles.

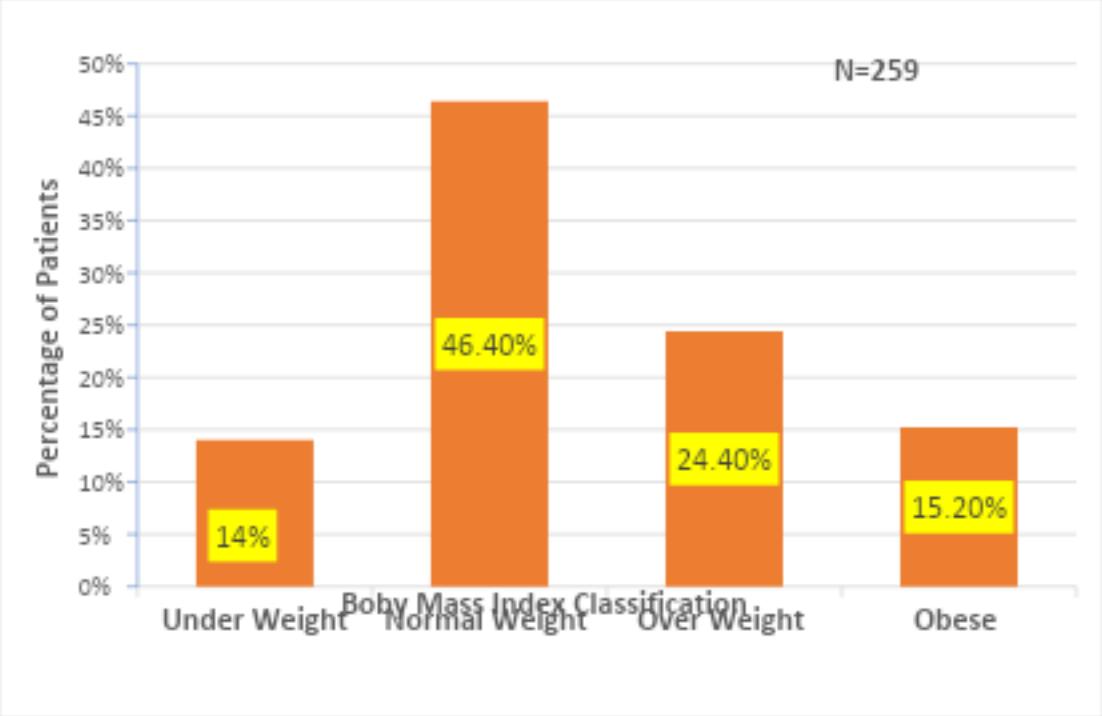

Figure 1: Body mass index distribution in female partners.

Investigations

Hysterosalpingography (HSG) a crucial imaging technique utilized for assessing infertility in women revealed that out of the infertile women sample,12 individuals (5.3%) had bilateral blockage of their fallopian tubes, while 10.6% had only one patent tube thereby categorized under tubal factor infertility (Table 1). Another important imaging method employed in assessing infertility in women was pelvic ultrasound which showed that 37 infertile women had fibroids, 50 had PCOS, 18 had endometriosis (Table 2). Data on surgical procedures showed that out of 72 participants who underwent surgical procedures, (30.6%) underwent ovarian cystectomy whereas myomectomy was performed on 19.4% and polypectomy on 20.8% respectively (Table 3).

Table 1: Findings of HSG.

Hysterosalpingography Findings	**Frequency (n=259), n(%)**
Test not indicated	133 (51.4%)
Normal	90 (34.7%)
One tube blocked	24 (9.3%)
Both tubes blocked	12 (4.6%)

Table 2: Results of pelvic ultrasound in infertile women.

Pelvic ultrasound findings	**Frequency (n=231), n (%)**
Normal	126 (54.5 %)
Fibroids	37 (16.0%)
PCOS	50 (21.6%)
endometriosis	18 (7.8%)

**PCOS: Polycystic Ovarian Syndrome.*

Table 3: Surgical procedures that infertile patients had undergone.

Surgical procedures	**Frequency (n=72), n (%)**
Myomectomy	14 (19.4%)
Polypectomy	15 (20.8%)
Ovarian cystectomy	22 (30.6%)
Excision varicocele	8 (11.1%)
others	13 (18.1%)

Etiologies

Females accounted for most infertility cases (53.7%) with 17.4% cases showing only male infertility. Combined infertility was seen in 37 couples. (Table. 4) The most identified factors in infertile women [45.3% (n=63)] were anovulatory disorders like PCOS and hyperprolactinemia. Fibroids, adenomyosis, and congenital uterine anomalies which are uterine factors [27.3% (n=38)] accounted for the second most common cause of infertility in women. Tubal factors like blockage of both fallopian tubes and patients who had salpingectomy, were seen in 20 women (14.4%). We treated endometriosis as a distinct cause of infertility in women (7.8%) There was a positive correlation between fibroids and age of participants ,pearson correlation of 0.211 with a p value of <0.001

Table 4: Infertility etiologies in the study population.

Infertility etiology	**Frequency, n=259(%)**
Female factor	139 (53.7%)
Male factor	45 (17.4%)
Unexplained factor	38 (14.7%)
Combined factor	37 (14.3%)

Semen analysis revealed asthenozoospermia in 38 (46.3%) as the most prevalent feature, indicating a motility issue. Oligospermia was found in 12(14.6%) combined semen abnormalities in 17(20.7%), teratospermia in 7.3% and in 11% azoospermia were identified as other male factors in this study population. Further, various combinations of both male and female infertility factors were identified among these 72 couples. The most prevalent combination of male and female factor with anovulation was 23.6%, tubal factors 8.3%, uterine factors 5.6%, endometriosis 4.2%. The other combinations were below 2%. The sperm motility values were less than 40% in almost all semen analysis results.

Discussion

Female age is a significant factor impacting the process of conception. The threshold for advanced reproductive age lacks a generally agreed-upon definition; yet it is widely accepted that 35 years constitutes an important cutoff in terms of fertility[1]. A study conducted in Qatari women reported age over 35years as a significant risk factor with similar finding reported from other studies.[1,6,16] High mean age was a significant factor in our study too, as the mean age of female partner was found respectively, to be 37 and 43 years for primary and secondary infertility patients. A study from Lebanon reported close mean age (34.8 ± 8 years) to infertile women[7]. Further, many individuals do not seek infertility therapy in the early stages, preferring to start with conventional medicine and arrive late to the clinic. Additionally, late marriage patterns that are also seen today might contribute to the high mean age prevailing in Oman[14]. Lastly, considering BMI categories, 24.4% of the infertile group were found to be overweight and 15.2 % were obese women and this overweight is mainly affected with multiple environmental factors and life style and is supported and in par with previous reports of Vitale et al.[17]

Our study results are not different than prior findings which suggested that women who develop obesity at a young age are more likely to experience irregular menstruation and infertility.[5] A study that addressed the risk factors for infertility in Korean women found that women with BMI ≥ 25.0 kg/m^2 showed 2.06 times higher odds for infertility when compared to normal weight participants.[1,9] Primary infertility (81%) was considered to be more prevalent than secondary infertility in Bangladesh.[18] In our study, secondary infertility (61.0%) was more common compared to primary infertility (39.0%). A study from Qatar showed a higher prevalence of secondary infertility (68.4%) than primary infertility (31.6%) which is at par with this Omani study findings.[1]

The most identified factors in infertile women were anovulatory disorders like PCOS and was at par with a similar study of Dia et.al 2024. [7] Current evidence revealed that those with a history of ovarian cyst surgery were more likely to report having a history of infertility compared with age-matched women who reported no history of ovarian cyst surgery.[16] The commonest surgical procedure underwent by participants was ovarian cystectomy (30.6%) out of 72 couples who underwent surgical procedures. It is possible that both ovarian surgeries to remove cysts and the conditions that lead women to develop cysts requiring surgery may affect subsequent successful conception.[16] Ovulation disorders are the leading cause of female infertility as reported in various studies. Sultana and colleagues observed comparable findings where they documented women with ovulation failure (60%), polycystic ovarian disease (32%), bilateral tubal blockage (8%), and pelvic adhesions (24%).[19] Our study revealed 45.3% of the infertile women having anovulation problem. Retrospective study among Omani infertile women also reported congenital uterine anomaly and tubal block as etiology for infertility.[20] Similarly, endometriosis is a common condition affecting 5-10% of women of reproductive age globally.[21]

The prevelence of endometriosis in our study was 7.8% based on ultasound in 231 women only. If only female factors (139) are taken into account this proportion will be 12.9% it is commonly reported that about 30 % of patients with endometriosis experiences infertility and up to 50 % of infertile patients may suffer. 22 The second most common cause of infertility found in our study was uterine factors (27.3%) including fibroids and adenomyosis. 20 women had tubal factors that include the blockage of both fallopian tubes and undergoing salpingectomy. Unexplained infertility is a diagnosis of exclusion that is made only after assessing the infertility

factors in the male and female. Out of 259 participants in our study, 14.7% of them had unexplained infertility. Our observation is much lower than literature review showing respectively 34% and 19% of the infertility cases with unexplained etiology.[12,18]

In analyzing the semen parameters, asthenozoospermia (46.3%) followed by combination of asthenozoospermia and oligospermia (20.7%) showed a significantly lower levels compared to other studies. Several other studies have reported similar observations. Pokhrel S et al[23] showed that the leading cause of male infertility was oligospermia (55%), followed by asthenozoospermia (45%). Moridi A et al[10] showed that azoospermia (56.4%) was the most diagnosed cause followed by oligospermia (24.5%). The variations seen above might be due to using different techniques in the laboratory or, the cutoff values of asthenozoospermia, teratospermia and oligospermia used in each study might be different. Significantly, in our study, a case was labelled as asthenozoospermia if the motile sperms were less than or equal to 42% in the collected semen sample. [24]

This study outcome identified the major risk and etiological factors of infertility among Omani infertile couples who attended this tertiary center which enhances in preventing and treating infertility among Omani couple. However, due to the retrospective nature of the study some of the modifiable risk factors such as smoking, other lifestyle factors and occupation of some of the couples were missing from the documents which contributed to the limitation of this study. Multisite data including private sector could be considered for comprehensiveness and generalizability.

The study observations strongly recommend the need for early detection, treatment, and accessibility to affordable infertility treatment facilities. It is important to pay attention to community-based awareness programs to prevent modifiable risk factors and reduce the infertility rate to enhance health indices of Oman. This recommendation is supported by a similar recent study among Lebanon population by Dia et al.[7] Policy makers and administrators could consider availability of affordable and accessible infertility treatment facilities throughout the country for early diagnosis and treatment in a cost-effective way. A recent scoping review where psychological and social research on infertility is being conducted and recommended the common areas of research include exploring patients' quality of life, barriers to seeking fertility treatment, stigma and attitudes around infertility, social, cultural, and religious issues relating to infertility as this gap persists.[25] However, a major limitation of the study, is the retrospective data collection, although it was from a major public tertiary infertility clinic in the country.

Conclusion

This study helps identify different etiologies and risk factors of infertility among couples of reproductive ages. Advanced age of the couples a main risk factor. Anovulatory disorders were the leading causes of infertility in females. Further, an association between increasing BMI and incidence of PCOS was significant modifiable and treatable risk factor. Thus, tackling the risk factors and raising awareness about modifiable risk factors would certainly bring better fertility indices reflecting better national health.

Disclosure

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