



RESEARCH PAPER

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Prevalence of obesity and its impact on female reproductive health outcomes in Al-Baha Region: A retrospective assessment

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Abstract

Obesity has severe reproductive implications depending on the amount and distribution of body fat. Epidemiological studies have shown that obesity leads to abnormalities in menstruation, infertility, miscarriage, poor pregnancy outcomes, reduced fetal well-being, and diabetes mellitus. No previous study has investigated the Prevalence of Obesity and Its Impact on Female Reproductive Health Outcomes in Al-Baha Region, Saudi Arabia yet. We investigated the retrospective cross sectional case series studies of various patients to see the correlation between obesity, metabolic hormones, and female reproductive disorders. Because of the potential benefits of weight management, lifestyle intervention programs should constitute the first-line treatment for women with reproductive disorders. This retrospective cross-sectional case series study included adult female patients (aged >10 years) with obesity-related reproductive disorders. We examined all patient databases that contained various reproductive disorders and pharmacotherapy prescribed for a definite diagnosis of infertility, abortion, ectopic pregnancy, cervical cancer, irregular menstruation, and other less commonly reported reproductive abnormalities. The study included 150 patients, with 87.9% being married and 12.1% being unmarried. Obesity was linked to infertility concerns in 36.6% (n=55) of 150 obese adults, followed by 20.6% (n=31) of patients with irregular menstrual cycles. The percentage of patients with PCODs associated with increasing obesity was 8.7% (n=13). The proportion of patients who had abortions was 8.7% (n=13). Obesity caused cervical cancer in a small number of patients (1.3%, n=2). Other reproductive complications were responsible for 44% of the cases. In addition, a statistically significant difference of 0.001 was found in the reproductive diagnosis Variations with different age groups. A statistically significant difference of 0.05 was found between the various treatment regimens prescribed based on age groups. The correlation between BMI and obesity outcome according to age groups

was found to have a statistically significant difference of 0.05. Obesity has been linked to a variety of reproductive problems. For life-threatening reproductive disorders such as cervical cancer and other reproductive disorders, pharmacotherapeutic interventions are available. Furthermore, because of the potential benefits of weight management, lifestyle intervention programs should be the first-line treatment for infertile women. As a result, personalized therapeutic assistance in clinical care is intended to encourage weight loss in obese patients with infertility. This may also be beneficial during pregnancy, allowing for a more comfortable physiological delivery and healthy pregnancies. The primary limitations of this study are the lack of statistics explaining the prevalence of obesity and its impact on the female reproductive system in Saudi Arabia, as well as the lack of previous studies on the research topic in Saudi Arabia.

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Introduction

Obesity is a global issue that is affecting worldwide. Overweight and obesity are age-related disorders, and the World Health Organization has designated them as epidemics (Lin and Li, 2021). Obesity is a growing worldwide health issue that affects several aspects of reproductive health. Overweight and obesity entail abnormal and excessive fat build-up, which has a detrimental effect on health in terms of body mass index (Fruh, 2017). Overweight people were defined as having a BMI of 25 to 29 and obese people as having a BMI of 30 or above. More than twice as many people and 15% of women are estimated to be obese globally as of 2021 compared to 1980 (Althumiri *et al.*, 2021). Hormonal exposure and reproductive function are significantly affected by obesity in women. It is usually linked to polycystic ovarian syndrome (PCOS), the most prevalent endocrinopathy in women of reproductive age, when it comes to fertility (Deswal *et al.*, 2020). With the incidence of obesity in PCOS ranging from 38 to 88%, most women with the condition are overweight. Failure to obtain a clinical pregnancy after 12 months or more of frequent, unprotected sexual contact defines infertility as a disorder of the reproductive system. Existing research supports the idea that androgen changes and their interaction with estrogen are the main factors contributing to subfertility or infertility in women with obesity (Cena *et al.*, 2020). Moreover, obesity may contribute to infertility and reproductive system malignancies through an altered microenvironment that favors epigenetic changes that increase the susceptibility to inducing and cementing a disease state (Crujeiras and Casanueva, 2015).

As a result, the metabolic environment, chronic inflammation, oxidative stress, and adipokine secretion deregulation induced by obesity may play direct or indirect roles in the regulation of the hypothalamic-pituitary-gonadal axis or in inducing epigenetic modifications of specific genes in reproductive pathways (Crujeiras and Casanueva, 2015). Obesity is known to worsen ovarian responsiveness to ovulation-inducing drugs such as clomiphene, leading to ovulatory dysfunction. Fifteen percent of women using assisted reproductive

technology (ART) are overweight or obese, which has a major impact on their response to therapy (Medenica *et al.*, 2023). Additionally, obese women who become pregnant are more likely to experience miscarriage and other pregnancy-related issues for the mother, such as gestational diabetes, hypertension, preterm delivery, and caesarean section (Reichetzeder, 2021). Simple obesity has several detrimental effects on general health and is linked to a wide range of illnesses, including type 2 diabetes, cardiovascular disease, osteoarthritis, sleep apnea, breast cancer, uterine cancer, polycystic ovarian syndrome (PCOS), and metabolic syndrome (Lam *et al.*, 2023). Studies have reported strong evidence that obesity contributes significantly to the emergence of female-specific reproductive health problems, which have a major impact on overall public health (Tauqeer *et al.*, 2018). It has been reported that the prevalence of preconception maternal overweight in Saudi Arabia has increased to 35.4% because women are aware of the risks of obesity on reproductive outcomes, especially those related to pregnancy (Fallatah *et al.*, 2021). Although the public has access to a wealth of information about the impact of obesity and excess weight on women's health, cardiometabolic disorders, and other conditions, surprisingly few studies have evaluated patient comprehension and awareness of these risks, particularly as they apply to women's reproductive health (Lin and Li, 2021).

To our knowledge, no published research has examined the level of knowledge about how obesity affects reproductive outcomes in an area of Saudi Arabia that is mostly Al-Baha. It is crucial to gauge how well informed the populace of the Al-Baha community is about these concerns, because obesity disproportionately affects several of its constituent demographics. To identify opportunities for intervention, it is crucial to evaluate the degree of awareness regarding obesity and its effects on reproductive health in various groups, especially those in urban settings (Tiwari and Balasundaram, 2023). The purpose of this study was to assess the prevalence of obesity and its effects on other risk factors for reproductive health in a female community, mostly in Al-Baha.

Relationship with reproductive health. We expected women to be less aware of excess body weight and associated risk factors. Several epidemiological and observational studies have provided evidence for the links between obesity and reproductive pathologies, ranging from early puberty to menopause/andropause, and various types of tumors in the reproductive tissues (Crujeiras and Casanueva, 2015). Attempts to reduce obesity-related factors may improve reproductive function and lower the incidence and prognosis of cancers in the reproductive tissues. Although the molecular mechanisms underlying these associations remain unknown, the molecular etiology of reproductive diseases associated with obesity may be epigenetic changes caused by or as a result of obesity.

Material and methods

Study design

This was a retrospective case series study to assess the impact of obesity on reproductive health. Data were collected from tertiary hospitals located in the Al-Baha region of the Kingdom of Saudi Arabia. The study included females of all age groups, with nearly 149 cases counted in total.

Study Area

This study was conducted in Al-Baha city (BC) lies in the southwest of the kingdom of Saudi Arabia.

It includes several governorates, the most important of which are Baljurashi, Al-Mandaq, Al-Aqiq, Al-Makhwah and Qilwa. The study population included all patients who had obesity (grades 1, 2, and 3) and its impact on reproductive health, and few were admitted to the hospital.

Sampling Technique

This study was conducted at King Fahad Hospital (Obstetrics Department and Obesity Center) and King Misharay Hospital (Obstetrics Department) in Al-Baha. From August 2019 to August 2021, data were gathered from various patients' records with mild, average, and serious reproductive disorders with increased BMI. The hospital's obstetrics department (Antenatal and Maternal) provided patient information pertinent to the study, which was collected and recorded after obtaining ethical clearance.

Data Collection and Analysis

Data was collected from various two major hospitals located in Al-Baha. A data sheet was employed, and all needed data, if available, were checked, as were all study needs noted on the data sheet. After being gathered by the computer, the data were examined using SPSS version 22's statistical package and Excel. Fig. 1 showing the distribution of various reproductive disorders among patients and their demographics.

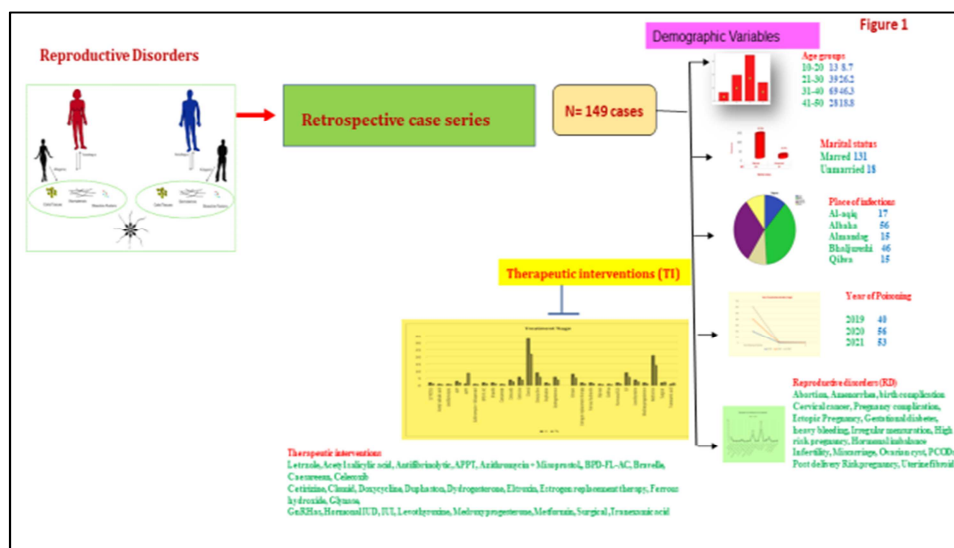


Fig. 1. Graphical representation of total number of reproductive disorders among various patients and possible therapeutic interventions provided in hospitals. “N” specifies total number of cases. “TI” signifies various treatment options provided to patients. “RD” signifies reproductive disorders.

Ethical consideration

The study was conducted according to the guidelines of the Declaration of Health Affairs and approved by the Institutional Review Board of Al-Baha University (IRB number: KF/IRB20112022/2).

Result and discussion

Result

Retrospective study

Demographic characteristics

A total of 149 cases of reproductive disorders were obtained from King Fahad hospital, Al-Baha. research is an epidemiological study of correlation of obesity with reproductive disorders. Descriptive information, including age, marital status, nationality, place of residence, disorders and treatment of the poisoned patients, is summarized in Table 1.

Table 1. Demographic characteristics of various patients suffering from reproductive disorders caused by obesity.

Variables categories		
Age Group	N	%
10-20	13	8.7
21-30	39	26.2
31-40	69	46.3
41-50	28	18.8
Marital status		
Married	131	87.9
Unmarried	18	12.1
Year of Reproductive Disorders		
2019	40	26.8
2020	56	37.6
2021	53	35.6
Region		
Al-Aqiq	17	11.4
Al-Baha	56	37.6
Almandag	15	10.1
Bhaljureshi	46	30.9
Qilwa	15	10.1
Nationality		
Saudi	4	87.9
Non-Saudi	145	12.1
Reproductive disorders		
Abortion	13	8.7
Amenorrhea	2	1.3
birth complication	2	1.3
Cervical cancer	2	1.3
Pregnancy complication	6	4.1
Ectopic Pregnancy	1	0.7
Gestational diabetes	2	1.3
heavy bleeding	3	2.0
Irregular mensuration	31	20.6
High risk pregnancy	2	1.3
Hormonal imbalance	3	2.0
Infertility	55	36.6
Miscarriage	2	1.3

Variables categories		
Age Group	N	%
Ovarian cyst	6	4.1
PCODs	13	8.7
Post delivery	1	0.7
Risk pregnancy	2	1.3
Uterine fibroids	3	2.0
Treatment regimen		
Letrzole	2	1.3
Acetyl salisalic acid	1	0.7
Antifibrinolytic	1	0.7
APPT	3.3	10.7
Azithromycin + Misoprostol	1	0.7
BPD-FL-AC	2	1.3
Bravelle	2	1.3
Caesareean	1	0.7
Celecoxib	4	2.7
Cetirizine	6	4
Clomid	33	22
Doxycycline	9	6
Duphaston	2	1.3
Dydrogesterone	6	4
Eltroxin	8	5.4
Estrogen replacement therapy	2	1.3
Ferrous hydroxide	2	1.3
Glynase	1	0.7
GnRHAs	1	0.7
Hormonal IUD	2	1.3
IUI	9	6
Levothyroxine	4	2.7
Medroxyprogesterone	2	1.32
Metformin	21	14.1
Surgical	2	2.4
Tranexamic acid	1	1.7

Age and Marital status

Of the 149 cases included, 131 (87.9%) were married patients and 18 (12.1%) were unmarried patients. Fig. 2 is showing the frequency of married and unmarried patients who were having reproductive disorders because of excess weight.

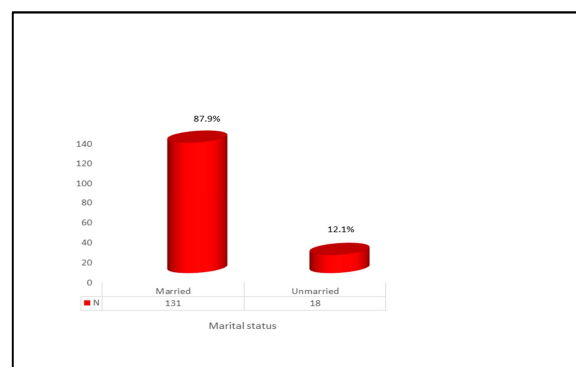


Fig. 2. Frequency and percentage of married and unmarried having reproductive complications. "N" signifies number of married and unmarried patients having reproductive disorders. Percentage (%) of married women was 87.9% and unmarried women 12.1%.

The lowest age of the patient was found to be ten-year-old and the highest age of the patient with a reproductive disorder was 50-year-old. It was observed that patients between the ages of 31 and 40 years were more susceptible to reproductive disorders due to obesity, and the percentage of the reproductive orders found in this group was 46.3%, followed by the age group of twenty-one to 30 years (26.2%). The patients whose age were in-between forty-one till fifty forty were having reproductive disorders (n=28, 18.8%). Obesity caused reproductive disorders have also been found in age group of 10 years till 20 years old patients as well with a percentage of 8.7% (Fig. 3)

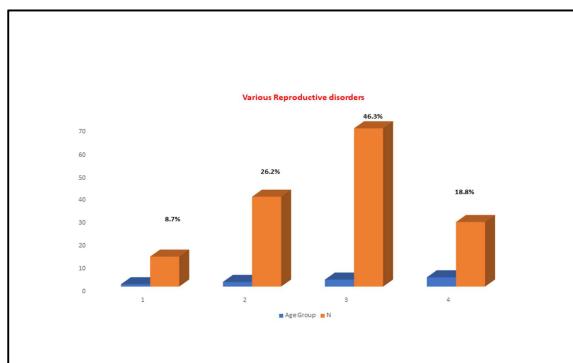


Fig. 3. Reproductive complications with respective to age groups. “N” signifies percentage of patients with different age groups having reproductive disorders. “1” signifies patients in between age groups of 10-20, “2” signifies patients in between age groups of 21-30, “3” signifies patients in between the age groups of 31-40 and “4” signifies patients in between the age groups of 41-50.

Various reproductive complications

In our study, we found that out of 149 obese patients, approximately 36.6% (n=55) had significant infertility complications, followed by 20.6% (n = 31) with irregular menstruation cycles. Patients with PCODs complications with rising obesity seem to be around 8.7%, and those with abortion seem to rise, with a percentage of approximately 8.7%. A few patients (1.3%) also had cervical cancer due to obesity (Fig. 4).

Therapeutic regimen

Various therapeutic options/medications were prescribed to the patients depending on the intensity of the complications. We investigated 22% of clomids

given to patients with infertility problems. Followed by metformin with a percentage of 14.1% and other medications (Fig. 5).

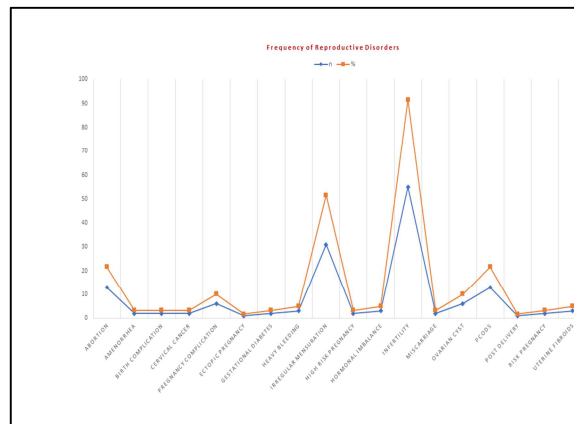


Fig. 4. Frequencies of reproductive complications among patients. “N” signifies number of patients suffering from various types of reproductive disorders and “%” signifies percentage of patients.

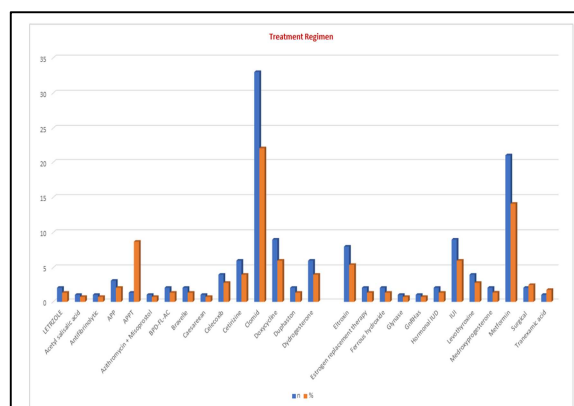


Fig. 5. Various therapeutic regimens provided to patients. “N” signifies number of patients taking therapeutic interventions suffering from various types of reproductive disorders and “%” signifies percentage of patients.

Region

In our study, patients with reproductive disorders were reported in various regions of Baha City, with a greater number found in the Al-Baha region (around 56 cases, 37.6%). This was followed by the Bhaljureshi region, marked by around 24 food poisoning cases, with a marked percentage of approximately 15.1%. Almandag (46 cases, 30.7%), Al-aqiq (17 patients, 11.4%), and Qilwa (15 patients each, 10.1%). The least food poisoning cases were noticed in Qilwa, with four

patients being infected with microbial contamination at a percentage of 2.5% (Fig. 6).

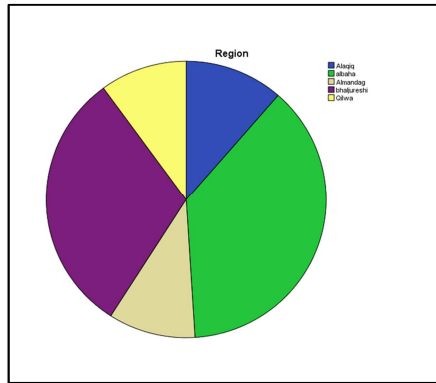


Fig. 6. Reproductive disorders among patients from various regions of Baha. The percentage calculated for various regions showing the rate of reproductive disorders among patients. Al-Baha (37.6%) signified by “Green” color, followed by Bhaljureshi (30.9%) signified by violet color, Al-Aqiq (11.4%) signified by blue color, and last one Al-Mandag and Qilwa (10.1%) signified by light brown and yellow color.

It was observed that out of 149 total cases, 56 cases of reproductive disorders were found in 2020, followed by 53 cases in 2021, and 40 cases in 2019. Fig. 7 shows the percentage of patients with various reproductive disorders between 2019 and 2021

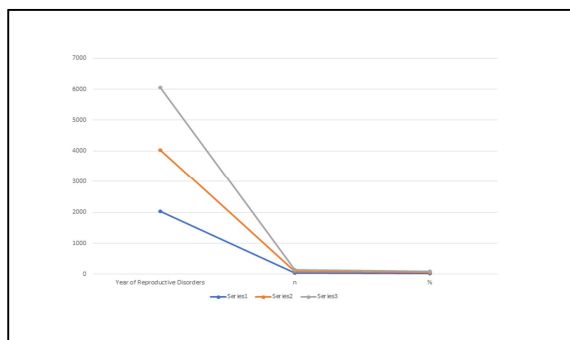


Fig. 7. Frequency of patients having reproductive disorders in the year of 2019-2021. “N” signifies number of patients in different years suffering from various types of reproductive disorders and “%” signifies percentage of patients in different years.

Correlation between reproductive disorders according to various age groups

We studied the relationship between reproductive disorders in various patients according to age group.

The lowest age that started complaining about reproductive disorders was reported to be ten-year-old kid and the highest age with reproductive disorders was fifty-year male patient. Table 2 shows correlation between reproductive disorders according to various age groups.

Table 2. Variations in the reproductive diagnosis with various age groups.

Reproductive Diagnosis	10-20	21-30	31-40	41-50	χ^2 P value
Abortion	0	3	6	4	
Amenorrhea	1	0	1	0	
birth complication	0	0	1	1	
Cervical cancer	0	0	1	1	
Pregnancy complication	0	2	3	1	
Ectopic Pregnancy	1	0	0	0	
Gestational diabetes	0	0	2	0	
heavy bleeding	0	1	0	2	
Irregular mensuration	8	13	5	5	132.37
High risk pregnancy	0	2	0	0	.001 ^s
Hormonal imbalance	2	0	1	0	
Infertility	1	10	34	10	
Miscarriage	0	1	1	0	
Ovarian cyst	0	2	1	3	
PCOS	0	3	10	0	
Post delivery	0	1	0	0	
Risk pregnancy	0	0	2	0	
Uterine fibroids	0	1	1	1	

χ^2 = chi-square analysis; s = significant difference; ns = non-significant difference; significance of *p* values is in bold.

A statistically significant difference ($\chi^2=132.37$, $P < .001$) was observed in various reproductive complications with varying severities with respect to patient age. Patients aged 31–40 years had the highest number of infertility cases because of the increased incidence of severe obesity. The rise in obesity due to lifestyle modifications can be a reason why the severity of obesity can hamper the reproductive mechanism in females, which can result in infertility. Moreover, ten infertility cases were also observed in the female age group of 21 to 30 years old patients. This was followed by an irregular menstrual cycle maximum observed in female patients aged 21–30 years. Eight patients were in the age group of 10 to 20 years, and persistent 5 cases were observed in 31- to 50-year-old patients. Polycystic ovary syndrome was also diagnosed within the age group of 31 to 40 years old female patients (10 cases). The study also showed a positive correlation between increased BMI

and spontaneous abortions in women aged 31–40 years, followed by those aged 41–50 years (four cases). Obese women had a lower risk of cervical cancer, as we investigated 2 cases found in Al-Baha. Uterine fibroids were rarely observed in a few patients with an increased BMI.

Treatment outcome with respective to age

We found a statistically significant difference (.05) between different age groups and patients administered a therapeutic regimen with reproductive complications (Table 3).

Table 3. Corelation between various treatment regime according to the age groups.

Treatment Provided	10-20	21-30	31-40	41-50	χ^2 P value
Letrzolet	0	1	1	0	
Acetyl salicylic acid	0	0	0	1	
Antifibrinolytic	0	0	0	1	
APPT	1	2	5	5	
Azithromycin + Misoprostol	0	1	1	0	
BPD-FL-AC	0	0	2	0	
Bravelle	0	0	2	0	
Caesareean	1	0	0	0	
Celecoxib	1	1	3	0	
Cetirizine	0	2	4	0	
Clomid	0	3	12	3	
Doxycycline	3	3	3	0	
Duphaston	0	1	1	0	148.338
Dydrogesterone	0	2	1	3	.05 ^s
Eltroxin	0	2	5	1	
Estrogen replacement therapy	3	0	4	0	
Ferrous hydroxide	0	2	0	0	
Glynase	0	0	1	0	
GnRHas	0	0	1	0	
Hormonal IUD	1	0	0	2	
IUI	0	3	3	3	
Levothyroxine	0	1	3	0	
Medroxyprogesterone	0	1	0	1	
Metformin	3	11	5	1	
Surgical	0	0	1	1	
Tranexamic acid	0	0	1	1	

χ^2 = chi-square analysis; s = significant difference; ns = non-significant difference; significance of p values is in bold.

As we noticed maximum infertility cases, a nonsteroidal fertility medicine, clomid, was administered to patients aged 31–40 years. Various therapeutic medications have been administered to patients with various pregnancy disorders in various age groups. The chi square ($\chi^2 = 148.338$, P value .05)

Outcome of body mass index with respect to the age

We calculated the BMI of various patients and classified their obesity levels according to their weight and height. Chi-square ($\chi^2 = 65.85$, $P = .05$). The maximum severity of obesity was observed between the ages of 31 and 40 years. Excess body weight increases the risk of reproductive disorders in adults aged between 31 and 50 years. The relative risk associated with greater body weight was higher among younger subjects. We observed various patients with BMI > 27 till BMI=50 and found severe reproductive complications. Table 4 is showing the outcome of various obesity disorders with respect to various age groups

Table 4. Correlation between BMI and obesity outcome according to the age groups.

Height	Weight	BMI	Outcome	10-20	21-30	31-40	41-50	χ^2 P value
153	65	27	Overweight	0	1	1	0	
154	67	28	Overweight	0	0	0	1	
157	71	29	Grade 1 obesity	0	0	0	1	
146	60	30	Grade 1 obesity	0	0	3	0	
156	77	31	Grade 1 obesity	1	2	5	5	
157	78	32	Grade 1 obesity	0	1	1	0	
155	80	33	Grade 1 obesity	0	0	2	0	
164	91	34	Grade 1 obesity	0	0	2	0	
148	75	35	Grade 2 obesity	1	0	0	0	
147	80	36	Grade 2 obesity	1	1	3	0	
159	93	37	Grade 2 obesity	0	2	4	0	65.58
156	94	38	Grade 2 obesity	0	3	12	3	.05 ^s
158	97	39	Grade 2 obesity	3	3	3	0	
154	94	40	Grade 3 obesity	0	1	1	0	
170	118	41	Grade 3 obesity	0	2	1	3	
159	106	42	Grade 3 obesity	0	2	5	1	
156	105	43	Grade 3 obesity	3	0	4	0	
150	100	44	Grade 3 obesity	0	2	0	0	
152	105	45	Grade 3 obesity	0	0	1	0	
148	102	47	Grade 3 obesity	0	0	1	0	
156	119	50	Grade 3 obesity	1	0	0	2	

χ^2 = chi-square analysis; s = significant difference; ns = non-significant difference; significance of p values is in bold

We noticed variations in BMI among patients in different age groups. Patients with BMI≥27 were considered overweight, and two patients within the age group of 21-30 and 31-40 were considered overweight. Furthermore, we classified some patients as grade I obese, particularly those with BMI ≥30-34. In grade I obesity, we identified 18 patients of different ages. Patients with BMI≥ 35-39 were considered to have grade 2 obesity, and in our study, we found 36 patients in various groups with BMI

between 30 till 34 and were considered to have grade 2 obesity. Grade3 obesity was observed in patients with a BMI \geq 40. In our study, we found thirty patients of various age groups had grade 3 obesity.

Discussion

The prevalence of obesity has grown globally, along with an apparent decrease in fertility and other reproductive complications (Dag and Dilbaz, 2015). Despite the fact that there is currently inadequate evidence to suggest that human fecundity is decreasing as a result of obesity, experimental investigations on animal models and humans have revealed clear links between obesity and infertility in both males and females (Silvestris *et al.*, 2019). Studies included in our research generally show a positive effect on fertility of various therapeutic regimens that are provided and the duration of intervention. The participants in the studies were exclusively patients with all types of reproductive disorders and obesity. No study has exclusively examined obese non-PCOS patients. Evidence indicates a link between high BMI and periconceptual phases in both men and women (Hieronimus and Ensenauer, 2021). Obese women who want to become pregnant have a lengthier conception, even if they are young and have a regular menstrual cycle (Silvestris *et al.*, 2019). In support of these observational data, female mice with diet-induced obesity ovulate eggs with developmental delays to the blastocyst stage and give birth to embryos with altered cell type proportions (Di Berardino *et al.*, 2022). Furthermore, obesity appears to alter the aging and function of the ovary in women, as reported in the general population, and was recently confirmed in a cohort of female survivors of childhood cancer (Schmandt *et al.*, 2011). Our study showed the prevalence of obesity and being overweight as an alarming call for all female patients who later had various reproductive complications. In our study, we found that in 36.6% (N=55) of 150 obese individuals, obesity contributed significantly to infertility issues, followed by 20.6% (n = 31) of patients who had irregular menstrual cycles. The proportion of patients with PCODs associated with increased obesity appears to be approximately 8.7%, while that of patients experiencing abortion

appears to be approximately 8.7%. Obesity causes cervical cancer in a small number of cases (1.3%). Obesity may be caused by sedentary lifestyle. Lack of physical activity and the high caloric intake of typical meals are other issues. Obesity can even be regarded as a sign of wealth. As a result, many females gain weight after marriage, experience cycle disruptions, and acquire infertility (Silvestris *et al.*, 2019). The comparatively high percentage of anovulation in the normal-weight group can be explained by the fact that one of the reasons patients are sent to our hospital is ovulation induction with gonadotropins in clomiphene-resistant anovulation (Weiss *et al.*, 2019). Another study reported that obese women frequently have oligomenorrhea, amenorrhea, or irregular periods (Itriyeva, 2019). The link between obesity and excessive menstrual bleeding is not well established, and statistics on its prevalence are scarce. While the inquiry techniques for obese women should be the same as for normal-weight women, special attention is necessary to rule out endometrial hyperplasia (Reavey *et al.*, 2021). Our study also showed that an increase in obesity causes an increase in amenorrhea and irregular menstruation cycles in female patients. We found approximately 31 patients who had irregular periods and two females who had amenorrhea-like complications.

In general, therapeutic approaches for menstruation abnormalities in obese women are comparable to those in normal-weight women. When dealing with women with a high BMI, therapeutic results in terms of efficacy and unfavourable consequences require special care (BMI). Different treatment techniques are discussed in this section, with special emphasis on the influence of weight on efficacy and obstacles in delivering each treatment choice. Obesity is a characteristic of polycystic ovarian syndrome (PCOS). PCOS is the most frequent hormonal disorder in women of reproductive age, accounting for 7% of this group (Cena *et al.*, 2020). PCOS causes elevated androgen production and abnormal gonadotropin secretion, resulting in monthly irregularity, hirsutism, and infertility (Sadeghi *et al.*, 2022). This study is in support of our research, where we found an increase in PCOS (N=13 and 8.7%) cases in patients whose BMI was \geq 40.

To date, the genes responsible for PCOS have not yet been identified. Given the strong relationship between PCOS and obesity, it is possible that comparable or interconnected genes contribute to obesity in affected women. Environmental variables (high-calorie meals and lack of exercise) have a significant influence on the high prevalence of obesity among women with PCOS (Aversa *et al.*, 2020). A previous study showed an association between visceral fat and the development of uterine fibroids in adult women (Sun *et al.*, 2019). The likelihood of uterine fibroids increased when the VFA, BMI, waist circumference, waist height ratio, and waist-to-hip ratio increased. BMI, VFA, and waist circumference of individuals with uterine fibroids increased steadily with age, with statistically significant variations. Increased body fat (particularly abdominal visceral fat) can increase the risk of uterine fibroids (Yang *et al.*, 2014). Our study also showed a correlation between fibroids and an increase in obesity in female patients, and patients aged 21–40 years were maximally affected.

Our study also investigated the association between obesity and abortion rate. In our study, we found that patients aged 21–50 years had the highest abortion rate and their BMI was ≥ 47 . Our study is supported by some studies showing that maternal obesity is generally recognized as one of the most prevalent risk factors in obstetric practice (Nurul-Farehah and Rohana, 2020). Obese women have a higher risk of miscarriage, gestational diabetes, preeclampsia, venous thromboembolism, induced labour, caesarean section, anaesthetic complications, and wound infections than women who have a healthy pre-pregnancy weight, and they are less likely to initiate or maintain breastfeeding (Riley *et al.*, 2018). Babies born to fat mothers are more likely to experience stillbirth, congenital abnormalities, preterm birth, macrosomia, and neonatal mortality. Obesity exposure during pregnancy is also linked to an increased risk of juvenile obesity and metabolic diseases (Glastras *et al.*, 2018). Various treatment options were provided by physicians with different stages of pregnancy disorders, as we found in our study, a range of medications that treat various

reproductive disorders. We found a statistically significant difference (0.05) across various age groups and individuals receiving treatment for reproductive problems. As we observed in the majority of infertility cases, clomid, a non-steroidal fertility drug, was administered to patients aged 31–40 years. Various treatment drugs have been administered to individuals of various ages with various pregnancy problems. It is now related to a variety of health issues that can impair an individual's quality of life while also being a financial burden on the government. Because of the favourable effects of weight loss, lifestyle intervention programs should be used as first-line treatment for women with infertility. Insulin-sensitizing medications may have additional advantages, particularly when used in conjunction with hypocaloric diets.

Conclusion

Customized pharmaceutical assistance for weight reduction and insulin resistance should be routinely used in clinical practice for infertile obese individuals. Obesity is becoming more common in Saudi Arabia and affects a significant percentage of women of reproductive age. Obesity lowers natural reproduction rates and fertility treatment rates. Obese women have a lower chance of success with assisted reproductive technologies, a higher risk of miscarriage, and a higher risk of maternal/foetal problems during pregnancy. Weight reduction is the cornerstone of therapy and is critical for improving the safety and effectiveness of natural and treatment-related concepts. Unfortunately, it is difficult for individuals with obesity to lose weight, and most therapies, except for bariatric surgery, result in only moderate weight reduction that is difficult to sustain. Obese patients should be thoroughly evaluated throughout the preconception period and any concomitant problems should be addressed.

Recommendation(S)

- Obese women should be made aware that their risk of anovulatory infertility is more than double that of non-obese women (strong recommendation, low quality evidence).

- Obese women should be informed that their natural fertility rates are reduced even when they are ovulating (strong recommendation, moderate quality evidence).
- Obese men should be informed that they are at a higher risk of erectile dysfunction, which can be treated by losing weight (strong recommendation, high quality evidence).
- Women with an increased BMI should be informed that as the severity of obesity increases, so do the rates of implantation, clinical pregnancy, and live birth. According to the most recent data, each 1kg/M² increase in BMI above 25 causes a 0.3% to 0.4% decrease in live birth rates (strong recommendation, moderate quality evidence).
- Women who are obese should be offered or referred for lifestyle changes (diet + exercise) as a first line of defense to help them lose weight (strong recommendation, low quality evidence).
- Women with obesity who are unable to lose weight through lifestyle changes may be referred to other practitioners/specialists who can provide appropriate counselling on other therapies such as pharmacotherapy and bariatric surgery (strong recommendation, moderate quality evidence).
- Programs that enforce BMI cut-offs should provide patients with options to help them lose weight and educate them on the risks and benefits of delaying reproductive therapy (strong recommendation, low quality evidence).

Abbreviation

WHO= World health organization; BC= Al-Baha city; PCOS= Polycystic ovarian syndrome; OC= Ovarian cysts; RD= Reproductive Disorders; FSH= Follicle stimulating hormone; LH= Luteinizing hormone.

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