

Knowledge, attitude, and practices of infertility among Saudi couples

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Introduction: Infertility places a huge psychological burden on infertile couples, especially for women. Greater knowledge of the factors affecting fertility may help to decrease the incidence of infertility by allowing couples to avoid certain risk factors. The aim of our study was (1) to assess the knowledge and attitudes of infertile and fertile Saudi participants on infertility, possible risk factors, and social consequences; and (2) to determine the practices of infertile Saudi couples to promote their fertility before having them attend an in vitro fertilization (IVF) clinic.

Methods and materials: We conducted a cross-sectional study on 277 fertile participants from outpatient clinics and 104 infertile patients from the IVF clinic at King Abdulaziz Medical City between June 24, 2012 and July 4, 2012, using a previously validated interview questionnaire. Descriptive and analytical statistics were applied with a significance threshold of $P \leq 0.05$.

Results: A generally poor level of knowledge (59%) and a neutral attitude (76%) toward infertility were reported by participants. Mistaken beliefs commonly held by the study participants regarding the causes of infertility were Djinn and supernatural causes (58.8%), black magic (67.5%), intrauterine devices (71.3%), and contraceptive pills (42.9%). The healer/Sheikh was reported as the primary and secondary preference for infertility treatment by 6.7% and 44.2% of IVF patients, respectively. Compared with fertile patients, IVF patients were significantly less likely to favor divorce (38.5% versus 57.6%; $P = 0.001$) or marriage to a second wife (62.5% versus 86.2%; $P < 0.001$), if the woman could not have a baby. The patients with infertility had more favorable attitudes toward fertility drugs (87.5% versus 68.4%; $P = 0.003$) and having a test tube baby (92.4% versus 70.3%; $P < 0.001$). Child adoption was accepted as an option for treatment by the majority of IVF patients (60.6%) and fertile outpatients (71.5%). Alternative treatments previously practiced by the IVF patients to improve fertility include practicing Ruqia (61%), using alternative medicine (42%), engaging in physical exercise (39%), eating certain foods (22%), and quitting smoking (12%).

Conclusion: These findings have implications for health care providers regarding the reluctance that couples experiencing fertility problems may have, at least initially, to accept some interventions required for the couple to conceive.

Keywords: infertility, knowledge, attitude, practice, KAP, misconceptions

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Introduction

Infertility is a global phenomenon that affects between 60 million and 168 million people worldwide.¹ It affects 13% to 15% of couples worldwide.² It places a huge psychological burden on the infertile couple, especially on the woman, and it may lead to depression, suicidal tendencies, and other pathologic psychological conditions.³ The medical definition of infertility is the failure to conceive after 12 months of unprotected sexual intercourse.⁴ Primary infertility is the inability to conceive after

1 year of unprotected sexual intercourse with no previous conceptions. Secondary infertility occurs when couples who have previously conceived children are now unable to conceive.^{4,5} According to a retrospective analysis of 70 patients attending a gynecological clinic and seen by a consultant at the Riyadh Military Hospital in Saudi Arabia, 58.6% of infertile patients complained of primary infertility, whereas 41.4% complained of secondary infertility.⁶

Infertility is surrounded by many mistaken beliefs about its causes, such as witchcraft and possession by evil spirits, and these beliefs negatively affect its management.⁷ In a previous study on an adult population in Pakistan,⁸ only 25% correctly identified when infertility is pathological and only 46% knew about the fertile period in a woman's cycle. Evil forces and supernatural powers were widely held as causes of infertility. In Kuwaiti women, most educated participants blamed infertility on nutritional, marital, and psychosexual factors, but participants who were not literate blamed their infertility on supernatural causes, such as evil spirits, witchcraft, and God's retribution.³

The risk factors for infertility include smoking, obesity, alcohol consumption, advanced maternal age, sexually transmitted infections, and many others.⁷ Increasing the level of knowledge of these factors may help to decrease the incidence of infertility by allowing couples to avoid certain risk factors that might lead to it. This knowledge may also help wider society to understand and empathize with the infertile couple, which may lead to a decrease in the psychological burden to those affected.⁹ Because infertility is a taboo subject, people accumulate many misconceptions about reproductive health and fertility all over the world. However, in Saudi Arabia, with an Arab Islamic community, no previous studies have been conducted to assess the level of knowledge or the attitudes related to infertility. Thus, the aims of this KAP (knowledge, attitude, and practices) study were 1) to assess the knowledge and the attitudes of fertile and infertile Saudi couples regarding infertility and its social consequences; and 2) to identify infertile couples' expectations of the success rate of in vitro fertilization (IVF) and determine the practices of infertile Saudi couples to promote their fertility before having them attend an IVF clinic.

Methods and materials

Study design

We conducted a comparative cross-sectional study.

Study setting

We conducted this study in the IVF unit and in the outpatient clinic at King Abdulaziz Medical City (KAMC),

Riyadh, Saudi Arabia. KAMC is a multientity tertiary hospital that provides care to more than 500,000 patients annually and has more than 1,000 beds with an increasing capacity. It was originally built for the medical services of the Saudi National Guard. However, it now serves all Saudi nationals who are in need of tertiary care. All medical services are provided free of charge at KAMC. KAMC strives to attain the highest clinical research standards to ensure the safety of its patients. In September 2004, there was an expansion and renovation of the IVF clinic (recently known as the Division of Reproductive Medicine), which performs approximately 700 IVF trials per year.

Study participants and sampling technique

The required sample size was estimated at 277 participants on the basis of results obtained in a previous study,² in which 25% of participants exhibited good knowledge of fertility, together with a confidence limit of 95% and a 5% precision level. Thus, 373 participants were enrolled in the study to compensate for dropouts. These 373 participants were allocated to two groups. The first group included outpatients visiting KAMC ($n = 269$) between June 24, 2012 and July 4, 2012, and those accompanying them who were chosen randomly from those who were willing to participate in the study. The second group included all infertile patients who attended the IVF clinic ($n = 104$) during the same period of study.

Data collection methods

The study was based on an interview questionnaire. The questionnaire was initially designed by the research team according to a previously validated questionnaire.^{8,10} The interview questionnaire was translated into Arabic. The test-retest reliability was measured in a pilot study of 20 participants (twelve outpatients and eight infertile patients) on the day before data collection was started. Discussions with various relevant experts at King Abdullah International Medical Research Center (KAIMRC) confirmed the content validity and feasibility of the questionnaire to ensure relevance and clarity of the questions. Several additions and amendments were made to ensure that the questions were valid in a Saudi context. The interview schedule was composed of five parts:

- The first part collected demographic data of the patients, such as age, gender, occupation, education, and monthly income.
- The second part assessed the level of knowledge regarding infertility.⁸ This part consisted of a total of 15 statements.

The statements were concerned with different possible factors that may affect fertility and some infertility-related misconceptions. The correct response was scored as “1.” Incorrect and “Don’t know” responses were scored as “0.” An overall knowledge score was calculated by summing the scores for the statements. Thus, the highest possible score was 15 points. The mean percentage score was calculated.

- The third part concerned attitudes toward infertility.^{8,10} This was a seven-item attitude statement scale that used a five-point Likert scale to evaluate the participants’ attitudes toward beliefs about infertility and its social consequences. The statements were concerned with their beliefs about the nature of infertility, its severity, the obligations of society toward childless couples, the right of a couple to have children, beliefs about medical treatment of infertility, divorce and remarriage, and adoption as an alternative solution. Participants gave “Strongly agree,” “Agree,” “Not sure,” “Disagree,” or “Strongly disagree” responses to all of the questions. The negative attitude statements were scored from 1 (“Strongly agree”) to 5 (“Strongly disagree”). The reverse of this scoring system was used for the positive attitude statements. Accordingly, the maximal total score for the attitude questions was 35 and the minimal score was 7. The mean percentage score was calculated.
- The fourth part concerned attitudes toward the social consequences of infertility.⁸ This six-item attitude statement scale used a five-point Likert scale to evaluate the participants’ attitudes toward the social consequences of infertility. The statements involved beliefs about medical treatment of infertility, divorce and remarriage, and adoption as an alternative solution. The maximal total score for the attitude questions – according to the Likert scale – was 30 and the minimal score was 6. The mean percentage score was calculated. Additional questions were 1) “Who should be tested first for infertility?” (“Husband,” “Wife,” “Both”); 2) “Who is being blamed for infertility?”; and 3) another two questions dealt with the choice of primary and secondary consultations for the couple.
- The fifth part entailed participants facing infertility who attended the IVF clinic of KAMC. Variables in this part were type of infertility, diagnosis, previous IVF trials and their outcome, the patient’s expectations regarding the success rate of IVF, and previous practices performed to improve fertility. The average IVF success rate per IVF trial was estimated for all of the previous trials.

Ethical considerations

All interviews were performed in private rooms. The participants were informed that their decision regarding participation would not affect their treatment or their relationships with their physicians. Only participants who were willing to participate in the study, after being fully informed of the aim of the study and methodology, were included in the target sample of the study. All participants had the right not to participate in the study or to withdraw from the interview before completion. Participants were asked not to mention their names during the interview so as to be anonymous. Data were treated confidentially by the principle investigator (PI) and coinvestigators. The study protocol received ethical approval from the Saudi National Guard Health Affairs, Riyadh, Saudi Arabia (Application number RR012/108).

Data analysis

The Statistical Package for the Social Sciences (SPSS version 17.0; IBM Corporation, Armonk, NY, USA) was used for data analysis. The arithmetic mean was used as a summary statistic for quantitative data. The standard deviation was used as a measure of dispersion. The chi square test, the Monte Carlo test, and Fisher’s exact test were used as tests of significance to compare categorical data. Student’s *t*-test was used as a test of significance to compare numerical data. Multiple regression analyses were used to determine the significant predictors of the patient’s overall knowledge and attitude scores related to infertility and its consequences. For all statistical analyses, a *P*-value < 0.05 was considered to be significant.

Results

Sociodemographic characteristics of the study participants

Table 1 shows some infertility-related characteristics of the IVF patients. The patients were distributed by the type of infertility (52.5% primary and 47.5% secondary) and the affected individual(s) in the couple (35.4% male, 30.3% female, 5.1% both), and unknown (29.2%). Oligospermia ranked the first diagnosis (29.3%), whereas anovulation was the second (13.1%). For more than half of IVF patients (57.6%), the success rate expected for the IVF trial ranged from 25%–74% and was $\geq 75\%$ for 28.3% of these patients and $\leq 25\%$ for a further 14.1%. The success rate per IVF trial was estimated as 17%.

Table 2 shows the distribution of Saudi fertile outpatients (*n* = 269) and infertile IVF patients (*n* = 104) according to selected sociodemographic characteristics. The majority of outpatients were men (88.5%), whereas the majority of IVF patients were women (64.4%) (*P* < 0.001). The fertile

Table 1 Infertility-related characteristics of IVF patients

Characteristics	N = 99	%
Type of visit		
First visit	27	27.3
Follow-up	72	72.7
Type of infertility		
Primary	52	52.5
Secondary	47	47.5
Affected couple		
Male factor	35	35.4
Female factor	30	30.3
Both	5	5.1
Unknown	29	29.2
Diagnosis in men		
Azoospermia	6	6.1
Oligospermia	29	29.3
Teratospermia	3	3.0
Hyperprolactinemia	4	4.0
High semen viscosity	1	1.0
Low semen volume	2	2.0
Diagnosis in women		
Polycystic ovarian disease	9	9.1
Endometriosis	3	3.0
Anovulation	13	13.1
Fallopian tube blockage	5	5.1
Vaginal septum	1	1.0
Unexplained	23	23.3
What success rate do you expect for conception by IVF?		
<25%	13	14.1
25%–74%	53	57.6
≥75%	26	28.3
Success rate per IVF trial		17.0

Abbreviations: IVF, in vitro fertilization; N, number.

outpatients were significantly older than the IVF patients (mean age, 35.84 years versus 33.84 years; $t = 3.15$; $P = 0.002$). Both groups were mostly of urban origin (92.8%), with secondary education and higher (67.6%). The majority of participants were employed (69.5% of fertile outpatients versus 61.1% of IVF patients; $P < 0.001$), and the largest subgroup had a monthly income of 1,500 to 3,000 USD (43.9% of fertile outpatients versus 37.5% of IVF patients; $P < 0.001$).

Knowledge and misconceptions related to infertility

Table 3 shows the distribution of Saudi fertile and infertile patients according to their knowledge and misconceptions of the factors that may affect sterility. Both IVF patients and fertile outpatients showed a low level of knowledge regarding factors that may affect fertility, as indicated by the mean percentage score for knowledge, with a significantly higher level found among IVF patients (45.91% versus 41.68%; $t = 2.14$; $P = 0.035$). This higher level of knowledge was evident from the frequency at which they correctly reported

Table 2 Sociodemographic characteristics of the IVF patients and fertile outpatients

Variable	IVF patients (N = 104) N (%)	Outpatients (N = 269) N (%)	Total (N = 373) N (%)	P-value*
Gender				
Male	37 (35.6)	238 (88.5)	275 (73.7)	<0.001**
Female	67 (64.4)	31 (11.5)	98 (26.3)	
Age (years)				
15–24	7 (6.7)	34 (12.6)	41 (11.0)	0.001**
25–39	81 (77.9)	149 (55.4)	230 (61.7)	
40–59	16 (15.4)	76 (28.3)	92 (24.7)	
≥60	0 (0.0)	10 (3.7)	10 (2.7)	
Mean (SD)	33.84 ± 6.06	35.84 ± 11.13	35.05 ± 10.05	$t = 3.15$; $P = 0.002$ **
Origin				
Urban	96 (92.3)	250 (92.9)	346 (92.8)	0.833
Rural	8 (7.7)	19 (7.1)	27 (7.2)	
Educational level				
<Secondary	40 (38.5)	81 (30.1)	121 (32.4)	0.122
≥Secondary	64 (61.5)	188 (69.9)	252 (67.6)	
Occupation				
Unemployed	12 (11.5)	48 (17.8)	60 (16.1)	<0.001**
Student	2 (1.9)	19 (7.1)	21 (5.6)	
Employed	228 (61.1)	187 (69.5)	228 (61.1)	
Home maker	64 (17.2)	15 (5.6)	64 (17.2)	
Monthly income (USD)				
<1,500	23 (22.1)	61 (22.7)	84 (22.5)	<0.001**
1,500–3,000	39 (37.5)	118 (43.9)	157 (42.1)	
>3,000	25 (24.0)	85 (31.6)	110 (29.5)	
No answer	17 (16.3)	5 (1.9)	22 (5.9)	

Notes: *Chi square test was applied; **statistical significance at $P < 0.05$.

Abbreviations: IVF, in vitro fertilization; N, number; SD, standard deviation; USD, US dollars.

the following possible causes for infertility compared with the same measure in the fertile outpatient group: abnormal menses (64.4% versus 43.1%; $P = 0.001$), blocked fallopian tubes (77.8% versus 65.8%; $P = 0.032$), psychological distress (72.1% versus 58.7%; $P = 0.008$), endocrine problems (66.4% versus 37.9%; $P < 0.001$), and obesity (70.2% versus 55.4%; $P = 0.026$). However, after adjustment for age, gender, occupation, and monthly income by multiple regression analysis, the level of knowledge regarding factors that may affect fertility was indifferent between the two groups of patients ($t = 1.40$; $P_{\text{adjustment}} = 0.37$). The causes to which both groups of participants erroneously attributed infertility included black magic (85.8%), Djinn/supernatural causes (80.7%), and vigorous exercise (80.4%).

Attitude toward infertility and its social consequences

Table 4 shows the response of IVF patients and fertile outpatients to some attitudinal statements toward infertility

Table 3 Knowledge and common misconceptions about factors that may affect sterility

Question	Response			P-value*
	Yes N (%)	No N (%)	Do not know N (%)	
May any of the following affect sterility?				
Abnormal menses (ovulatory factors)				
IVF	67 (64.4)***	22 (21.2)	15 (14.4)	0.001**
OP	116 (43.1)***	84 (31.2)	69 (25.7)	
Blocked tubes				
IVF	81 (77.8)***	9 (8.7)	14 (13.5)	0.032**
OP	177 (65.8)***	22 (8.2)	70 (26.0)	
History of infections of the genitourinary tract in women				
IVF	52 (50.0)***	27 (26.0)	25 (24.0)	0.127
OP	164 (61.0)***	49 (18.2)	56 (20.8)	
History of infections of the genitourinary tract in men				
IVF	58 (55.8)***	28 (26.9)	18 (17.3)	0.240
OP	167 (62.1)***	51 (19.0)	51 (18.9)	
Drinking alcohol				
IVF	56 (53.9)***	20 (19.2)	28 (26.9)	0.163
OP	123 (45.7)***	77 (28.6)	69 (25.7)	
Smoking				
IVF	53 (51.0)***	33 (31.7)	18 (17.3)	0.059
OP	125 (46.5)***	116 (43.1)	28 (10.4)	
Vigorous exercise				
IVF	21 (20.2)***	64 (61.5)	19 (18.3)	0.163
OP	52 (19.3)***	187 (69.5)	30 (11.2)	
Previous use of contraceptive pills				
IVF	46 (44.3)	31 (29.8)***	27 (25.9)	0.830
OP	114 (42.4)	89 (33.1)***	66 (24.5)	
Previous use of intrauterine devices				
IVF	82 (78.8)	14 (13.5)***	8 (7.7)	0.100
OP	184 (68.4)	62 (23.0)***	23 (8.6)	
Black magic				
IVF	75 (72.1)	10 (9.6)***	19 (18.3)	0.275
OP	177 (65.8)	43 (16.0)***	49 (18.2)	
Djinn/supernatural causes				
IVF	66 (63.4)	14 (13.5)***	24 (23.1)	0.196
OP	151 (56.1)	58 (21.6)***	60 (22.3)	
Psychological distress				
IVF	75 (72.1)***	17 (16.4)	12 (11.5)	0.008**
OP	158 (58.7)***	87 (32.3)	24 (9.0)	
Marriage at an advanced age				
IVF	56 (53.8)***	35 (33.7)	13 (12.5)	0.081
OP	117 (43.5)***	125 (46.5)	27 (10.0)	
Endocrine problems				
IVF	69 (66.4)***	17 (16.3)	18 (17.3)	<0.001**
OP	102 (37.9)***	62 (23.1)	105 (39.0)	
Diabetes mellitus				
IVF	34 (32.7)***	53 (51.0)	17 (16.3)	0.397
OP	92 (34.2)***	147 (54.6)	30 (11.2)	
Obesity				
IVF	73 (70.2)***	20 (19.2)	11 (10.6)	0.026**
OP	149 (55.4)***	86 (32.0)	34 (12.6)	
% mean score (\pm SD)				
IVF	45.91 \pm 1.71			$t = 2.144, P = 0.035$ *** $P_{\text{adjustment}} = 0.37$
OP	41.68 \pm 1.05			

Notes: *Chi square test was applied; **statistical significance at $P < 0.05$. P-value adjusted for age, gender, occupation, and monthly income; ***correct knowledge.

Abbreviations: N, number; IVF, in vitro fertilization group; OP, fertile outpatient group; SD, standard deviation.

Table 4 Attitudes of IVF patients and fertile outpatients toward infertility and its social consequences

Statements	Response					P-value [@]
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	
A. Attitude toward infertility						
I think that infertility is a disease						
IVF	27 (26.0)	29 (27.9)	16 (15.4)	25 (24.0)*	7 (6.7)*	<0.001**
OP	62 (23.1)	59 (21.9)	17 (6.3)	56 (20.8)*	75 (27.9)*	
I think that infertility is a handicap						
IVF	9 (8.6)	7 (6.7)	9 (8.7)	52 (50.0)*	27 (26.0)*	<0.001**
OP	29 (10.8)	80 (29.7)	19 (7.1)	52 (19.3)*	89 (33.1)*	
I think that infertility is a simple problem						
IVF	14 (13.4)*	37 (35.6)*	15 (14.4)	27 (26.0)	11 (10.6)	<0.001**
OP	40 (14.9)*	74 (27.5)*	15 (5.6)	47 (17.5)	93 (34.5)	
I think infertility should be treated medically						
IVF	76 (73.1)*	21 (20.2)*	4 (3.8)	3 (2.9)	0 (0.0)	0.130
OP	185 (68.7)*	75 (27.9)*	7 (2.6)	1 (0.4)	1 (0.4)	
I think it is a human right to have children						
IVF	84 (80.8)*	19 (18.3)*	0 (0.0)	0 (0.0)	1 (0.9)	0.382
OP	222 (82.5)*	37 (13.8)*	5 (1.9)	3 (1.1)	2 (0.7)	
I think that it is society's obligation to help childless couples						
IVF	72 (69.2)*	21 (20.2)*	6 (5.8)	3 (2.9)	2 (1.9)	0.503
OP	192 (71.4)*	59 (21.9)*	7 (2.6)	9 (3.4)	2 (0.7)	
I think that if a couple conceives once, they might have problems conceiving again						
IVF	34 (32.7)	37 (35.6)	16 (15.4)	10 (9.6)	7 (6.7)	0.0004**
OP	47 (17.5)	88 (70.4)	48 (17.8)	45 (16.7)	41 (15.3)	
% mean score (\pm SD)						
IVF	69.68 \pm 10.77					$t = 2.76, P = 0.006^{**}$ $P_{\text{adjustment}} = 0.007^{**}$
OP	66.03 \pm 11.73					
B. Attitude toward the social consequences of infertility						
I think that if the woman cannot have a baby, this is grounds for divorce						
IVF	16 (15.4)	24 (23.1)	13 (12.5)	32 (30.8)*	19 (18.2)*	0.001**
OP	89 (33.1)	66 (24.5)	18 (6.7)	46 (17.1)*	50 (18.6)*	
I think if a woman cannot have children, this is a valid reason for the man to marry a second time						
IVF	22 (21.2)	43 (41.3)	10 (9.6)	20 (19.2)*	9 (8.7)*	<0.001**
OP	141 (52.4)	91 (33.8)	9 (3.3)	12 (4.5)*	16 (6.0)*	
I think if a couple cannot have a child, they should adopt						
IVF	28 (26.9)*	36 (34.6)*	17 (16.3)	15 (14.4)	8 (7.8)	0.417
OP	94 (34.9)*	96 (35.7)*	32 (11.9)	27 (10)	20 (7.5)	
I think it is acceptable to have a test-tube baby						
IVF	53 (51.0)*	43 (41.4)*	4 (3.8)	4 (3.8)	0 (0.0)	<0.001**
OP	103 (38.3)*	86 (32.0)*	43 (16.0)	18 (6.7)	19 (7.0)	
I think fertility drugs are acceptable						
IVF	46 (44.2)*	45 (43.3)*	9 (8.7)	2 (1.9)	2 (1.9)	0.003**
OP	93 (34.6)*	91 (33.8)*	37 (13.7)	25 (9.3)	23 (8.6)	
% mean score (\pm SD)						
IVF	61.22 \pm 15.81					$t = 1.488, P = 0.149,$ $P_{\text{adjustment}} = 0.143$
OP	61.22 \pm 15.81					

Notes: *Positive attitude. @Chi square test was applied; **statistical significance at $P < 0.05$. P-value adjusted for age, gender, occupation, and monthly income.

Abbreviations: IVF, in vitro fertilization group; OP, fertile outpatient group; SD, standard deviation.

and its social consequences. The table shows an overall neutral attitude toward infertility, as denoted by the mean percentage score, with IVF patients reporting a significantly higher mean percentage score (69.68% versus 66.03%; $t = 2.76$; $P = 0.006$). Even after adjustment for age, gender, occupation, and monthly income by multiple regression analysis, the level

of attitude toward infertility was significantly more favorable among IVF patients ($t = 2.72$; $P = 0.007$). Most of the IVF patients and fertile outpatients agreed that infertility should be treated medically (93.3% versus 96.6%, respectively; $P = 0.13$), that having children is a human right (99.1% versus 96.3%, respectively; $P = 0.38$), and that helping

childless couples is a social obligation (89.4% versus 93.3%, respectively; $P = 0.50$). IVF patients positively responded more than fertile outpatients that infertility is a simple problem (49.0% versus 42.4%, respectively; $P < 0.001$), that a couple who conceives once might have a problem conceiving again (68.3% versus 87.9%, respectively; $P = 0.004$), and that infertility is not a handicap (76.0% versus 52.4%, respectively; $P < 0.001$). However, compared with the fertile outpatients, they responded more negatively that infertility is a disease (53.9% versus 45.0%, respectively; $P < 0.001$).

Regarding the social consequences of infertility, more than one-third of IVF patients and more than one half of fertile outpatients negatively agreed or strongly agreed with divorce (38.5% versus 57.6%, respectively; $P = 0.001$) or remarriage (62.5% versus 86.2%, respectively; $P < 0.001$) in the case of a childless couple, and there was a significantly more favorable attitude in IVF patients. Adoption, as an alternative to divorce and/or remarriage, was reported by 61.5% of IVF patients and 70.6% of fertile outpatients ($P = 0.42$). Moreover, the majority of both IVF patients and fertile outpatients positively agreed that having a test tube baby (92.4% versus 70.3%; $P < 0.001$) and taking infertility drugs (87.5% versus 68.4%; $P = 0.003$) are acceptable behaviors, with a significantly more favorable attitude by IVF patients. The overall attitude toward the social consequences of infertility was neutral, as indicated by the mean percentage score, with no significant difference between the IVF patients and the fertile outpatients before adjustment (61.22% versus 64.06%, respectively; $t = 1.49$; $P = 0.15$) or after adjustment ($P = 0.143$) for possible confounders.

The majority of both IVF patients (82.7%) and fertile outpatients (85.4%) reported that both partners should be investigated at the same time ($P = 0.79$). Those who reported that the husband, the wife, or both partners are to be blamed for infertility constituted a significantly higher proportion of IVF patients (37.5% versus 31.1%; $P = 0.034$). The obstetrics and gynecology specialist was the primary preference for a childless couple to seek help from for almost all of the IVF patients and fertile outpatients (93.3% versus 95.2%, respectively; $P = 0.56$). However, the healer/Sheikh was reported as the second preference by 44.2% and 34.9% of IVF patients and fertile outpatients, respectively ($P = 0.10$) (Table 5).

Figure 1 shows common practices of the Saudi IVF patients and fertile outpatients. Ruqia, or "Reading the Quran," was the most common practice and was reported by approximately 60% of all of the patients in both groups, followed by the use of alternative medicines (42%), physical

Table 5 Attitude of IVF patients and fertile outpatients toward infertility-related issues

Question	IVF patients N = 104 N (%)	Fertile outpatients N = 269 N (%)	P-value*
Who do you think should be investigated first?			
Husband	14 (13.5)	31 (11.6)	0.794
Wife	4 (3.8)	8 (3)	
Both	86 (82.7)	229 (85.4)	
Who is to blame for infertility?			
Husband	5 (4.8)	7 (2.6)	0.034**
Wife	10 (9.6)	8 (3.0)	
Both	24 (23.1)	66 (24.5)	
None	65 (62.5)	188 (69.9)	
Primary preference			
Ob/Gyn specialist	97 (93.3)	256 (95.2)	0.556
Healers/Sheikh	7 (6.7)	12 (4.5)	
Other	0 (0.0)	1 (0.4)	
Secondary preference			
Ob/Gyn specialist	57 (54.8)	173 (64.8)	0.103
Healers/Sheikh	46 (44.2)	94 (35.2)	
Other	1 (1)	0 (0)	

Notes: *Chi square test was applied; **statistical significance at $P < 0.05$.

Abbreviations: IVF, in vitro fertilization; N, number; Ob/Gyn, obstetrics and gynecology.

exercise (39%), consumption of certain foods (22%), and smoking cessation (12%).

Discussion

Our study was designed to collect information about attitudes and knowledge about infertility in the Saudi population. Knowledge about infertility is inadequate in many parts of the world. A global survey of almost 17,500 women (mostly of childbearing age) from ten countries revealed that knowledge regarding fertility and the biology of reproduction was poor.⁸ This finding is in agreement with the findings of our present study in which the level of knowledge was generally low, as indicated by the low mean percentage score for knowledge among the IVF patients and the fertile outpatients. However, taking into account only the correct identification of the risk factors, one would conclude from the results that knowledge regarding the potential risks associated with infertility was satisfactory. The IVF patients were significantly more knowledgeable than the fertile outpatients. However, this difference was abolished after adjustment for all potential confounders.

Numerous factors have been associated with reduced fertility; these include demographic factors (eg, age), reproductive history (eg, menstrual cycle characteristics, history of pelvic surgery), and current lifestyle habits (eg, alcohol consumption, smoking). The participants in our study

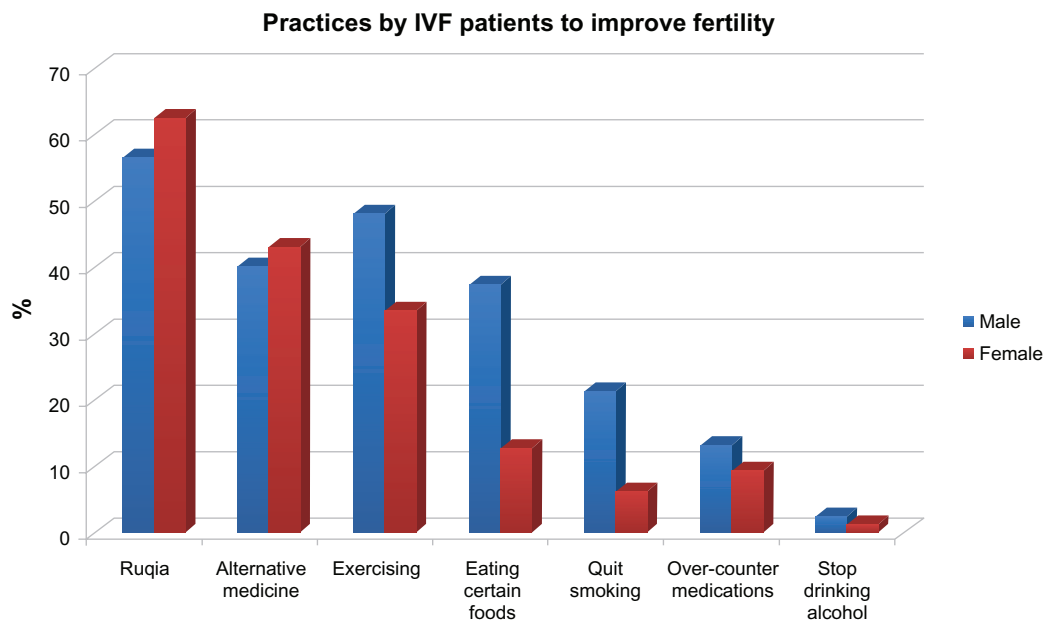


Figure 1 Practices of infertile Saudi patients before attendance at an IVF clinic to improve their fertility.

Abbreviation: IVF, in vitro fertilization.

correctly identified most of the causes of infertility but also incorrectly highlighted factors that do not cause infertility. Approximately one-half of both IVF patients and fertile outpatients correctly identified the irregularity of menses, blocked fallopian tubes, and genitourinary tract infections as causes of infertility. Approximately one-half of both IVF patients and fertile outpatients thought that the previous use of oral contraceptive pills or an intrauterine contraceptive device may lead to infertility. These findings were in agreement with the findings of Ali et al.⁸ This belief may lead to underutilization of these contraceptive methods for the fear that they may cause infertility, and thus add to the problem of high parity in developing countries.⁸

Several studies have noted noxious effects of tobacco before and after conception, in both women and men, from the smokers' gametes to their offspring.¹¹⁻¹³ Yet approximately one-half of both IVF patients and fertile outpatients in our study did not believe smoking was a cause of infertility. Quitting smoking was reported as one of the measures taken by the IVF patients to improve fertility. A study by Aryanpur et al¹⁴ supported brief counseling on smoking cessation and showed that the provision of an educational package by the treating physician or other health care workers in busy infertility clinics was both possible and effective in achieving cessation of smoking.

Reproductive dysfunction has been reported to have a higher prevalence in athletes versus nonathletes, with clinical consequences that may include infertility.¹⁵ Roughly one-half

of both IVF patients and fertile outpatients believed that vigorous exercise may lead to infertility. In our present study, heavy exercise was reported as a possible risk factor for infertility by only 20% of participants. In a previous study by Gudmundsdottir et al,¹⁶ the increased risk of infertility was only found for a small group of women reporting the highest levels of intensity and frequency of physical activity; no associations were found between lower activity levels and fertility or parity. The potential role of regular physical activity in the prevention and treatment of infertility needs further investigation. However, the awareness of the possible risks of infertility should be highlighted among nonathletic women who exercise vigorously.

Obesity can affect fertility in both men and women.¹⁷ In women, obesity is associated with increased risks of menstrual dysfunction, anovulation, miscarriage, and pregnancy complications.¹⁸ In men, evidence exists that spermatogenesis is impaired by obesity.¹⁹ In our study, the majority of participants (70% of IVF patients and 55% of fertile outpatients) correctly responded that obesity may affect fertility. IVF patients were more knowledgeable about this issue, possibly because of the prevalence of obesity in this group of patients. In another study,¹⁹ men identified as experiencing male factor infertility were three times as likely to be obese (body mass index >30 kg/m²); however, this relationship was not investigated in our present study.

People from all over the world accumulate many misconceptions about reproductive health and fertility

because infertility is considered a taboo subject. In our study, misconceptions about infertility were common among both groups of patients such as black magic (67.5%), Djinn/supernatural causes (58.8%), and vigorous exercise (67.29%). These trends were in agreement with the findings of previous studies,^{3,8} where beliefs in evil forces and supernatural powers as a cause of infertility were still prevalent. The healer/Sheikh was reported as the primary and secondary preference for infertility treatment by 6.7% of IVF patients and 44.2% of fertile outpatients. This finding may reflect the strong belief that not all ailments could be cured by medical science. In our present study, 60% of the IVF patients practiced "Reading the Quran" (Ruqia) before seeking medical help. These findings have implications for health care providers regarding the reluctance that couples experiencing fertility problems may have, at least initially, to accept some interventions required for the couple to conceive. Educational programs are necessary to increase the levels of knowledge and change the attitudes of the Saudi population regarding infertility and its social complications. Special emphasis needs to be placed on directing IVF patients toward correct information and healthy practices and helping them seek medical advice as their only preference for treatment.

From a psychological standpoint, women facing infertility exhibit significantly more tension, hostility, anxiety, depression, self-blame, and suicidal ideation.³ This finding is in agreement with the findings of our present study in which 37.5% of IVF patients and only 30.1% of fertile outpatients ($P = 0.034$) reported the wife, husband, or both partners to be blamed for infertility. When asked who should be investigated first, more than 80% of all participants answered "both" at the same time, whereas the remaining participants either chose "man" or "woman." In Latin America, the strong social stigma attached to infertility causes women to blame themselves for infertility.²⁰ Overall, the attitude toward infertility and its interventions was significantly more favorable among IVF patients than among fertile outpatients, even after adjustment for possible confounders. That infertile couples had more favorable attitudes than did fertile couples toward various interventions suggests that when couples are confronted with more information and personal necessity, their attitudes about infertility interventions become more positive.

Infertility is not only a medical but also a social problem in Saudi society, as cultural customs and perceived religious dictums may equate infertility with a failure on a personal, interpersonal, or social level. Women are verbally or physically abused in their own homes, deprived of their inheritance, sent

back to their parents, or even have their marriage dissolved or terminated if they are unable to conceive.²¹⁻²³ In Islamic law, polygamy is permissible; however, it is neither an allowance nor a prohibition in the Quran. The Quran has only referred to this practice, prompting the Muslims to take care of the orphans and widows in society.²⁴ However, it cannot be denied that polygamy was an accepted norm of Arab society, where the wife, under normal circumstances, would not object to her husband taking another wife. In fact, evidence suggests that the number of wives was considered to be an indication of a person's high social standing. In our present study, IVF patients were significantly less likely to favor divorce or marriage to a second wife if the woman could not have a baby. However, this finding may not reflect the negative attitudes of all of the infertile couples toward divorce or remarriage but, rather, those seeking medical care, for whom such attitudes would be expected. Overall, both the IVF patients and the fertile outpatients were comparable in their attitude toward the social consequences of infertility, with an overall neutral attitude that was denoted by mean percentage scores for IVF patients and fertile outpatients, respectively.

There has been marked progress in the development of interventions available to couples having fertility problems. In our present study, fertility drugs were significantly more acceptable to IVF patients than to fertile outpatients. It was interesting to find that almost all of the IVF patients (92.4%) accepted having a test tube baby, yet 29.7% of fertile outpatients were still unsure or were against this option despite its acceptance by religious dictums. That infertile couples had more favorable attitudes than did fertile couples toward various interventions suggests that when couples are confronted with more information and personal necessity, their attitudes about infertility interventions become more positive. In a previous study by Adashi et al,²⁵ although most of the participants were aware of IVF, many overrated the chance of treatment being successful, with 39% believing that couples had a success rate of achieving a live birth between 40% and 100%. In our present study, the majority of the IVF patients expected a success rate of between 25% and 74% when in reality, the per-cycle success rate was closer to 20%.²⁶ In our study, the success rate per cycle was 17%.

Child adoption is an available option for infertile couples. Many couples with incurable infertility in advanced countries are willing to adopt babies but are limited by the few babies available for adoption because of the high rate of contraceptive use and liberalized abortion laws.²⁷ In Saudi Arabia, the Islamic term for what is commonly called adoption is "kafala," which comes from a word that means "to feed."

In essence, it describes more of a foster parent relationship. The Quran gives specific rules about the legal relationship between a child and his or her adoptive family. The child's biological family is never hidden; their ties to the child are never severed. The Quran specifically reminds adoptive parents that they are not the child's biological parents. In our study, the majority of both IVF patients and fertile outpatients agreed with the alternative of adopting a child in the case of childless couples. This finding may reflect their adherence to The Prophet Muhammad (peace be upon him), who said that "a person who cares for an orphaned child will be in Paradise with him." Prophet Muhammad himself adopted a former slave and raised him with the same care as if he were his own son.²⁸

Study limitations

Our study had some limitations. First, the study was limited by the relatively small sample size of the IVF patients. Thus, it would be important to increase this in future research. Although most of the IVF patients who attended the IVF clinic of KAMC during the time of the study were included, we made no effort to identify the infertile couples who did not seek care at KAMC. The participants in this latter category could represent a substantial proportion of those who are infertile, especially in that they may represent a particular socioeconomic group. Second, because the results came from a specific geographical area, they may not be generalizable to other geographical areas. Third, the participants were not asked whether they engaged in risk behaviors or how they felt lifestyle was affecting their own fertility. Although people may be able to identify risk factors, they may not apply this risk to themselves. Fourth, knowledge of and attitudes about infertility might have been affected by whether infertility was primary or secondary and whether the cause of infertility was a result of male or female factors. Meanwhile, not all possible risk factors of infertility were dealt with in our study, such as exposure to pollutants. We did not consider this information when assessing the knowledge and attitudes of the target sample in our study. Further studies may highlight all of these issues.

Conclusion

Aside from these limitations, the results of our present study would suggest that people with limited knowledge about fertility may engage in ineffective behaviors that could delay seeking effective interventions. These results reflect the fact that other alternative treatments of infertility, such as seeking the help of a Sheikh, eating certain foods, or reading

the Quran (Ruqia), remain popular options for couples with infertility. These findings have implications for health care providers regarding the reluctance that couples experiencing fertility problems may have, at least initially, to accept some interventions required for the couple to conceive. Compared with fertile outpatients, patients with infertility showed significantly more favorable attitudes toward infertility and various interventions, such as IVF or fertility drugs. This trend suggests that when couples are confronted with more information and personal necessity, their attitudes about interventions for infertility become more positive. Public education campaigns should be directed toward correcting erroneous beliefs about the risk factors associated with infertility. Educational programs are necessary to upgrade the level of knowledge and the attitudes of Saudi citizens in relationship to infertility and its social complications. Special emphasis should be placed on directing IVF patients to the correct knowledge and healthy practices and helping them seek medical advice as their only preference for treatment. Information and education about the success rates of IVF need to be made available to the public to reduce overrating the success of this procedure. Future research is necessary to determine the extent to which the pattern of attitudes found here is representative of that in the population facing infertility as well as in the general population.

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Disclosure

The authors report no conflicts of interest in this work.

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