

Comparison of various aspects of women's lives between infertile and women with and without tubal ligation: a comparative cross-sectional study

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Abstract

Background: The aim of this study is to compare anxiety, depression, body image, self-esteem, sexual function (SF), and quality of life (QoL) between infertile women and women with or without tubal ligation (TL).

Methods: This cross-sectional study was conducted on 600 women, distributed equally as infertile women, women with or without TL, who met the inclusion criteria. They were selected from the Royan Institute in Tehran (Iran) and a number of health care centers in Tehran (Iran) from May 2017 to February 2019. The subjects were asked to fill out the Short Form Health Survey (SF-12), Female Sexual Function Index (FSFI), Hospital Anxiety and Depression Scale (HADS), Body Image Concern Inventory (BICI), and Rosenberg' Self-Esteem Scale (RSES). One-way ANOVA was used to find the statistical differences between the three groups.

Results: Mean scores of all FSFI domains were found to be lower in the TL women and the differences between the three groups were statistically significant in all domains. Women with TL had more female sexual dysfunction (FSD) (22.43 ± 5.30 vs 24.79 ± 4.74 vs 28.03 ± 3.29 , $P < 0.001$). There was a significant difference between the three groups in SF-12 scores (76.59 ± 13.14 vs 68.49 ± 14.47 vs 78.87 ± 12.62 , $P < 0.001$). Also, there was a significant difference between the three groups in anxiety, depression, and total scores HADS ($P < 0.001$). Infertile women had lower body image ($P < 0.05$) and self-esteem was lower in the TL group ($P < 0.05$).

Conclusions: Our findings reveal the adverse effects of TL on the anxiety and depression, sexual life, body image, and QoL of women. It is recommended that the awareness and knowledge of health-care professionals regarding the side-effects of TL in the above-mentioned aspects of women's lives should be increased and discussed with patients.

Background

Childbearing is one of the main goals of family formation, which has a special socio-cultural and religious significance in Iranian culture. As a matter of fact, it is an important expected outcome of their sexual relationship for most couples, and many factors that may disrupt the natural fertility process impose an *enormous* psychological burden on a couples' life (1, 2).

Infertility is the inability to conceive after 12 months of frequent coitus without contraceptives, which accounts for 25 percent of couples in developing countries (3). Infertility imposes a great deal of psychological burden to couples and has negative effects on various aspects of their lives(4) and can increase marital conflicts and sexual dysfunction (5). Anecdotal evidence suggests that infertility as a stressful condition doubles the risk of anxiety and depression in women (6).

Tubal ligation (TL), which is the most commonly used family planning method worldwide, is a surgical procedure for contraception in women who have completed their family or have no desire to become

pregnant (7). Despite using TL by 19% of women aged between 15–49 years (8), sexual functioning and other aspects of QoL in women undergoing TL have not been adequately explored and available studies have found conflicting results. Several studies have reported destructive effects associated with TL on QoL and sexual function (SF)(9-13).

Childbearing as an important concept of marriage can be affected by infertility and TL. Infertile couples are those who have desire to have children of their own but are unable to do so, and therefore usually seek some type of medical infertility treatment. Nonetheless, TL is a voluntary choice for those who no longer want children and tend to limit their family size (14).

This study aimed to assess depression, anxiety, body image, self-esteem, SF, and QoL in infertile women in Iran and compare the results with fertile group (condom) and those with TL.

Materials And Methods

Participants

The study was conducted as a comparative cross-sectional approach and the sample was selected via convenience sampling method. Using the appropriate formula to calculate sample size by taking 95% confidence interval and 90% power to test. In this study, the number of participants in each group was 200 women who met the inclusion criteria.

Overall, the inclusion criteria were women who were still at their childbearing aged (≥ 35 years), married, lived in the same house as her husband, and were sexually active (had sexual intercourse in the past 4 weeks). Women who were unable to conceive after 12 months of frequent coitus without contraceptives and had referred to the Royan Research Institute in Tehran (Iran) were listed as the infertile group before entering the treatment cycle. Additionally, women who had undergone tubectomy for ≥ 1 years and women who used condoms to prevent pregnancy were included in the study when they went to health-care centers in Tehran (Iran) for other problems. To avoid possible confounding factors, exclusion criteria included infertile couple with male infertility, gynecological disorders, suffering from chronic diseases (such as diabetes, hypertension...), not being sexually active, breastfeeding, taking any antidepressant drugs, serotonin and norepinephrine reuptake inhibitors (SNRI), or antipsychotic drugs that could have sexual side effects.

The research was conducted from May 2017 to February 2019, using a standard questionnaire that had been tested for validity and reliability and the hospital anxiety and depression scale (HADS)

Female sexual function index (FSFI), body image concern inventory (BICI), Rosenberg' Self-Esteem Scale (RSES), Short Form Health Survey (SF-12) are used to measure various aspects of women's lives. Before being asked to fill out the questionnaire, the respondents were provided with explanations and the approval letter. The study protocol was approved by the institutional review board and the Ethics Committee of the Royan Institute (IR.ACECR.ROYAN.REC.1395.97).

Questionnaires

The participants were asked to complete several self-report questionnaires, as follows:

demographic survey that included the age of the participants, the number of their children, their husband's age, their educational levels, occupational status, body mass index (BMI), smoking status, type of previous deliveries, and menstruation status.

Anxiety and depression:

The hospital anxiety and depression scale (HADS) objectively measure these factors and it contains a 7-item depression scale and a 7-item anxiety subscale (the score range of each component is 0–3). Higher scores represent higher symptom levels for both subscales and a score of 11 and above is considered a clinical disease (15). The validity and reliability of the Iranian version of HADS have been confirmed (16).

Female Sexual Function:

Female sexual function index (FSFI) investigates the quality of women's sexual life over the last month prior to the study. This questionnaire measures desire, arousal, lubrication, satisfaction, orgasm, and pain by 19 questions with a range of 0 or 1 to 5. The domain score of 0 indicated that the women reported no sexual activity during the previous month. A total score of less than 23 denotes sexual dysfunction, and the scores less than 3.3 in the desire domain, less than 3.4 in the arousal and orgasm domain, less than 3.7 in the lubrication domain, less than 3.08 in the satisfaction and pain domain were used to classify the participants as having difficulties in that domain(17). The Persian version of FSFI has also been evaluated for both reliability and validity (18).

Body Image:

Development of the body image concern inventory (BICI) is a measure that assesses dysmorphic concerns. The questionnaire consists of 19 questions that examine the individual's dissatisfaction and concerns about their appearance. The answer is based on the Likert scale of 1-5 and the total score range is 19-95, higher scores indicate higher levels of dissatisfaction about one's body image or appearance(19). The validity and reliability of this questionnaire has been previously assessed in Iran (20).

Self-esteem:

Rosenberg' Self-Esteem Scale (RSES) is composed of 10 questions that are scored on a 4-point Likert-type scale ranging from 1 (totally disagree) to 4 (totally agree). A higher score indicates higher self-esteem (21). Validity and reliability tests of the Iranian form have been previously performed (22).

Quality of life:

The participants were asked to fill out the Short Form Health Survey (SF-12) that measures QoL in eight areas: physical functioning, physical role, bodily pain, general health, vitality, social functioning, role emotional, and mental health by 12 items. Higher scores indicate better QoL (23). The validity and reliability of this questionnaire have been confirmed in Iran (24).

Statistics

All statistical analyses were performed by the SPSS software version 25.0 (SPSS Inc., Chicago, IL, USA). A one-sample Kolmogorov-Smirnov test was used to analyze normality for the continuous variables, which were compared using the Student's t-test and χ^2 -test.

A one-way ANOVA was used [with LSD posthoc test] to compare each variable between groups. Differences were considered significant at $P \leq 0.05$ for the two tails.

Result

Table 1 describes the characteristics of women in the infertile, TL, and condom groups. The age of the participants ranged from 20 to 43 years. As shown in Table 1, there were no significant differences ($P > 0.05$) between women age groups, the ages of the husbands, Body Mass Index, smoking status, educational level, and the type of previous deliveries in the participants' groups. However, there were statistically significant differences among the groups in characteristics of menstrual cycle length (28.71 ± 2.08 vs 27.99 ± 5.95 vs 29.43 ± 6.49 , $P = 0.02$) and features ($P < 0.001$). The number of children in infertile, women with TL and without TL were respectively 0.83 ± 0.38 , 2.35 ± 0.56 , 2.29 ± 0.71 and there was also a statistically significant difference ($p < 0.001$).

Table 1: Comparison of demographic characteristics between infertile, TL and condom groups.

| Variable | Infertile group n=200 | TL group n=200 | Condom group n=200 | P-value |
|--------------------------------|--------------------------|-------------------|-----------------------|---------|
| Age of female* | 32.48 ±4.92 | 33.06±3.01 | 33.07±3.61 | 0.25 |
| Number of children* | 0.83±0.38 | 2.35±0.56 | 2.29±0.71 | <0.001 |
| Education of female** | | | | 0.08 |
| Illiterate | 0(0) | 1(0.5) | 1(0.5) | |
| Under diploma | 85(42.3) | 111(55.5) | 99(49.5) | |
| Higher diploma | 116(57.7) | 88(44) | 100(50) | |
| Age of husbands* | 39.06±6.27 | 38.93± 8.19 | 38.22±4.27 | 0.17 |
| Job of female** | | | | 0.075 |
| Housewife | 148(73.6) | 166(83) | 157(78.5) | |
| Recruitment | 53(26.4) | 43(17) | 43(21.5) | |
| BMI (kg/m2)* | 27.02±4.39 | 28.05±4.06 | 27.43±4.81 | 0.06 |
| Smoking** | | | | 0.60 |
| Yes | 1(0.5) | 1(0.5) | 0(0) | |
| No | 200(99.5) | 199(99.5) | 200(100) | |
| Menstrual cycle features** | | | | <0.001 |
| Regular | 154(77) | 168(84) | 187(93.5) | |
| Irregular | 46(23) | 32(16) | 13(6.5) | |
| Menstrual cycle length (days)* | 28.71±2.08 | 27.99±5.95 | 29.43±6.49 | 0.02 |
| Type of delivery** | | | | 0.15 |
| Cesarean section | 19(79.2) | 152(76) | 136(68) | |
| NVD | 5(20.8) | 48(24) | 64(32) | |

BMI: Body Mass Index, NVD: Natural Vaginal Delivery

*values are given as mean \pm SD using t-test,

** values are given as a number (%) using chi-squared test

Sexual function status

The evaluation of FSFI scores and comparison of sexual dysfunction are shown in Table 2. As can be seen, all mean values were lower in the TL group compared with other groups. Also, the differences in scores in the three groups were statistically significant in all domains. There was a statistically significant difference between TL, infertile, and the condom group in terms of desire, arousal, lubrication, orgasm, satisfaction, pain, and total FSFI scores. The prevalence of sexual dysfunction in the women with TL were significantly higher than the infertile and condom group ($P < 0.001$).

Table 2: Comparison of FSFI scores and dysfunction between infertile, TL and condom groups

| Variable | Infertile group (I) N=200 Mean ± SD | TL group (T) N=200 Mean ± SD | Condom group (C) N=200 Mean ± SD | P-value* | Pair wise comparison P-value** |
|---------------------|--|------------------------------------|---|----------|--|
| Desire | 3.79±0.83 | 3.07±0.84 | 3.99±0.75 | <0.001 | I and C: 0.012 I and T:< 0.001 T and C: 0.001 |
| Arousal | 3.99±1.08 | 3.28±1.01 | 4.20±0.82 | <0.001 | I and C: 0.003 I and T:< 0.001 T and C: 0.001 |
| Lubrication | 4.61±1.20 | 3.82±1.19 | 4.91±0.76 | <0.001 | I and C: 0.005 I and T:< 0.001 T and C: 0.001 |
| Orgasm | 3.06±0.91 | 3.81±1.30 | 4.89±0.77 | <0.001 | I and C: 0.001 I and T:< 0.001 T and C:< 0.001 |
| Satisfaction | 4.74±1.12 | 4.19±1.15 | 5.14±0.88 | <0.001 | I and C: 0.001 I and T:< 0.001 T and C:< 0.001 |
| The pain | 4.67±1.28 | 4.18±1.44 | 4.87±0.96 | <0.001 | I and C: 0.102 I and T:< 0.001 T and C:< 0.001 |

| | | | | | |
|-----------------------|------------|------------|------------|--------|---|
| Total score | 24.79±4.74 | 22.43±5.30 | 28.03±3.29 | <0.001 | I and C:< 0.001 I and T:< 0.001 T and C:< 0.001 |
| Dysfunction*** | | | | <0.001 | |
| Yes | 148(73.6) | 177(88.5) | 115(57.5) | | |
| No | 53(26.4) | 23(11.5) | 85(42.5) | | |

FSFI: Female Sexual Function Index, TL: tubal ligation. ANOVA: analysis of variance

* One-way ANOVA

** One-way ANOVA followed by LSD post hoc test

***values are given as a number (%) using chi-squared test

Quality of life status

Table 3 compares SF-12 scores between the infertile, TL, and condom groups. The mean total scores of SF-12 was significantly lower in the TL group compared with the other groups (76.59±13.14 vs 68.49±14.47 vs 78.87±12.62 P=0.001).

Table 3: Sums scores and total scores for the domain subgroups of QoL, HADS, and body image between infertile, TL, and condom group

| Variable | Infertile group (I) n=200 Mean ± SD | TL (T) n=200 Mean ± SD | group Condom group (C) n=200 Mean ± SD | P- value* | Pair wise comparison P-value** |
|------------------------------------|--|---------------------------------|--|--------------|--|
| SF-12 | | | | | |
| Sum score | 78.96±14.10 | 67.88±15.87 | 79.52±14.25 | <0.001 | I and C: 0.70 |
| physical Components (PCS-12) | | | | | I and T:< 0.001 T and C: 0.001 |
| Sum score | 74.22±15.23 | 69.10±16.02 | 78.23±13.34 | <0.001 | I and C: 0.007 |
| mental Components (MCS-12) | | | | | I and T: < 0.001 T and C: <0.001 |
| Total score | 76.59±13.14 | 68.49±14.47 | 78.87±12.62 | <0.001 | I and C: 0.09 I and T: < 0.001 T and C:< 0.001 |

HADS

| | | | | | |
|------------|-----------|-----------|-----------|--------|--------------------------------------|
| Depression | 5.29±3.22 | 6.65±3.57 | 4.42±3.22 | <0.001 | I and C: 0.09 I and T: < 0.001 |
|------------|-----------|-----------|-----------|--------|--------------------------------------|

| | | | | | |
|--------------------|------------|------------|-------------|--------|---|
| | | | | | T and C: < 0.001 |
| Anxiety | 7.66±3.05 | 10.05±3.93 | 6.84±3.27 | <0.001 | I and C: 0.005 I and T: < 0.001 T and C = 0.001 |
| Total scores | 12.88±4.93 | 16.55±6.49 | 11.23±5.97 | <0.001 | I and C: 0.017 I and T: < 0.001 T and C: < 0.001 |
| Body image | 36.58±12.4 | 33.86±13.1 | 32.43±10.35 | 0.02 | I and C: 0.001 I and T: 0.024 T and C: 0.234 |
| Self-Esteem | 29.16±5.26 | 25.01±5.44 | 29.16±5.52 | =0.001 | I and C: 0.881 I and T: =0.001 T and C: =0.001 |

QoL: Quality of Life, SF-12: Short Form-12, HADS: Hospital Anxiety and Depression Scale, TL: Tubal Ligation

* One-way ANOVA

** One-way ANOVA followed by LSD post hoc test.

From the information summarized in Table 3 we can see that the TL group shows significantly less physical, psychological, and total scores of QoL than the other two groups ($P \leq 0.001$). There was no significant difference between infertile and condom groups in physical and total scores of QoL ($P > 0.05$).

Depression and anxiety

As shown in Table 3, there were statistically significant differences between the mean scores of depression, anxiety, and total HADS in infertile, TL, and condom groups (12.88 ± 4.93 vs 16.55 ± 6.49 vs 11.23 ± 5.97 , $P \leq 0.001$). Statistically significant differences were observed between TL with infertile and condom groups in depression, anxiety, and total scores of HADS. However, there was no statistically significant difference between infertile and condom group in terms of depression ($P > 0.05$).

Body image and Self-esteem

It can be seen from the data in Table 3 that the body image score difference was statistically significant among TL, infertile and condom groups ($P \leq 0.05$) and infertile women have a higher score (36.58 ± 12.4 vs 33.86 ± 13.1 vs 32.43 ± 10.35 , $P = 0.02$). Self-esteem was statistically lower in infertile women (29.16 ± 5.26 vs 25.01 ± 5.44 vs 29.16 ± 5.52 , $P \leq 0.001$).

Discussion

According to the increasing infertility rate in Iran, the main goal of the current study was to assess SF, QoL, depression, anxiety, self-esteem, and body image among infertile women. Also, due to the soaring use of TL by Iranian women in recent years, it is important to evaluate potential complications associated with this method. Recognition and diagnosis of sexual dysfunction as well as the impairment of QoL, indicate a need for sufficient education and comprehensive consultation by the healthcare system prior to the procedure.

Anxiety and Depression

Although TL is the most commonly used form of contraceptive method worldwide, the long term psychological effects are still obscure. Contrary to expectations, the result of this study showed that anxiety and depression symptoms in women who had undergone TL surgery would be higher than that in infertile women.

Many evidences indicated that depression and anxiety are more prevalent among women who had infertility compared to non-infertile women. Almost half of the infertile subjects had moderate to severe symptoms of depression and the level of anxiety was increased by infertility (25). Anxiety and

depression caused by infertility may be due to various factors such as uncertainty about the cause of infertility, duration of treatment, and unspecified treatment, as well as financial and social pressures. Since cyclical hormonal changes are related to anxiety and depression, these observations may be due to undergoing TL (26). The results of a study by Lin et al. (27) indicated sterilization as a risk factor for depression and anxiety; the risk of depression and anxiety following TL was reported to be 2.34 and 2.88 times greater than before TL, respectively. A similar study has been conducted on one hundred sixty-two women who had experienced TL, reported increased Beck depression inventory scores after TL and were suffering from regret after sterilization (26). Complications by reason of TL cause regret (14), in addition to in traditional societies such as Iran, the picture of a woman is directly related to her fertility and motherhood ability and cause them to feel perfect and valuable. Although TL is a voluntary procedure, cultural factors that are rooted in one's unconscious cause conveys them feelings of inadequacy and unattractive that can manifest as sexual dysfunction and regret (9). It has been shown in several studies that anxiety and depression are more common in women regretting sterilization in comparison to the control group (14, 26).

Depression can be influenced by many factors including a feeling of guilt after an irreversible surgery, negative perceptions of others, a change in husband's intuition, cultural conditions, and religion status, or pre-existing emotional disorders. Women should be given time to consider their decision on fertility state and be provided with psychological support during this time.

Body image and Self-esteem

In the results of our study, infertile women had lower body image in comparison with TL and condom group. These results confirm the association between body image and infertility. In addition to physical appearance, a person's body image also reflects physical wellbeing and biological status (health/illness) (28). Previous studies have shown that self-concept, identity development, anxiety, and depression are factors closely related to a woman's body image that might be affected by infertility (29). A strong relationship between infertility and depression has been reported in the literature (28), so depression in different stages of life may lead to a distorted body image (29). Based on our findings, self-esteem scores were lower in TL women compared to the other two groups. In many studies, however, the authors have indicated that there was no link between TL and self-esteem (11, 30).

This observation may support the hypothesis that although individuals continuously think about their appearances, after a physical disease state like infertility, they become more aware and alert of their bodies and are more mentally concerned (31).

In sum, very little research has been done on the relationship between undergoing TL and body image. Li et al. (11) and Raine et al. (30) showed that TL had no effect on body image. Further work is required to establish the validity of this result and different factors affecting the body image.

Sexual function status

In the present study, the prevalence of FSD in the TL women was around 50% in comparison to 27.4% in infertile group and 8.5% in condom groups. Therefore, results from many studies have confirmed that women with infertility had an increase in sexual dysfunction(32-34). Omani-Samani (35) carried out a meta-analysis study to estimate the prevalence of FSD among infertile Iranian women. Their result suggested that more than 64% of infertile Iranian women reported sexual dysfunction. It is well-known that the risk of FSD in infertile women is higher because the tendency of having sexual intercourse is strongly affected by pregnancy. Among infertile couples, sex is defined as a clinical tool, which should happen on certain days of the month, instead of an act of love (36). It has, on the other hand, been suggested that in some cases infertility might be a result of sexual dysfunction (37). The results of studies that have assessed the effects of TL on SF are controversial. Surprisingly, Smith et al. (12) and Li et al. (11) observed positive effects of sterilization on SF, which may be the result of reduced fear of getting pregnant. In contrast, Kunker et al. (38) and Jahanian Sadatmahalleh et al. (9) reported the higher FSD in women undergoing TL compared with their control group.

According to the proven effects of infertility on the quality of SF (32), this finding was unexpected. But a possible explanation for this might be “post tubal sterilization syndrome” that causes a decrease of libido, menstruation disorders, pelvis pain, dyspareunia, and depression (39).

SF is complex and involves interactions of many factors, including emotional connection, body image, and other elements such as cultural differences, ethnicity, misinterpretation of religious codes, personal belief regarding her role as a woman, and social pressures(40, 41). Overall, it seems that having a discussion about sexual matters is centuries-long taboo, especially speaking about them with others, including the spouse and their doctor (38).

Regarding the importance of SF in life, marital relationship and the significant association between post-sterilization regret and FSD in women with TL (44), Jahanian Sadatmahalleh et. al. reported the prevalence of FSD in the TL group was 63.4% in comparison with 40.8% in the control group (14). Being completely informed about TL procedure and its complications, and having access to other contraceptive options prior to the operation may be helpful in avoiding future dissatisfaction.

Quality of life status

We found that QoL in women with TL (both physical and mental demands) was significantly lower than other groups.

Several reports have shown that infertility is associated with decreased physical and mental health(45, 46). The result of a qualitative study which conducted on 16 people who received successful infertility treatment supported evidence from previous observations. The effects of the stage of infertility process, gender, and the quality of the relationship on marital relationship and QoL have been indicated; infertility causes many problems such as dissatisfaction, stress, sadness, insomnia, increased/decreased appetite, increased smoking, social pressure, exposure to questions of curiosity about having children, avoiding from being where children are, losing the privacy of sex life, having sex in some planned days just for

reproduction, interruption in work life and the high cost of treatment. Therefore, it is probable that the scores of QoL have decreased in infertile women (47).

Numerous studies which have evaluated the impact of TL on women's QoL, have observed conflicting results. For instance Pauls R. (13) conducted a study to summarize recent literature on SF following benign gynecological surgeries, including tubal ligation. They concluded that the QoL and SF in the majority of the cases benefit from surgical interventions. However, Li et. al. (11) did not find such associations. Thus far, several studies have demonstrated that TL has a negative impact on QoL(9, 10). In a similar study that was conducted by Monga et. al. (48) 18 infertile couples and 12 couples seeking elective sterilization were interviewed. The total marital adjustment and quality of well-being's score of the women who seek infertility treatment were lower than in women with elective sterilization.

One possible interpretation for our result could be the occurrence of menstrual abnormalities after TL (49). The spectrum of menstrual disorders can be wide and includes more frequent menstrual periods, irregular menstrual cycles, menorrhagia, metrorrhagia, spotting, dysmenorrhea, and oligo menorrhea (50). Given the importance of the menstrual pattern in Iranian women's lives, any menstrual disorder can have a devastating effect on personal life and religious duties. Therefore, TL is a decision that can later cause women to feel guilty.

Discrepancies in QoL and SF conditions after TL surgery can be the result of different definition of TL in various cultures. In societies with traditional cultures, such as Iran, self-satisfaction, value, and the image that a woman holds of herself is closely reliant on their motherhood ability. Although TL seems to be a voluntary choice at first, it might induce a feeling of guilt in some women. Therefore, sexual dysfunction, a decrease in QoL, and regret for having done this operation might happen after a while (9). In sum, due to the growing demand for TL surgery as a means of contraception, the number of women who regret choosing this method as a permanent approach have been increased (51). Regression is associated with sadness, pain, harm, affliction, anxiety, and displeasure, all of which affect the QoL (52).

Despite the fact that, multiple psychological and physical factors such as FSD affect a woman's QoL (53), many physicians refuse to look for details about SF and women often do not perceive it as a disorder and never discuss this with their doctors, so many women have suffered in silence for years (38). Women should view SF as a biological and enjoyable need and be free to talk about their sexual problems, and this cannot be achieved except through education and counseling (38).

Despite the well-known adverse effects of infertility on women's health, the results of this study imply the relationship between TL and the poor quality of various aspects of a woman's life. Based on our knowledge, this study has compared infertile and TL women for the first time and has provided a great value for fertility and childbearing in societies like Iran. This study distinguishes the importance of making the right decisions about anything that may affect fertility more than previous studies. Nonetheless, this study was limited by the absence of sufficient information about the history of QoL, FSD, and the mental health of individuals before TL surgery. A larger sample size would be helpful to determine more significant results.

Conclusion

This study has identified SF, QoL, psychological health in women undergoing TL and has shown that they were more disrupted compared with infertile and condom groups. To our knowledge it is for the first time that such a study has been conducted in Iran. These findings have significant implications and suggest a need for investigating the side effects of TL more carefully, as TL may not be a safe method for contraception. This study has provided profound insight into the importance of a comprehensive consultation before TL.

List Of Abbreviations

FSFI: Female Sexual Function Index

SF: Sexual Function

FSD: Female Sexual Dysfunction

HADS: Hospital Anxiety and Depression Scale

QoL: Quality of Life

BMI: Body Mass Index

TL: Tubal Ligation

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Ethics Committee of the Royan Institute (code: IR.ACECR.ROYAN.REC.1395.97). All procedures were in accordance with the ethical standards of the Regional Research Committee and with the Declaration of Helsinki 1964 and its later amendments. After explaining the study's purposes, a written consent and a verbal assent were collected from all participants, and the subjects were informed that their participation was voluntary, confidential, and anonymous and that they had the right to withdraw from the research at any time.

Consent for publication

Not applicable.

Availability of data and materials

The data sets used and analyzed for the current study are available upon reasonable request.

Competing interests

The authors declare no conflicts of interest.

Funding

None.

Authors' contributions

Sh.JS and M.A contributed to the conception and design of the study; M.A and Sh.JS did the literature search; N.M and Sh.JS performed the statistical analysis; M.A, N.M, Sh.JS, N.J and S.Y wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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