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Risk Factors of Secondary Infertility among Women Attending Outpatient Clinic at Cairo University Hospital; Suggested Guideline

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Abstract: Secondary infertility is a common, preventable but neglected reproductive health problem caused by a myriad of factors including genetic abnormalities, aging, acute and chronic diseases, hormonal factors, behavioral factors and exposure to environmental, occupational and infectious agents. Aim of this study was to assess risk factors of secondary infertility among infertile women and develop Guideline to prevent and / or minimize these risk factors. Design: A descriptive exploratory design was adopted in this study to provide a picture of a secondary infertility as it naturally happens. Sample, a purposeful sample of (200) women with secondary infertility attending the infertility outpatient clinic at El-Manial University Hospital were recruited. Tool, secondary infertility risk factors questionnaire was utilized to collect data. Results revealed that mean age of the sample was 27.5± 5.58 years old, 34.5% received secondary education and 62.5% was living in rural area. Fifteen percent of the sample had family history of primary infertility and 20% of the sample had family history of secondary infertility. Using multiple regression analysis results indicated a significant relation between secondary infertility and women`s age, place of residence, age at marriage and women' consanguinity relation as risk factors. Also, age at menarche, menstrual irregularities, menstrual abnormalities, number of living children, gynecological history and number of abortion were significantly correlated with secondary infertility. Conclusion, this study concluded that personal, occupational, lifestyle, obstetric, gynecological history and medical history are considered risk factors for secondary infertility.

Key words: Risk Factors · Secondary Infertility · Suggested Guideline

INTRODUCTION

Childbearings are extremely important events in every human's life and are strongly associated with the ultimate goals of completeness, happiness and family integration. Infertility is a global health issue affecting approximately 8-10% of couples. It is multidimensional problem with social, economic and cultural implications, which can take threatening proportions in countries with strong demographic problems [1].

Infertility is a global phenomenon, as World Health Organization recognized it as a public health issue worldwide. The National Survey of Family Growth, which used data collected from 2006 to 2010 to estimate infertility prevalence in the U.S. reported that the number of women aged 15 to 44 years with an impaired ability to conceive or carry a baby to term is 6.7 million which translates as 10.9%, the number of married women aged 15 to 44 years who are infertile is 1.5 million or 6.0% and the number of women aged 15 to 55 years who have used infertility services at some point in their lives is 7.4 million [2]. One in ten couples experiences primary or secondary infertility, but infertility rates vary amongst countries from less than 5% to more than 30%. Most of those who suffer from infertility live in developing countries where infertility services in general and assisted reproductive technologies in particular are not available [3].

Secondary infertility is usually defined as the inability to conceive despite exposure to pregnancy for one year (2 years in some epidemiological studies), after having conceived at least once before. The risk factors for infertility include smoking, obesity, alcohol consumption, advanced maternal age, infections, miscarriage, still birth and many others. Women facing infertility exhibit significantly more tension, hostility, anxiety, depression, self-blame and suicidal ideation [4].

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Ricci [5] mentioned that, the risk factors which can contribute to female infertility include overweight or under weight (can disrupt hormone function); hormonal imbalances leading to irregular ovulation; fibroid; tubal blockages; reduced oocyte quality; chromosomal abnormalities; sexually transmitted diseases (STDs); age older than 27; history of Pelvic inflammatory disease (PID); smoking and alcohol intake; decreased frequency of coitus; congenital anomalies of the cervix and uterus; and immune system disorders.

A global survey of almost 17,500 women (mostly of childbearing age) from 10 countries revealed that knowledge regarding fertility and biology of reproduction was poor. Many women are verbally or physically abused in their own homes, deprived of their inheritance, sent back to their parents, looked down upon by society, or even have their marriage dissolved or terminated if they are unable to conceive. Increasing the level of knowledge of these factors may help to decrease the incidence of infertility by allowing women to avoid certain risk factors that might lead to it [4].

The nurse has a crucial role in the prevention and management of infertility, the nurse should perform careful assessment for the presence of risk factors as age, chronic disease, stress and poor diet. As well, education is another important role that the nurse should teach the couples about the symptoms and timing of ovulation, the most effective times for intercourse, avoiding douches and artificial lubricant, home assessment of cervical mucus and basal body temperature (BBT) recording. The nurse also can alleviate some of the anxiety associated with diagnostic testing by offering explanation about timing and reasons for each test. In addition, the nurse should be familiar with the infertility problems; psychological, socially, the couple's stage of coping and fertility centers for referral [5].

Significance of the Study: In Egypt, the prevalence of infertility has been estimated to be between 10 to 15% among married couples and causes of infertility can be found in about 90% of infertile cases and about 10% of couples without explained causes [6]. Furthermore, Egyptian women especially who live in Upper Egypt are still sticking to their old traditional and ancient pattern of life especially the inherited primitive prescriptions for treatment of infertility. Faith and traditional healers were the first option for the treatment of infertility among illiterate and jobless women [7].

In Egypt, Mohsen *et al*. [8] reported that the prevalence of the primary and secondary infertility was 2.5 and 7.9% respectively; also, they added that, the overall prevalence of infertility is 10.4%. Moreover, infertility has a profound emotional, psychological and economic impact on affected couples and society. Also evidence reported a great relation between demographic, social, lifestyle, reproductive & physiological body changes and secondary infertility. However, in Egypt there is scattered nursing researches that determine risk factors of secondary infertility among women; so, the current study assessed risk factors and developed guidelines to prevent and / or minimize these risk factors.

Aims of the Study were to: Assess risk factors of secondary infertility among infertile women and develop guideline to prevent and / or minimize these risk factors.

Research Question: What are the risk factors of secondary infertility among infertile women?

MATERIALS AND METHODS

Research Design: Descriptive exploratory design was adopted to assess risk factors of secondary infertility among infertile women

Setting: This research was carried out in infertility outpatient clinic at El-Manial University Hospital in Cairo, Egypt. The infertility outpatient clinic provides health care for infertile women; it includes 2 rooms, one for infertility examinations & management and other room was equipped with an ultrasound machine for gynecological examinations of infertile women. In September 2014, the total admission number to infertility outpatient clinic was 60 secondary infertile women (Infertility outpatient clinic records, El-Manial university Hospital, 2014).

Subjects: Purposive sample with a total of 200 women were recruited according to the following inclusion criteria: women having secondary infertility and at the reproductive age (during the childbearing period).

Tool for Data Collection: Secondary infertility risk factors questionnaire

It Consisted of Four Parts:

Part I: Personal risk factors: included age of women, educational level, place of residence, women`s occupation, husband`s occupation and women consanguinity relation.

Part II: Lifestyle and occupational risk factors: included data about practicing exercise, smoking, drinking coffee and tea, women and husband exposure to chemical or radiation hazards and women use insecticide.

Part III: Reproductive risk factors: included menstrual profile as (age at menarche, menstrual cycle interval, duration of menstruation, menstrual regularity; menstrual disorders as (menorrhagia, dysmenorrhea, intermenstrual bleeding); use of hormones to regulate menstruation; obstetric history as (preterm deliveries, living children, abortion history, causes of abortions, age at first delivery/abortion, age at last delivery/abortion); breast feeding history, secondary infertility duration, age at marriage, duration of marriage and family planning history.

Part IV: Medical & gynecological risk factors: it included data about any medical and gynecological problems for women and family.

Tool Validity: Validation of the tool was done through submission to the panel of 5 experts in the field. Modifications were carried out according to the experts' judgments on the clarity of sentences and the appropriateness of content.

Ethical Consideration: An official permission was granted from the administrative personnel in the selected setting for data collection. The researchers explained the aim of the study to the women and informed them that the information obtained will be confidential and their participation was in a voluntary base. A verbal consent was taken from women to obtain their acceptance to participate in the research.

Pilot Study: It was conducted on 10% of the sample to ensure clarity of the questions and to detect ambiguity and estimate the time required to fill the questions in research tool.

Procedure: Data were collected through a period of 6 months from October 2014 to March 2015, two days/week from 9.00 am to 12.00 pm. All women accepted to participate and met the inclusion criteria were interviewed to collect data. The researchers met the women at infertility outpatient clinic at EL-Manial University Hospital where they came for the first time, or for follow –up of their conditions. The researchers introduced themselves to the women and informed them that the study posed no risks or hazards on their health and then asked for verbal consent from the women. The researchers faced the women, asked them the questions in simple Arabic language and recorded her answers in the questionnaire sheet. The interview lasted for about 30-45 minutes for each woman.

Description of Suggested Secondary Infertility Guideline: Secondary infertility guideline was developed based on the present research results and Australia´s National Infertility Network [9] and after extensive review of related literature to distribute it to newly married women and women after first delivery. The suggested guideline includes the following:

1-The Nature of Secondary Infertility Includes: When a woman is unable to bear a child, either due to the inability to become pregnant or the inability to carry a pregnancy to a live birth following either a previous pregnancy or a previous ability to carry a pregnancy to a live birth, she would be classified as having secondary infertility. Thus those who repeatedly spontaneously miscarry or whose pregnancy results in a stillbirth, or following a previous pregnancy or a previous ability to do so, are then not unable to carry a pregnancy to a live birth would present with secondary infertile.

2-Effects of Secondary Infertility on Women, Family and Community Include:

2.1 Psychological-Emotional Impact: stress, frustration, depression, anxiety, hopelessness, guilt, shame and feelings of worthlessness in life.

2.2 Socio-cultural impact: isolation, violence, denial, social stigmas, loss of social status, marital instability and divorce.

2.3 Economic Impact: burden of expensive treatment, transportation, accessing both biomedical and traditional health services.

3-Risk Factors for Secondary Infertility among Women Include:

3.1 Personal risk factor includes obesity, unhealthy diet, smoking, addiction, alcohol consumption, occupation and environmental health hazards.

3.2 Lifestyle risk factors, stress, poor nutrition, lack of exercise, alcohol consumption, smoking, caffeine, plus other circumstances.

3.3 Occupational Risk Factors: Exposure to organic solvents, metals and pesticides in the work environment

3.4 Medical Risk Factors: Numerous diseases such as diabetes, arthritis, hypertension and asthma can affect fertility as can the medication used to treat them.

3.5 Obstetric Risk Factors: Unsafe methods of childbirth and post-partum period, symptoms of sexually transmitted diseases, lack of prenatal care in the last pregnancy, the first pregnancy before the age of 21 years, a history of unwanted pregnancy, an adverse pregnancy outcome, stillbirth, postpartum infection and curettage.

4-Methods to Improve Women Chances of Getting Pregnant Include:

4.1 Modify and Alleviate Risk Factors:

- Comprehensive approaches for screening, treatment, prevention and education to reduce infertility and to address economic needs in access to prevention, testing and treatment, use of infertility services and outcomes of treatment.
- Chronic disease prevention and health promotion programs to reduce the incidence and severity of conditions such as diabetes, polycystic ovary syndrome and infertility related to polycystic ovary syndrome.
- Measures to protect the reproductive health and fertility potential of workers who may be exposed to environmental and occupational hazards.
- Programs aimed at behavioral factors that may affect infertility, such as programs to prevent use of drugs, tobacco and anabolic steroids; improve nutrition; and promote adequate levels of physical activity.
- Support and improve access to quality services, including screening, diagnosis and treatment services for known causes of infertility.
- Psychological and social support

Statistical Analysis: The Statistical Package for the Social Science (SPSS) software was used for data entry and analysis. Descriptive statistics and frequencies were used to analyze the sample for homogeneity; examine normality and determine if any skewness or kurtosis occurred. Assessment of normality was made through histogram; 95% confident interval (CI).Parametric and non-parametric inferential statistics were used. Regression analysis was run to answer risk factors affecting secondary infertility. Multiple regressions were used to assess the relationship between dependent and independent variables. Statistical significance was considered at p-value <0.05.

RESULTS

Findings of this descriptive study were presented in three main sections; section I. Description of the sample, section II. Risk factors for secondary infertility, section III: Relations among variables.

Section I. Description of the Sample: The women age range was, 19-44 year with a mean of 27.5± 5.58 years old. Regarding to level of education, 14% of the women cannot read and write, 8% can read and write, 11.5% had primary education, 27.5% had preparatory education, 34.5% had secondary education and only 4.5% had baccalaureate education. Regarding to place of residence, 62.5% of women lived in rural areas and 37.5% lived in urban areas. In relation to women's occupation, 31.5% were working while 68.5% of them were housewife. While 33% of husband`s worked in governmental sectors, 20.5% of them worked in private sectors and 46.5% of the husbands worked as handicraft. In relation to consanguinity relation, 46% of the women had first degree relative relation with their husbands.

Section II. Risk Factors for Secondary Infertility: This section encompassed a) Lifestyle and occupational risk factors, b) Reproductive risk factors and c) Medical and gynecological risk factors (women and family).

Lifestyle and Occupational Risk Factors: Regarding practicing exercise; findings revealed that only 5% of the women practicing exercise regularly, 19.5% irregularly practicing exercise, while, 75.5% did not practicing exercise. In relation to cigarette smoking; 5% of the women were cigarette smokers, with cigarettes number range from 10-15 cigarettes/day while 60% were passive smokers. Regarding to recreational drug, 9.5% of the husbands use recreational drugs. As regards drinking coffee and tea; 88% of the women used to drink tea and coffee with a number of cups range from 2-5 cups/day. Regarding to household habits as use of insecticide; 50.5% of the women used insecticide agents; 48.5% of them used it regularly, while 2% of them used it with irregular pattern.

Regarding to occupational risk factors, chemical or rays exposure among women 4.5% of them exposed to chemical hazards in their work while 10.5% exposed to radiation hazard. In addition, 8.5% of the husbands` exposed to chemical hazards and 10.5% of them exposed to radiation in their work (Table1).

Reproductive Risk Factors: Reproductive risk factors included; menstrual profile, obstetric profile, breast feeding history and family planning history. In relation to menstrual history the results revealed that 52.5% of the women had irregular menstruation, while 12, 21 and 13%, respectively of women had menstrual abnormalities as menorrhagia, dysmenorrheal bleeding and intermenstrual bleeding respectively. Also, 11% of the women took hormones to regulate their menstruation. Four percent of the women had preterm labors and 21% had abortion history. Regarding to the causes of these abortions, 14.3% of them had cervical incompetence, 21.4 % of them had therapeutic induced abortion "related to fetal causes" and 64.3% of them had unknown cause (Table 2).

Also, the result revealed that age range at menarche was 10-16 years with a mean of 13.1 ± 1.28 years old, menstrual cycle interval range was 21-30 days with a mean of 28.73± 4.80 days, the duration of menstruation range was 3-7 days with a mean of 4.82± 1.22 days. Age range at marriage was 16-30 years with a mean of 21.34±3.16 years; range of marriage duration was 1-19 years with a mean of 6.26±4.59 years. Age range at first delivery/abortion was 19-40 years with a mean of 27.5± 7.56 years and age range at last delivery/abortion was 20-44 years with a mean of 29.62± 9.19 years. Range of duration of secondary infertility was 2-17 years with a mean of 5.46± 3.55 years.

In relation to breast feeding, 34% of the women breast fed their children for a range period of 2-24 months with a mean of 15.76± 7.74 months. Regarding breast feeding complications 44.2% of them developed cracked nipples, 22 % developed breast engorgement, 13.2 % developed lactation mastitis, 7.4% developed plugged ducts and 13.2 % breast abscess. More than half of the women (58.5%) had no living children, 34.5% had one child and 7% had more than one child (Table 2).

Family planning history: in this study, 39 % of women use family planning methods, the range duration of use this methods was 12- 60 months with a mean of 32.53± 20.05, 24.4% of them used contraceptive pills, while, 6.4% of them used contraceptive injection and 69.2 % of them used intra uterine device (Table2).

Medical and Gynecological Risk Factors Related to Women and Their Families: Results revealed that, 46% of the women had history of medical disorders as: diabetes mellitus, hypertension, thyroid and kidney disease (24, 5, 7, & 10% respectively). Regarding gynecological risk factors, 74.5% of women had history of gynecological problems as infection, uterine bleeding and tumor in reproductive system (53, 11.5, & 10% respectively). While, results revealed that the women had family history of diabetes mellitus, hypertension, kidney disease and thyroid disease (15.5, 18, 6.5 and 5% respectively). Regarding family gynecological risk factors 2.5% had benign tumors in the reproductive system, 15% had primary infertility and 20% of the sample had family history of secondary infertility while 17.5% had no family history of gynecological risk factors (Table 3).

Part III: Relations among Variables: Using multiple regression analysis results indicated a significant relation between secondary infertility and personal risk factors as women`s age, educational level, place of residence, age at marriage and women' consanguinity relation as risk factors for secondary infertility ($p<0.001$, $=0.045$, $= 0.037$, $=0.023$ &$= 0.006$ respectively). While, occupation of the women, occupation of the husbands and exposure of the women and their husband to chemical or ray agents were not significant ($p =0.45$, $=0.060$, $=0.19$ & $=0.67$, respectively).

Also, results indicated that a significant relation between secondary infertility and reproductive risk factors as menstrual irregularities, age at menarche, presence of menstrual abnormalities, age at first delivery/ abortion, age at last delivery/abortion, number of living children, gynecological history and abortion history ($p=0.009$, $=0.04$, $=0.02$, $=0.007$, $=0.002$, <0.001, $=0.002$ & <0.001 respectively). On the other hand, no significant relation was found between family medical history, women medical history, use hormones for menses regulation, duration of menstruation, family planning methods, breast feeding and breast feeding complications ($p=0.79$, $=0.12$,, $=0.12$, $=0.70$, $=0.37$, $=0.52$, & $=0.30$, respectively).

In addition, results indicated that a significant relation between secondary infertility and lifestyle risk factors, as irregular practicing exercise, use of insecticidal agents and use of recreational drugs were risk factors that might affect secondary infertility ($p=0.02$, $=0.043$& <0.001 respectively). While, smoking habits and drinking coffee & tea habits were not significant ($p=0.47$ & $=0.75$, respectively).

Table 1: Distribution of the sample according to their lifestyle and occupational risk factors

Characteristics	Freq. (n=200)	%
Irregular practicing exercise		
Disagree	10	5
Agree	39	19.5
No exercise	151	75.5
Smoking		
Active smokers	10	5
Passive smokers	120	60
Husband`s use of recreational drugs	19	9.5
Drinking coffee and tea		
Yes	176	88
No	24	12
Women's exposure to chemical hazard		
Yes	9	4.5
No	191	95.5
Women`s exposure to ray hazard		
Yes	21	10.5
No	179	89.5
Women use insecticide		
Yes, irregular use	97	48.5
Yes, regular use	4	2
No	99	49.5
Husband`s exposure to chemical hazard		
Yes	17	8.5
No	183	91.5
Husband`s exposure to ray hazard		
Yes	21	10.5
No	179	89.5

Table 2: Distribution of the sample according to their reproductive risk factors

Characteristics	Freq. (n=200)	%
Menstrual regularity		
Regular	95	47.5
Irregular	105	52.5
Menorrhagia		
Yes	24	12
No	176	88
Dysmenorrheal bleeding		
Yes	42	21
No	158	79
Inter menstrual bleeding		
Yes	26	13
No	174	87
Used hormones to regulate menstruation		
Yes	22	11
No	188	89
Premature deliveries		
Yes	8	4
No	192	96

Table 2: Continued

Characteristics	Freq. (n=200)	%
Abortion		
Yes	42	21
No	158	79
Causes of abortions (n=42)		
Cervical incompetence	6	14.3
Therapeutic induced abortion	9	21.4
“related to fetal causes"		
Unknown cause	27	64.3
Breast feeding		
Yes	68	34
No	132	66
Breast feeding complications (n=68)		
Cracked nipple	30	44.2
Breast engorgement	15	22
Lactation mastitis	9	13.2
Plugged ducts	5	7.4
Breast abscess	9	13.2
No living children	117	58.5
One living children	69	34.5
More than one living children	14	7
Family planning history		
Yes	78	39
No	122	61
Family planning methods (n=78)		
Contraceptive pills	19	24.4
Contraceptive injection	5	6.4
Intra uterine device	54	69.2

Table 3: Distribution of the sample according to their Medical and gynecological risk factors related to women and their families.

Characteristics	Freq. (n=200)	%
Personal medical risk factors		
Diabetes mellitus	48	24
Hypertension	10	5
Thyroid	14	7
Kidney disease	20	10
No medical risks	108	54
Personal gynecological risk factors		
Infection	106	53
Uterine bleeding	23	11.5
Tumor in reproductive system	20	10
No gynecological risks	51	25.5
Family medical risk factors		
Diabetes mellitus	31	15.5
Hypertension	36	18
Kidney disease	13	6.5
Thyroid disease	10	5
Family gynecological risk factors		
Benign tumors in the reproductive system	5	2.5
Primary infertility	30	15
Secondary infertility	40	20
No gynecological risks	35	17.5

DISCUSSIONS

In this research the researchers assessed risk factors among women with secondary infertility, the findings of this research were answered the research question which was what are the risk factors of secondary infertility among infertile women attending infertility outpatient clinic.

Results revealed that age of the sample range was19-44 year with a mean of 27.5± 5.58 years old. slightly more than half of the sample was in the age range 31-44 years old, the results of this study indicated a significant relation between age and secondary infertility ($p<0.001$). Finding is matched with the data in the study of Gurevich [10] who reported that, as a woman age beyond 35years (and particularly after age 40years), the likelihood of becoming pregnant is less than 10% per month, when way to menopause begins, women' bodies reproductive capabilities slow down, becoming less effective at producing mature and healthy eggs. As women age becomes closer to menopause, their ovaries respond less well to the hormones that are responsible for helping the eggs ovulate. In the same context, Baird *et al*. [11] and Gnoth *et al*. [12] added that during the last twenty years, the average age of having children has increased and this is a key factor for infertility. As the age of giving birth is increased, the reproductive capacity is decreased, the ovary becomes less efficient, the frequency of sexual intercourse is decreased and the possibility of chromosomal abnormalities and miscarriage is increased.

The results revealed that slightly more than one third of the sample received primary and preparatory education, level of education is another risk factor of secondary infertility ($p=0.045$). This may be related to lack of awareness with secondary infertility causes and risk factors. This is supported by Mokhtar *et al*. [8] who emphasized that low level of education was significantly associated with secondary infertility where cases of low level of education had double risk for secondary infertility as compared to cases with high level of education.

Regarding place of residence, near two third of the sample lived in rural areas and a significant relation was found between secondary infertility and place of residence ($p= 0.037$). This result may be due to, women that lived in rural areas are more vulnerable to pollutants and chemicals such as frequent use of detergents, insecticides and pesticides due to agriculture nature of rural environment, also self-care of women in rural areas are relatively poor so women are more prone to suffer from secondary infertility. This is supported by Woodruff *et al*. [13] who studied the effect of environmental challenges on reproductive health and fertility, concluded that there is lack of knowledge in rural communities about the effects of environmental contaminants on reproductive health. These may be associated with the level of illiteracy and education.

But on the other hand, the findings of the present study regarding place of residence disagreed with Bentley and Mascie-Taylor [14] who mentioned that there were no significance difference between rural and urban area in which the prevalence of infertility in urban regions was 6.8% and in rural population was 5.3%.

Interestingly, results of this study revealed that near half of the sample had first degree relative relation with their husbands and results indicated that women's' consanguinity relation was a predictor variable in increasing secondary infertility risks ($p=0.023$). This finding agrees with Inhorn [15] who pointed to a positive association between consanguinity and infertility and stressed on the important contribution of recessive genetic factors among consanguineous to the etiology of infertility. This finding is in contrary with Tadmouri *et al*. [16] who stated that higher fertility rates and higher rates of live births were reported among first cousin couples than non consanguineous couples in Qatar, Kuwait, Saudi Arabia and Tunisia, as increase in fertility could be a biological means possibly to the earlier age at marriage, earlier first maternity and longer reproductive span among consanguineous as compared to non-consanguineous couples.

Regarding lifestyle risk factors, the majority of women did not regularly practicing exercise and not practicing exercise that significantly related with secondary infertility ($p=0.02$). Ferreira *et al*. [17] stated that in a study of 26,955 women, vigorous activity was associated with reduced risk of ovulatory infertility. Also, moderate regular exercise positively influences fertility and assisted reproductive technology outcomes.

Finding of this research indicated that exposure of the women and their husband to chemical hazards or ray hazard not affect female fertility. However, this is may be due to the minority of the sample and their husbands who exposed to chemical or ray hazard. These findings are in agreement with Gambrell [18] and Ten *et al.* [19] who stated that exposure to workplace hazards as Cancer treatment drugs (e.g., methotrexate), Lead and Ionizing radiation (e.g., X-rays and gamma rays) can damage the woman's eggs or the man's sperm, altered ovum & sperm DNA integrity or a change in the hormones needed to regulate the normal menstrual cycle are just a few things that can cause problems with fertility.

Age at marriage is another risk factor contributed to secondary infertility (p=0.023). More than half of women married before 21 years old. This finding is matched with the data in the study of Yang *et al.* [20] who reported that, the prevalence rate of infertility was increased in the women whose marriage age were younger than 20 years or elder than 29 years old. Also, this finding is similar to the data of Mokhtar *et al.* [8] study about risk factors for primary and secondary female infertility in Alexandria and clarified that early age at marriage correlated with infertility.

More than half of the sample had menstrual irregularities and near half of the sample complained from menstrual abnormalities as menorrhagia, dysmenorrheal bleeding and inter menstrual bleeding and a statistically significant relation was found between menstrual irregularities, menstrual abnormalities and secondary infertility (p=0.009, =0.02).This result is supported by Meneses Holland [21] who mentioned that hormonal disorders, ovulation problems and menstrual irregularities are experienced by women diagnosed with polycystic ovarian syndrome, endometriosis, uterine fibroid and uterine bleeding, this may be due to that those previously mentioned problems may blocked fallopian tubes, disturbed the reproductive hormones which are positively linked with increased incidence of female infertility.

One third of the sample their age at menarche was below 12 years old and there was statistical significant relation between age at menarche and secondary infertility (p=0.04). These finding is in agreement with Andrea *et al.* [22] who investigated whether age at menarche is associated with functional ovarian reserve later in life and found that women who experienced menarche at a younger age were more likely to suffer from diminished functional ovarian reserve and more liable to infertility problem. In contrary Chen *et al.* [23] who studied the relationship between age at menarche and infertility among 6906 Chinese rural women and indicated that increasing age at menarche was associated with an increased risk of infertility.

Above two third among those who used contraceptive methods utilized Intrauterine Devices (IUDs) but no significant correlation was found with secondary infertility. This finding matche with Delbarge *et al*. [24] who demonstrated that, the use of IUD doesn't affect future fertility of women wishing to become pregnant following removal of IUD. In contrast, with the data of Corcoran [25] who reported that using of contraceptive methods especially IUD is a fundamental indicator of the female infertility and the most profound complications of IUDs are infection, pelvic inflammatory diseases and infertility. Also, added that, the serious complications due to infection associated with an IUD may prevent women from being able to become pregnant in the future.

Also, according to the present study findings it was shown that near one quarter of the sample had abortion history, there was statistically significant relation between abortion and secondary infertility (p<0.001). This was agreed with Cates *et al.* [26] and Stanton *et al.* [27] who reported that abortion is a very important cause of secondary infertility, a study was conducted in Sub Saharan Africa which reported that infection after child birth or after abortion were the major causes of infertility. Unsafe abortions can have severe consequences from 20-50% of women will have immediate complications (e.g. haemorrhage, sepsis or trauma) and 20-30% will get infertility as abortions under unhygienic conditions leading to high rates of infections. These infections often damage the tubes resulting in irreversible bilateral tubal occlusion.

CONCLUSIONS

This study concluded that women`s age, place of residence, age at marriage, women' consanguinity relation, menstrual irregularities, age at menarche, presence of menstrual abnormalities, age at first delivery/ abortion, age at last delivery/abortion, number of living children, gynecological history, abortion, irregular practicing sports, use of insecticidal agents and use of recreational drugs are considered risk factors for the occurrence of secondary infertility.

Recommendations: Based on the findings of the present research the following recommendations were suggested;

- Raise awareness of youth and adults through utilizing secondary infertility guideline developed by the researcher to be used in the gynaecological outpatient clinic, infertility clinic, Maternal and child health centre, to be used through counselling.
- Further research is needed to get a better understanding of the impact of secondary infertility on women, family and community.

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