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Effect of Instructional Guideline on Fertility Nurses' Knowledge and Attitude regarding Invitro Fertilization

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Abstract
Invitro Fertilization Technique is one of the greatest successful forms of assisted reproductive technologies today that can help infertile couple to get an integrated family. Fertility nurses play important role in caring of patients undergoing invitro fertilization (IVF). Most of them lack knowledge and skills in the area of embryology and genetic counseling of IVF partners. Thus, the aim of this study was to assess the effect of instructional guideline on nurses' knowledge and attitude regarding invitro fertilization.
Subjects and methods: *A quasi experimental research design was used to conduct this study. The study was carried out at one university hospital (Fertility Unit at Tanta University Educational Hospital) and three private fertility centers (Fertility Egyptian Consultants Center in Tanta city, Koreat Eain for Fertility and Helm Elomoma Center in El-Mehall El-kopra) affiliated to El-Gharbia Governorate, Egypt. The subjects of this study consisted of all nurses (45 nurses) who are working in the previously mentioned settings. Two tools were used for data collection: Tool I part I socio-demographic characteristics of nurses, part II nurse's knowledge interview questionnaire and tool II attitude of nurses toward invitro fertilization questionnaire.*
Result: *The study confirmed that all nurses (100%) had low level of knowledge and 86.7% of them had negative attitude regarding invitro fertilization before the educational intervention, while all of them (100%) had high level of knowledge and 80.0% had positive attitude immediately after the intervention.*
Conclusions: *The instructional guideline significantly affects nurses' knowledge and attitude regarding invitro fertilization.*
Recommendations: *Increased knowledge about invitro fertilization will improve nurses' attitudes. So, this study recommends that invitro fertilization should be included in maternity nursing curriculums. It should also be provided as in-service refreshment topic for nurses who are working in fertility units and centers either in educational, governmental or private sectors to improve their knowledge, attitude, self-confidence and comfort augmented by communications skills to discuss sensitive topics related to invitro fertilization with their clients.*
Keywords: *Instructional Guideline, Knowledge, Attitude, Invitro Fertilization.*

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I. Introduction

In-vitro fertilization (IVF) is a sophisticated process by which a mature ovum is fertilized by a healthy sperm outside the body. IVF is the advanced clinical treatment for infertility, when other techniques of assisted reproductive technology had been failed [1]. The first success of the IVF technique occurs in 1976 resulted in ectopic pregnancy. While, the first baby from IVF named Louise Brown, was born in 25 July 1978 in London [2]. IVF in the Arab world especially in Egypt faces some issues of resistance because of the cultural, social, religious, financial limitations, and other problems [3]. The World Health Organization (WHO) states that approximately 8-10% of couples face infertility problem. Infertility is not a disease but a health problem [4]. IVF can help infertile couple to have a baby when other treatments fail. IVF is not the first option for treatment of infertility because it is an invasive and costly procedure [5].

IVF technique is one of the highest successful forms of assisted reproductive technologies today that can help infertile couple to get an integrated family, but the rate of IVF success varies. According to the American Pregnancy Association, birth rate for women under age 35 undergoing IVF is 41 to 43%, while this rate falls to 13 to 18 % for women with the of 40 years or older [5,6]. IVF is indicated for treatment of males 'unexplained infertility, blocked or damaged fallopian tubes, uterine fibroids, endometriosis, reduced ovarian function, and fertility in women over the age of 40 and for males' associated with low motility and low sperm count or sperm shape abnormality. IVF is also used for treatment of repeated failure of intrauterine insemination or other methods

of assisted reproductive technology, selection of baby sex and pre-implantation genetic testing to exclude genetic problems [7].

Numerous diagnostics measures and laboratory investigation is required before IVF technique for enhancing the performance in preparation. The diagnostics measures include hysteroscopy, laparoscopy, ovarian reserve tests, ultrasonography, hysterosalpingography, surgery for endometriosis, uterine fibroids, and endometrial polyps. The laboratory tests include seminal analysis, anti-mullerian hormone, estradiol, prolactin, follicle stimulating hormone (FSH), luteinizing hormone (LH) and thyroid stimulating hormone (TSH) and other more investigations [8, 9].

Different medications are essential for preparation of the infertile couple and for successful IVF technique of treatment. Injections of FSH and/or LH hormones are used to stop normal ovulation and to stimulate more than one follicle from the ovaries [10]. FSH is a hormone that may work with LH to increase the estrogen production and follicles growth. These are given by intramuscular or subcutaneous injection. The dosage of these drugs requires monitoring of the ovarian response, usually by vaginal ultrasound examinations or blood tests as estradiol level during the period of ovarian stimulation. Other medications are used to prevent premature ovulation as gonadotrophins releasing hormones. Gonadotropins are fertility drugs (Gonal-F, Bravelle, Follistim, and Menopur) utilized to stimulate the ovary to produce multiple oocytes over the span of some days or more [11].

Moreover, progesterone and estradiol are given after egg retrieval, because the ovaries will not produce satisfactory amounts of these hormones for long enough to fully support the uterine lining and maintain the pregnancy. Progesterone is given as a form of vaginal or rectal suppositories or by intramuscular injection. Progesterone side effects are several and include allergic reaction, depression, sleepiness, and infection at the site of injection [1,12]. Estradiol is taken orally, intramuscular injection, transversally, or through the vaginal route. Its side effects include nausea, vomiting, irritation at site of injection and the risk of blood clots. Antibiotics may be given after egg retrieval or embryo transfer for a short time to reduce the risk of infection during the treatment cycle. Other medications used during the technique / protocol of treatment include heparin or aspirin, DHEA-S, and androgens. Invitro fertilization technique / protocol consist of five basic steps that should be clearly taught to the couple, as well as its benefits, risks, methods of giving injections at home [6,13]. The steps include 1) ovarian stimulation to produce several ova (follicles), 2) retrieval of the ovum (one or more) from the ovaries, 3) obtaining a semen sample from the husband, 4) fertilization of the ova with sperms in the laboratory, 5) transfer of the grown embryos to the uterus[14].

The first step of IVF technique is simulation of the ovaries. It involves use of fertility medications. The ovum development is monitored by using vaginal ultrasounds and measuring estrogen level in the blood. When the ovarian follicles reach the required degree of development, injection of Human chorionic gonadotropin (HCG) to final oocytes maturation is done. Then, the ovulation would occur between 38 and 40 hours. The second step of the IVF procedure is retrieving ova between 34 to 36 hours after (HCG) injection, just prior to rupturing of follicles [5,15]. The embryologist can aspirate the follicles and the follicular fluid is passed through a minor surgical procedure. Ultrasound imaging is used during needle penetration to the vaginal wall in or to reach the ovaries and collects a range of 10 to 30 ova. The third step is obtaining the sperm from the husband by ejaculation or from testes, and then it is prepared by the embryologist laboratory [6,16].

The fourth step is insemination of the mature ova with healthy sperms, then place in the laboratory incubators to enable fertilization. In cases of lower probability of fertilization, intracytoplasmic sperm injection (ICSI) may be done and the ova are monitored to find out that fertilization and cell division are taking place and it became embryos. The fifth step of IVF is transferring embryo the into woman's uterus from three to five days after ova retrieval. A doctor or nurse will insert a catheter, a long, thin and flexible tube into the vagina, through the cervix and into the uterus [8,17]. A syringe containing one or more embryos suspended in a small amount of fluid is attached to the end of the catheter, this procedure is painless. Then, hormonal drugs as progesterone are given to support the uterine lining to increase chance for pregnancy. Implantation occurs when an embryo attaches to the uterine wall of the endometrial lining. This occurs after the ova retrieval process from six to ten days, which is one to five days after the embryo transfer. This equates to days 20 to 24 of an ideal 28-day menstrual cycle [18,19].

The successfulness of the IVF depends on quantity and quality of the growing multiple eggs at once. The rate of successful implantation depends on two elements: the receptiveness of the uterus and the quality of the embryo**.** Implantation failures occur due to chromosomal abnormalities in the embryo and poor ova quality or the resulting embryos may not be healthy enough to implant. If in vitro fertilization failed or pregnancy test is negative, this mean crisis for the couple. The second attempt is a difficult decision and a complicated process, because of the associated physical, financial, and emotional toll [4,5].

Hazard of IVF include increase incidence of abortion, damage of ovum, multiple pregnancies, chromosomal abnormality of the fetus and ovarian hyperstimulation syndrome (OHSS) due to ovulation stimulator drugs [20]. OHSS is the most common complication of IVF. It is characterized by severe abdominal swelling and pain, nausea, vomiting, blood clots in the legs or lungs and fluid imbalances in the blood. Two type of OHSS; mild or sever, mild cases occur in 2 % to 6%, while severe cases occur in approximately 1 % of women,

usually in association with more than 20 ova retrieved[21]. The hazard of OHSS can lead to cancelled IVF cycle when too many follicles showed by vaginal ultrasound and estrogen levels become too high. In this case, the retrieved oocytes are often fertilized, the decision to freeze all embryos may be delayed until this time and it will be used in a subsequent cycle. The symptoms of OHSS are highest almost three to five days after retrieval of the ova [22,23].

The fertility nurses play important roles in the assistive reproductive technology especially in IVF technique [1]. These include assessment, planning, implementation, evaluation, counseling and education roles. They are the primary health care personnel who communicate with couples during the IVF, coordinate the various stages of treatment and ensure the couple' commitment to the treatment [24]. The fertility nurses perform as practitioner roles of in diagnosis, treatment and follow-up from first contact with couples. They assess the couples' needs with a holistic perspective in accordance with their medical knowledge, detect problems, choose care practices, plan and implement the plan of treatment and evaluate the outcome of care [1, 18]. They use their management skills during the cycle of treatment to ensure that the patient and the health care providers are in the right place at the right time. They keep the records of treatment outcomes, give scientific counseling and information to the couple to reduce their stress and anxiety and help them in planning of the treatment cycle in the first interview [25].

The fertility nurses play significant role in the follow-up of the cycle, oocytes removal, embryo transfer and pregnancy test at the end of the cycle [1]. The fertility nurse also provides instruction guidelines for women after embryo transfers that include avoidance of sexual intercourse until pregnancy test, important of dose and time of medication and increase fluid, fiber and protein diet. The fertility nurse must be knowledgeable and equipped in all stages of IVF to provide the necessary assistance for couple to cope with their crisis and to cope with the psychosocial situation, which they live in [26].

Nurses' attitude regarding invitro fertilization is very important, while research of their attitude regarding IVF is limited. Nurses may have more time and opportunity in the clinical setting to discuss IVF than other health care providers. Several barriers may affect nurses' attitude regarding IVF. These include nurses may not be up to date about IVF or may have difficulty in communication with couple about IVF technique [27]. Other barriers include patient factors and institutional factors. Nurses may be in an ideal position to discuss IVF with patients, given their multiple interactions prior to infertility treatment. Providing IVF information for nurses is needed to improve the knowledge of the quality of care provided and the confidence in their abilities, which in turn improve their attitudes. Thus, fertility nurses should receive instructional guideline regarding invitro fertilization, in order to be equipped with knowledge, and to promote their attitude toward caring with IVF patients [28, 29].

Significant of the study

Slight is known about the knowledge and attitudes of fertility nurses who deal with invitro fertilization partners. Also, there is a gap between the attitudes and practices of the fertility nurses in communicating IVF information to their clients [30]. It would be beneficial to create a standardized communication protocol that includes instructional guidelines for practice and more research must be conducted in this area. So, this study thought to determine the effect of instructional guidelines on nurses' knowledge and attitudes regarding IVF.

Aim of the study

The aim of this study is to evaluate the effect of instructional guideline on nurses' knowledge and attitude regarding invitro fertilization.

Research Hypothesis:

Nurses′ knowledge and attitude regarding invitro fertilization are expected to be improved after implementation of the instructional guidelines.

II. Subjects and Methods

Subjects

Research Design:

A quasi-experimental research design was used to conduct this study

Setting:

The study was carried out at one university hospital (Fertility Unit at Tanta University International Education Hospital) and three private fertility centers (Fertility Egyptian consultants' center in Tanta city and Koreat Eain for Fertility and Helm Elomoma Centers in El-Mehall Elkopra) affiliated to El-Gharbia Governorate Egypt.

Subject:

The subjects of this study consisted of all nurses (45 nurses); 10 nurses form Tanta University Education Hospital, 9 nurses from Fertility Egyptian consultants' center in Tanta city and 15 nurses from Koreat Eain for Fertility and

11 from Helm Elomoma Centers in El-Mehall Elkopra affiliated to El-Gharbia Governorate; Egypt from April 2019 to October 2019..

Tools of data collection:

To achieve the aim of this study, the following three tools were used for data collection:

Tool I: Nurses' Knowledge Structured Interviewing Questionnaire:

It was developed by the researchers after reviewing recent related literature [16,27,31] and it comprises two parts:

Part I: Nurses socio demographic data: such as: age in years, marital status, level of education, residence, total experience in years and experience in fertility clinic and parity.

Part II:

It includes nurses′ knowledge related to invitro fertilization as follow:

- Menstrual data, such as definition, duration, interval, amount and physiology of menstruation.
- Anatomy of female reproductive system, characteristics of normal seminal fluid and of mature ovum.
- Knowledge regarding invitro fertilization as follows: IVF definition, benefits, indication, type of protocol and risks.
- Lab investigation, such as anti-Mullerian hormone, FSH, LH, estrogen and prolactin hormones.
- Diagnostic measures, such as foliclymetry, hysteroscopy, uterine, salpengography and ultrasound, hysteron.
- Steps of IVF technique: There are five basic steps in the IVF and embryo transfer process which include ovarian stimulation, retrieval of the ovum and obtaining a semen sample from the husband, fertilization of the eggs with sperm and transfer embryos into the woman 's uterus
- Nurses' instructions guidelines after embryo transferee, such as drinking too much, eating large amounts of protein, taking medications in a fixed time, rest, avoid sleeping on the back for long periods, eating vegetables and fiber to avoid constipation, avoid food like high-mercury fish and soft cheeses, reducing the intake of caffeinated drinks, taking folic acid and vitamin E, take paracetamol in case of high temperature, drug guava can be taken as a drink in the event of a cough, tell the lady about the date of the digital pregnancy analysis and repeat it after 48 hours, avoid sexual intercourse while doing the analyzes and avoid extreme exposure to temperature, such as sauna.

Scoring system for knowledge:

- Correct and complete answers will be scored as (2).
- Correct and incomplete answers will be scored as (1).
- Incorrect or didn't know will be scored as (0).

The total score level of knowledge will be calculated as follows:

- High level of knowledge ≥75%.
- Moderate level of knowledge 50 % - <75%.
- Low level of knowledge <50%.

Tool III: Nurses' self-reported attitude regarding IVF scale:

This tool was developed by Obioha, et al (2014) and adapted by the researchers to assess nurses' attitude toward IVF [32]. It consisted of (11) items in a 3-point Likert scale requesting respondents to tick which item (s) apply to them. The self- reported attitude of nurses was measured using a Likert scale and graded from 3= agreed; 2= neutral and 1= disagreed. These are:

1. IVF should be encouraged
2. IVF should be used to sex selection
3. Against any technique that experiments with human beings
4. IVF should be used to exclude genetic disorder
5. IVF is frightening because it complicates such as ovarian hyperactivity
6. IVF should be repeated because it increases the chances of its success
7. Against any method that experiments with humans
8. A child born with IVF will not be healthy
9. We do not need IVF in Egypt
10. It is very expensive and therefore cannot be recommended to anyone
11. Babies who are born with IVF behave abnormally
12. IVF is not very attractive, as the success rate is very low

The total scoring system of nurses' attitude was as follow:

- Positive attitude ≥ 50 % of the total attitude score.
- Negative attitude < 50 % of the total attitude score.

Method

1. Approval:

- An official letter clarifying the purpose of the study was obtained from the Faculty of Nursing and submitted to the responsible authorities of the selected settings for permission to carryout the study.

2. Ethical and legal consideration:

a. All the nurses were informed about the purpose of the study.
b. An informed consent was taken from every nurse in the study including the right to withdraw at any time.
c. The researchers ensured that the nature of the study do not cause any harm or pain for the entire sample.
d. Confidentiality and privacy were taken into consideration regarding the data collected.

3. Development of the tools:

- **Tools I and tool II** were developed by the researchers after extensive review o f recent related literature [5, 17, 26]. **Tool III** was adapted from Obioha et al (2014) [32].
- The study tools were translated into the Arabic language.
- Then, they were tested for content and construct validity by a jury of five experts in Obstetric and Gynecological Nursing field.
- The reliability of the tools was also tested using the suitable statistical test analysis.

4. A pilot study:

- After development of the tools, a pilot study was carried out on 10% of the nurses from the previously mentioned settings to test the clarity, feasibility and applicability of the tools. Its results revealed that there were no fatal changes or mistakes. The tools were finalized accordingly and made ready for use. The obtained data were included in the study due to the small number of the population of the study.

5. The instructional guidelines intervention was conducted through four phases (Assessment, planning, implementation and evaluation) as follow:

Phase I: Assessment phase (Pretest):

- **Tool I part I & II** was used to assess socio-demographic characteristics of the nurses as well as their knowledge before, immediately and three months after implementation of the instructional guideline regarding IVF.
- **Tool II** was used to assess nurses' attitude regarding IVF before, immediately and three months after implementation of the instructional guidelines regarding IVF.

Phase II: Planning phase:

a- Setting the goals and objectives of the instructional guidelines:

The goal of the instructional guidelines intervention is to:

-Enhance the nurse's knowledge regarding IVF.
-Promote the nurse's attitude regarding IVF.

Objectives of the instructional guidelines:

After implementation of the instructional guidelines, the fertility nurses will be able to:

- List anatomy of the female reproductive system and physiology of menstruation
- Identify the characteristics of normal seminal fluid
- Enumerate indications for IVF and types of protocol
- Recognize definition, benefits, hazards, diagnostic measures and lab investigation needs for IVF
-Enumerate steps of IVF
- Display the nursing roles and instructional guidelines after embryo transfer.
- Demonstrate positive attitude regarding IVF

b) Prepare the content of the program:

- The educational program content was developed by the researchers based on the nurses' needs, which were determined in the interviewing schedule pre-assessment and the objectives of the educational program, as well as the literature review that covered the various aspect of the educational program.
- Based on the results obtained from the pre-assessment phase; preparing and organizing the program by using the appropriate educational methods and all needed content to facilitate learning activities and to achieve the objectives was established.
- The content of the educational program was organized in three sessions provided for the fertility nurses, each session last for one hour.

c) Selecting educational strategies:

Lectures were presented in concise manner and simple language. It took 60 minutes for each session and group discussion and brain storming to encourage the nurses to engage in the instructional guidelines. In addition,

different methods of teaching were used as posters, power point presentation, pictures, questions and videos. An educational booklet was also developed by the researchers using simple Arabic language and illustrated pictures, which include the information needed for nurses related to anatomy of the female reproductive system, physiology of menstrual cycle and characteristics of normal seminal fluid. It also included information regarding IVF, such as definition, type of protocols, techniques and nursing role in caring with couples of invitro fertilization. It was developed based on nurse′s needs and submitted to all nurses to increase their awareness about their role in IVF.

Phase III: Implementation phase:

- The researchers explained the purpose of the instructional guidelines for the participants, and obtained their consent to participate.
- The instructional guidelines included 3 sessions that were carried out in the previously mentioned settings. The duration of each session was 60 minutes including a discussion time. The sessions were conducted at the morning shift
- The total numbers of nurses are (45 nurses) was divided into 5 groups. Each group includes 9 nurses; the instructional guidelines were conducted over 2-3 days per week.

The sessions were as follows:

- **The first session:**

The aim of this session was to provide fertility nurses with the following items:

- Orientation about the IVF instructional guidelines
- Anatomy of the female reproductive system
- Physiology of menstruation

-The second session:

The aim of this session is to provide fertility nurses with knowledge about:

- Characteristics of normal seminal fluid
- Definition, benefits and hazards of IVF
- Indications for IVF and types of protocol
- Diagnostic measures and lab investigation needed for IVF

-The third session:

The aim of this session is to provide nurses with knowledge related to:

- Steps of IVF
- Nursing roles and instructional guidelines after embryo transfer

Phase IV: Evaluation phase:

- Nurses' knowledge and attitude were assessed three times using **Tool II** and **Tool III**, before, immediately after and three months after implementation of the instructional guidelines.
- Comparison was done in relation to nurses' knowledge and attitude before, immediately and three months after implementation of the instructional guidelines to identify its effect on the nurses' knowledge and attitude regarding IVF.

- **Data of the study were collected within 6 months.**

6. Statistical analysis

The collected data were organized, tabulated and statistically analyzed using SPSS version 19 (Statistical Package for Social Studies) created by IBM, Illinois, Chicago, USA. For numerical values the range, mean and standard deviations were calculated. The differences between two mean values were used using student's t test. Differences of mean values at different follow up times were tested by repeated measurement analysis of variance (F) and when found significant Bonferroni test was used to compare between each two groups. The correlation between two variables was calculated using Pearson's correlation coefficient. The level of significant was adopted at $p<0.05$.

III. Results

Table (1): Socio-demographic characteristics of the studied nurses

Characteristics of studied nurses		Number (n=45)	%
Age in years	20- 30- 40+ **Range** **Mean ± SD**	28 11 6 **21-46** **29.11±6.95**	62.3 24.4 13.3
Total years of experience	<5 5- 10- 15- 20+ **Range** **Mean ± SD**	11 16 9 3 6 **1-26** **9.33±6.82**	24.4 35.6 20.0 6.7 13.3
Marital status	Married	36	80.1
	Widow	1	2.2
	Divorced	2	4.4
Educational level	Secondary level	30	66.7
	University level	15	33.3
Place of Residence	Rural	20	44.4
	Urban	25	55.6
Years of experience in fertility clinics		33	73.3
Parity		31	68.9

Table (1) shows the socio-demographic characteristics of the studied nurses. It revealed that their age ranged from 21- 46 years with mean and SD (29.11±6.95)and 35.6% of them have total 5-10 years of experience with a range of 1- 26, and a mean and SD (9.33±6.82). The table also demonstrates that most of them (80.1%) are married, (66.7%) have secondary school education, (55.6%) live in urban areas,(73.3%) had experience in fertility clinics while 68.9% have children.

Table (2): Basic knowledge of the studied nurses regarding reproduction before and after the intervention

Basic knowledge regarding reproduction		Before		Immediately after		After three months		χ^2 p
		N	%	N	%	n	%	
Definition of menstruation	Incorrect	35	77.8	1	2.2	6	13.3	70.903
	Partially correct	8	17.8	11	24.4	10	22.2	0.001*
	Completely correct	2	4.4	33	73.3	29	64.4	
Duration of menstruation	Incorrect	34	75.6	3	6.7	9	20.0	59.436
	Partially correct	11	24.4	7	15.6	7	15.6	0.001*
	Completely correct	0	0.0	35	77.8	29	64.4	
Interval of menstrual cycle	Incorrect	26	57.8	1	2.2	10	22.2	47.673
	Partially correct	15	33.3	7	15.6	6	13.3	0.001*
	Completely correct	4	8.9	37	82.2	29	64.4	
Amount of menstrual blood	Incorrect	32	71.1	1	2.2	5	11.1	59.102
	Partially correct	8	17.8	4	8.9	9	20.0	0.001*
	Completely correct	5	11.1	40	88.9	31	68.9	
Physiology of menstruation	Incorrect	32	71.1	1	2.2	8	17.8	63.267
	Partially correct	12	26.7	8	17.8	8	17.8	0.001*
	Completely correct	1	2.2	36	80.0	29	64.4	
Anatomy of external female genital organs	Incorrect	19	42.2	1	2.2	7	15.6	48.514
	Partially correct	22	48.9	8	17.8	7	15.6	0.001*
	Completely correct	4	8.9	36	80.0	31	68.9	
Anatomy of internal female genital organs	Incorrect	26	57.8	1	2.2	9	20.0	44.882
	Partially correct	16	35.6	9	20.0	8	17.8	0.001*
	Completely correct	3	6.7	35	77.8	28	62.2	
Characteristics of mature ovum	Incorrect	39	86.7	0	0.0	9	20.0	69.573
	Partially correct	6	13.3	5	11.1	5	11.1	0.001*
	Completely correct	0	0.0	40	88.9	31	68.9	
Characteristic of normal seminal fluid	Incorrect	33	73.3	0	0.0	9	20.0	55.855
	Partially correct	9	20.0	9	20.0	8	17.8	0.001*
	Completely correct	3	6.7	36	80.0	28	62.2	

Table (2) presents basic knowledge of the studied nurses regarding reproduction before and after the intervention. It revealed that there were a high statistically significant differences between the studied nurses' basic knowledge pre, immediately and three months post the intervention in all items of reproduction with p value = 0.001 each.

Table (3): Knowledge of the studied nurses regarding invitro fertilization before and after the intervention

Knowledge regarding invitro fertilization		Before		Immediately after		After three months		χ^2 p
		N	%	N	%	n	%	
Definition of IVF	Incorrect	26	57.8	0	0.0	3	6.7	61.062
	Partially correct	16	35.6	5	11.1	7	15.6	0.001*
	Completely correct	3	6.7	40	88.9	35	77.8	
Indication of IVF	Incorrect	29	64.4	7	15.6	13	28.9	47.231
	Partially correct	11	24.4	3	6.7	4	8.9	0.001*
	Completely correct	5	11.1	35	77.8	28	62.2	
Benefits of IVF	Incorrect	32	71.1	2	4.4	11	24.4	47.048
	Partially correct	8	17.8	6	13.3	6	13.3	0.001*
	Completely correct	5	11.1	37	82.2	28	62.2	
Hazard of IVF	Incorrect	32	71.1	0	0.0	10	22.2	50.864
	Partially correct	8	17.8	10	22.2	9	20.0	0.001*
	Completely correct	5	11.1	35	77.8	26	57.8	
Types of protocol IVF	Incorrect	27	60.0	0	0.0	7	15.6	65.687
	Partially correct	15	33.3	5	11.1	3	6.7	0.001*
	Completely correct	3	6.7	40	88.9	35	77.8	
Diagnostic measures before IVF	Incorrect	32	71.1	8	17.8	10	22.2	53.379
	Partially correct	9	20.0	4	8.9	8	17.8	0.001*
	Completely correct	4	8.9	33	73.3	27	60.0	
Lab investigation before	Incorrect	31	68.9	2	4.4	8	17.8	45.894
	Partially correct	5	11.1	4	8.9	6	13.3	0.001*
	Completely correct	9	20.0	39	86.7	31	68.9	
Steps of IVF	Incorrect	32	71.1	13	28.9	16	35.6	41.247
	Partially correct	10	22.2	7	15.6	9	20.0	0.001*
	Completely correct	3	6.7	25	55.6	20	44.4	
Instruction guidelines after embryo transfers	Incorrect	31	68.9	0	0.0	8	17.8	67.106
	Partially correct	14	31.1	3	6.7	4	8.9	0.001*
	Completely correct	0	0.0	42	93.3	33	73.3	

Table (3) demonstrates knowledge of the studied nurses regarding invitro fertilization before and after the intervention. It was found that there were high statistically significant differences between the studied nurses' basic knowledge pre, immediately and three months post the intervention in all items of invitro fertilization with p value = 0.001 each.

Table (4): Attitude of the studied nurses regarding invitro fertilization before and after intervention

Attitude regarding invitro fertilization		Before		Immediately after		After three months		χ^2 p
		N	%	N	%	N	%	
IVF should be encouraged	Negative	24	53.3	6	13.3	6	13.3	40.676
	Neutral	12	26.7	6	13.3	10	22.2	0.001*
	Positive	9	20.0	33	73.3	29	64.4	
IVF should be used to sex selection	Negative	15	33.3	6	13.3	6	13.3	40.000
	Neutral	22	48.9	11	24.4	11	24.4	0.001*
	Positive	8	17.8	28	62.2	28	62.2	
Against any technique that experiments with human beings	Negative	36	80.0	13	28.9	15	33.3	45.210
	Neutral	6	13.3	3	6.7	5	11.1	0.001*
	Positive	3	6.7	29	64.4	25	55.6	
IVF should be used to exclude genetic disorder	Negative	35	77.8	8	17.8	10	22.2	58.970
	Neutral	7	15.6	5	11.1	7	15.6	0.001*
	Positive	3	6.7	32	71.1	28	62.2	
IVF is frightening because it complicates such as ovarian hyperactivity	Negative	32	71.1	9	20.0	10	22.2	49.236
	Neutral	10	22.2	6	13.3	6	13.3	0.001*
	Positive	3	6.7	30	66.7	29	64.4	
IVF should be repeated because it increases the chances of its success	Negative	2	4.4	2	4.4	0.0	0.0	8.133
	Neutral	17	37.8	13	28.9	10	22.2	0.017*
	Positive	26	57.8	30	66.7	35	77.8	
Against any method that experiments with humans	Positive	25	55.6	6	13.3	6	13.3	50.000
	Neutral	16	35.6	14	31.1	14	31.1	0.001*
	Negative	4	8.9	25	55.6	25	55.6	

Table (4): Continues

Attitude regarding invitro fertilization		Before		Immediately after		After three months		χ^2 p
		N	%	N	%	N	%	
A child born with IVF will not be healthy	Positive	17	37.8	5	11.1	6	13.3	42.348
	Neutral	20	44.4	9	20.0	10	22.2	0.001*
	Negative	8	17.8	31	68.9	29	64.4	
We do not need IVF in Egypt	Positive	16	35.6	4	8.9	3	6.7	50.296
	Neutral	24	53.3	12	26.7	11	24.4	0.001*
	Negative	5	11.1	29	64.4	31	68.9	
It is very expensive and therefore cannot be recommended to anyone	Positive	19	42.2	1	2.2	0	0.0	51.835
	Neutral	19	42.2	15	33.3	13	28.9	0.001*
	Negative	7	15.6	29	64.4	32	71.1	
Babies who are born with IVF behave abnormally	Positive	17	37.8	7	15.6	6	13.3	29.515
	Neutral	20	44.4	10	22.2	9	20.0	0.001*
	Negative	8	17.8	28	62.2	30	66.7	
IVF is not very attractive, as the success rate is very low	Positive	19	42.2	10	22.2	9	20.0	44.240
	Neutral	25	55.6	12	26.7	10	22.2	0.001*
	Negative	1	2.2	23	51.1	26	57.8	

Table (4) presents attitude of the studied nurses regarding invitro fertilization before and after intervention. It was clarified that there were a high statistically significant differences between the studied nurses' in all variable of attitude regarding invitro fertilization pre, immediately and three months post the intervention since p= 0.001 for all variable expect for IVF should be repeated because it increases the chances of its success where p= 0.017.

Table (5): Distribution of the studied nurses by their level of knowledge and attitude before and after the intervention

knowledge and attitude	Before		Immediately after		After three months	
	n	%	n	%	n	%
Knowledge						
Low level of knowledge	45	**100.0**	0	0.0	1	2.2
Moderate level of knowledge	0	0.0	0	0.0	24	**53.3**
High level of knowledge	0	0.0	45	**100.0**	20	**44.4**
Range	1-14		**28-36**		14-34	
Mean ± SD	7.13±3.43		**31.67±2.07**		26.22±4.05	
Attitude						
Positive	6	13.3	36	80.0	34	75.6
Negative	39	86.7	9	20.0	11	24.4
Range	15-27		**23-35**		24-34	
Mean± SD	20.42±2.41		**30.00±2.84**		29.76±2.92	

Repeated measurement analysis of variance:
Knowledge score: p<0.001 (Bonferroni test: each observation significantly different from other two)
Attitude score: p<0.001 (Bonferroni test: before is significantly different from immediately after and after three months)

Figure (1): Distribution of studied nurses by their level of knowledge before and after the intervention

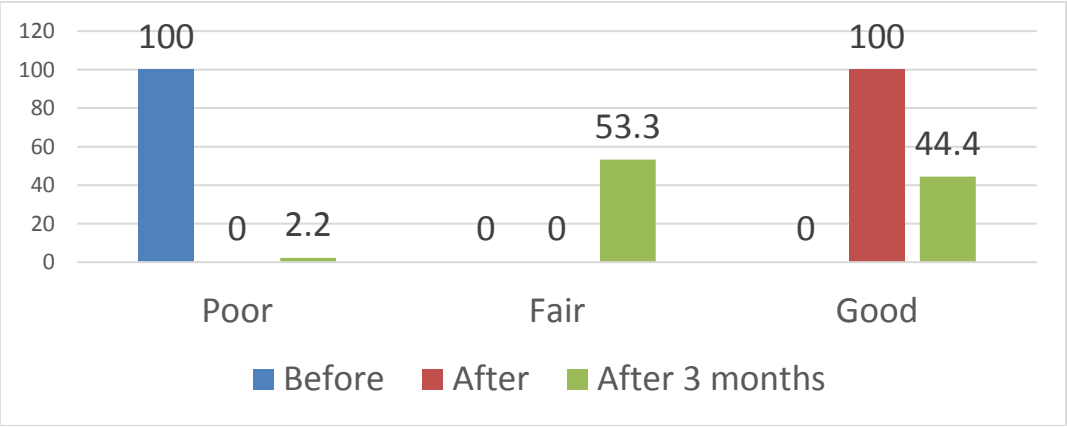

Figure (2): Distribution of studied nurses by their level of attitude before and after the intervention

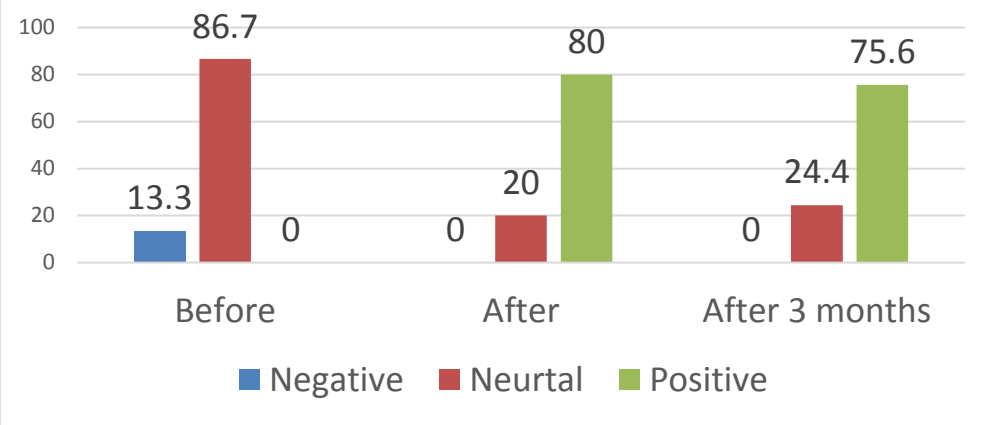

Table (5) and figure (1) and figure (2) illustrate distribution of the studied nurses by their level of knowledge and attitude regarding invitro fertilization before and after the intervention. It was evident that all of nurses (100%) had low level of knowledge and 86.7% had negative attitude before the educational intervention, while almost all of them (100%) had high level of knowledge and 80.0% had positive attitude immediately after the intervention compared to 44.4% had high level of knowledge and 75.6% had positive attitude three months after the intervention. The table also shows that there was a high increase in the student knowledge immediately after the intervention comparing of the pre intervention which has been decreased slightly three months after with a mean of; 7.13+3.43,31.67+2.07 and 26.22+4.05 in the pre, immediately post and three month after the intervention respectively. Also same table revealed that the mean and SD of nurses regarding IVF has been increased immediately after the intervention comparing of the pre intervention which has been decreased slightly three months after with a mean of; 20.42+2.41, 30.00 + 2.84 and 29.76+2.92 in the pre, immediately post and three month after the intervention respectively.

Table (6): Correlations between age and years of experience in fertility clinics with total score of knowledge and attitude among the studied nurses

Total score	Age in years		Years of experience in fertility clinics	
	R	P	R	P
Knowledge score				
Before	0.209	0.169	0.041	0.790
Immediately after	0.017	0.912	0.043	0.777
After three months	0.211	0.163	-0.023	0.881
Attitude score				
Before	0.104	0.495	0.086	0.576
Immediately after	-0.106	0.488	-0.097	0.528
After three months	-0.087	0.570	-0.146	0.339

Table (6) demonstrates correlations between age and years of experience in fertility clinics with total score of knowledge and attitude among the studied nurses. It was found that there were no statistically significant relation between the studied nurses' knowledge and attitude in relation to age in years, or years of experience in fertility clinics before, immediately and three months after the intervention.

Table (7): Total knowledge and total attitude scores of the studied nurses in relation to their level of education and residence

Total knowledge and total attitude scores in relation to education and residence		Before	Immediately after	After three months
Total knowledge score	Educational level			
	Secondary	7.53±3.78	31.47±2.14	26.17±4.05
	University	6.33±2.53	32.07±1.91	26.33±4.19
	F	1.108	0.916	0.129
	P	0.274	0.365	0.898
	Residence			
	Rural	7.40±3.53	31.65±2.32	26.80±3.46
	Urban	6.92±3.41	31.68±1.89	25.76±4.48
	F	1.142	0.442	0.178
	P	0.260	0.661	0.859

Table (7): Continues

Total knowledge and total attitude scores in relation to education and residence		Before	Immediately after	After three months
Total attitude score	Educational level			
	Secondary	20.13±2.13	30.13±2.78	29.70±2.90
	University	21.00±2.88	29.73±3.03	29.87±3.07
	T	0.462	0.048	0.853
	P	0.647	0.962	0.398
	Residence			
	Rural	20.60±2.62	30.65±2.64	29.48±2.93
	Urban	20.28±2.26	29.48±2.93	30.45±3.03
	T	0.439	1.389	1.442
	P	0.663	0.172	0.157

Table (7): presents the studied nurses' total knowledge and total attitude scores in relation to their level of education and their place of residence. It revealed that nurses mean total knowledge score has been increased immediately after the intervention, in relation to level of education; secondary and university with a mean SD of 31.47±2.14 & 32.07±1.91 respectively compared to 7.53±3.78 & 6.33±2.53 pre and 26.17±4.05 & 26.33±4.19 three months post the intervention with no statistically significant relation. It was clear that, the nurses' mean total knowledge score has been increased immediately after the intervention in relation to place of residence; rural and urban with a mean and SD of 31.65±2.32 & 31.68±1.89 respectively compared to 7.40±3.53 & 6.92±3.41 pre and 26.80±3.46 & 25.76±4.48 respectively three months post the intervention with no statistically significant relation.

This table also confirms that immediately after the intervention, the mean total attitude score has been increased in relation to level of education; secondary and university with a mean and SD of 30.13±2.78&29.73±3.03 respectively compared to 20.13±2.13&21.00±2.88 pre and 29.70±2.90&29.87±3.07 three months post the intervention with no statistically significant relation. It was obvious that immediately after the intervention, the nurses' mean total attitude score has been increased in relation to place of residence; rural and urban with a mean and SD of 30.65±2.64&29.48±2.93 respectively) compared to 20.60±2.62&20.28±2.26 pre and 29.48±2.93&30.45±3.03 three months post the intervention with no statistically significant relation.

IV. Discussion

Many couples suffer from infertility and related emotional distress and treatment costs. Treatment of infertility includes invitro fertilization (IVF), which is increased from 30,000 in 1996 to over 130,000 in 2005 in the USA. IVF is a component of Assisted Reproductive Techniques / technologies" (ART) that include any procedure handling of both sperm and eggs outside of the body. IVF is a complex series of technologically driven procedures used to treat infertility or genetic problems and assist with the conception of a child **[33,34].**The quality of the healthcare received by (IVF) patients can be greatly affected by knowledge and attitude of the fertility nurses. Fertility nurses are often the source in alerting the responsible gynecologists about possible complications **[35].**

Fertility nurses' experiences are being increasingly regarded as a vital component in improving the delivery of quality healthcare, as well as increasing the level of satisfaction with the nursing care among IVF clients. Little is known about the effect of instructional guideline on fertility nurses' knowledge and attitude regarding invitro fertilization, which is required to contribute to body of research. The aim of this study was to evaluate the effect of instructional guideline on fertility nurses' knowledge and attitude regarding invitro fertilization. A quasi-experimental research design was used to conduct this study at one university hospital and three private fertility centers affiliated to El-Gharbia Governorate Egypt. All nurses (45) working in the mentioned settings were recruited. Three tools were used for data collection: Tool I socio-demographic characteristics of the fertility nurses, tool II nurses' knowledge interview schedule and tool III nurses' attitude toward invitro fertilization.

The results of the present study revealed that the age of the fertility nurses ranged from twenty-one to fourty-six years, most of them were married, and had secondary school education, lived in urban areas, have total of five to ten years' experience in fertility clinics with a range of 1-26 years' experience and they have children. This result agrees with **Smith, et al (2014)** who stated that sixty-seven percent of the study participants had been in practice for more than 20 years and one fifth of them in practice for 10 years or less **[36]. Obioha et al (2014)**also proved that the mean age of the respondents was 35.6 years, sixty-three nurses have been in practice for more than 5 years and twenty-one nurses were single **[32]**.

This study presented that there were statistically significant differences between the fertility nurses' basic knowledge regarding reproduction pre, immediately and three months post the intervention regarding menstruation, duration, interval, amount and physiology, as well as anatomy of external and internal female reproductive organs and characteristics of mature ovum and normal seminal fluid, which are matching with **Myers et al (2008).** They stated that normal menstrual cycle involves coordination between the hypothalamus, pituitary

gland, and the ovaries in order to produce and release a mature ovum from the ovary and prepare the endometrium to receive an embryo [34]. For men, the quality of normal seminal fluid includes sufficient number of motile sperms to fertilize the ovum through complex chemical interaction between a sperm and an egg. This result is also in agreement with **El-Shazly (2004)** who certified that majority of the nursing students were acquainted with menstruation definition, length, and duration. Additionally, almost three quarter of the students gave correct answers about anatomy of the female genital organ. On the other hand, **Judith et al (2013)**illustrated that the research participants were in great need for specific knowledge related to anatomy, physiology and endocrinology related to menstruation[37, 38].

The findings of the present study demonstrated major increase in the fertility nurses' knowledge regarding IVF, as that there were statistically significant differences between the fertility nurses' knowledge regarding invitro fertilization pre, immediately and three months post the intervention regarding IVF definition, indication, benefits, hazard, and types of protocol, diagnostic measures and lab investigation before IVF, steps / process, as well as instruction guidelines after the embryo transfers. This is fitting with **Afolabi, et al (2018)**who admitted that almost sixty-three percent of the study sample heard of IVF, majority of them knew that the steps of IVF involves carrying the ovum and sperm together outside the body and putting the fertilized egg back into the woman's uterus[33]. **Ghatreh, (2008)** added that nearly four fifth of the research participants provided correct answers regarding IVF definition, benefits, and types of protocol [39]. On the other hand, **Judith et al (2013)**also stated that the research participants lack knowledge and were in great need for specific knowledge related to ART practice such, as treatment protocols; patient instructional guidelines after embryo transfer and supportive counseling strategies [38].

This study clarified that the fertility nurses have a positive attitude towards IVF, as there were statistically significant differences between the studied nurses' each variable of the attitude regarding invitro fertilization in the pre, immediately, and three months post the intervention. It was observed that nearly one third immediately after the intervention compared to fifteen percent before the intervention indicated that IVF is recommended, even if it is expensive. This is in line with **Obioha et al (2014)** who pointed out that the nurses have a positive attitude towards IVF even though it is expensive. Their study also revealed that a high percentage of respondents believed that IVF gives the infertile couple an opportunity to have a child and it can determine the gender of the child [32]. These findings are important in our culture due to preference of the sex of the child. **Afolabi et al (2018)** stated that slightly more than four fifth regarded IVF babies as normal and they had IVF in order to avoid genetic disorders; three quarters thought that IVF is too expensive, though they opt IVF in case of infertility [33]. Furthermore, **Marianne,** (**2005)** studied women's experiences of childlessness after two years of invitro fertilization treatment. The studied women revealed that IVF is a positive and important part of life. They are pleased and proud of being able to participate in the IVF treatments that gave them stronger feeling of self-esteem as they thought that their bodies have been functioned but not all the way [40].

The present study illustrated that almost all of the fertility nurses had low total level of knowledge and negative total attitude scores before the educational intervention. On other hand, almost all of them had high total level of knowledge and four fifth of them had positive total attitude scores immediately after the intervention compared to nearly one half had high level of knowledge and slightly more than three quarters had positive attitude three months after the intervention. The fertility nurses mean level of knowledge had increased and their mean attitude had improved compared to their mean level of knowledge and their mean attitude pre and three months after the intervention. **Obioha et al (2014)** confirmed that the nurses had high knowledge about IVF, while their attitude was at a very low level and they need instruction regarding IVF as a helpful step to improve their knowledge and attitudes, which are in agreement with the current study [32]. **Afolabi et al (2018)** added that fertility nurses will have more effective role if they have adequate knowledge and training [33]. Moreover, **Judith A., et at (2012)** and **Morris (2009)** presented that infertility nurses' role can be extended to allow more continuity of care and better understanding of patients' needs. They can provide clinical competence standardized quality of care to enhance the ART practice including knowledge, skills and attitudes; and in turn would result in a significant and positive impact on the lives and outcomes for couples accessing ART services [38, 41].

The present study confirmed that there was a statistically significant difference between the studied nurses regarding the instruction guidelines after embryo transfers before and after the intervention as this instructional guideline highlighted many aspects that fertility nurses should consider during care of IVF women, such as post embryo transfer instructions. IVF women should be notified to relax two weeks, abstain from vigorous exercise and sexual intercourse, eat nutritionally balanced diet with lots of protein, fiber, and vegetables. Also they should avoid foods like high-mercury fish and soft cheeses, and take vitamins or supplements based on their doctor prescription. Additionally, they should avoid harmful substances such as alcohol, nicotine, and caffeine, avoid extremes of temperature, and get support from net family and friends. These results are confirmed by **Judith A., et at (2012)** and **Morris (2009)** who aligned that the role of infertility nurses' role starts with ovulation induction and extends beyond the embryo transfer as they guide couples after IVF, counsel them and coordinate their care and treatment plans [38, 41].

The present study demonstrates that there was no statistically significant relation between the studied nurses' knowledge and attitude and their age and years of experience in fertility clinics before, immediately and

three months after the intervention. It was also evident there was no statistically significant relation between the fertility nurses' attitude and age, as well as years of experience in fertility clinics before, immediately and three months after the intervention. This result is also, in line with **Judith A., et at (2012)** who confirmed that there was a significant relationship between years' experience and level of knowledge and attitude of fertility registered nurses employed in the assistive reproductive technology Unit in Australia. **[38]**.

This study revealed that immediately after the intervention, the mean total knowledge score and the mean total attitude score of the fertility nurses had increased in relation to level of education and in relation to place of residence compared to pre and three months post the intervention with no statistically significant relation. The result of this study is contradicted with **Smith, et al (2014)** who revealed that there was little evidence that respondents' attitudes differed according to socio-demographic characteristics; residence and education **[36]**. Limitations of this study include limited number of the studied nurses from particular geographical area in Egypt. Therefore, to strengthen the study, other groups of health care providers should be included, such as embryologists, pharmacists, laboratory scientists and large number of IVF nurses.

V. Conclusions

To conclude, the instructional guideline significantly affected fertility nurses' knowledge and attitude regarding invitro fertilization. They expressed interest to discuss fertility and the factors that influence the chance of conceiving with their patients. Additional educational resources should be provided to improve their knowledge and attitude and enable them to provide effective education related to invitro fertilization.

VI. Recommendations

Increased knowledge about invitro fertilization will improve nurses' attitudes. Thus, this study recommends that invitro fertilization should be included in maternity nursing curriculums. It should also be provided as in-service refreshment education topic for nurses to improve their knowledge, attitude, self-confidence and comfort augmented by communication skills to discuss sensitive topics related to invitro fertilization with their clients. Moreover, further research is needed to assess nurses' performance in fertility clinics and barriers to participation in the field of reproduction. Future research considerations include using adequate sample size.

References

[1]. Ockhuijsen H., Gamel C., Van Den Hoogen A. & Macklon N. Integrating pre conceptional care into an IVF program. Journal of Advanced Nursing, 2012; 68(5), 1156–1165.
[2]. Janine K.,& Janelle M. In vitro fertilization: IVF. American Pregnancy. org / infertility/ ivf. html/ 2016; 4(35):144-156.
[3]. Mansour T., El Ghar M., and G., Serour G. In Vitro Fertilization and Embryo Transfer in Egypt. International Journal of Gynecology & Obstetrics 2002; 36 (1):49-53.
[4]. WHO. Sexual and Reproductive Health, Infertility is A Global Public Health Issue. https://www.who.int/reproductivehealth/topics/infertility/perspective/en/.
[5]. Reddy U., Wapner R., Rebar R., Tasca R. Infertility, Assisted Reproductive Technology, and Adverse Pregnancy Outcomes. Executive Summary of a National Institute of Child Health and Human Development Workshop. Obstet Gynecol 2007; 109(4):967-77.
[6]. Fauser B., Devroey P. Reproductive Biology and IVF: Ovarian Stimulation and Luteal Phase Consequences, Trends in Endocrinology & Metabolism, 2003; 14 (5): 236-242.
[7]. Robert R., Hermann M., Manuela S . Pharmacogenetics in Ovarian Stimulation – Current Concepts and Future Options, Reproductive Biomedicine Online, 2005; 11 (5): 589–600
[8]. Christoph K., Bassettand , Michael L. Factors Influencing Response to Ovarian Stimulation, RMPO Reproductive Biomedicine Online, 2005 11, (5): 562–569
[9]. BosdouJ., Venetis C. , Kolibianakis E., Toulis G., Goulis& et al. The use of androgens or androgen-modulating agents in poor responders undergoing in vitro fertilization: a systematic review and meta-analysis. *Human Reproduction Update*, 2012; 18 (2): 127–145.
[10]. A Danish N. Imprinting Diseases and IVF: F cohort study Human Reproduction 2005; 20(4):950-954.
[11]. Rosdahl C., and Kowalski M. Text Book of Basic Nursing, 10th ed., USA, Lippincott Williams and Wilkins Com., 2014.
[12]. Smith S., & Slone E. Foundations of Maternal Newborn and Woman's Health Nursing. 6th ed., United States of America, Elsevier Co., 2014.
[13]. Lidegaard O, Pinborg A and Anderson A. Multiple pregnancy associated with infertility therapy.ThePractice Committees of the American Society for Reproductive MedicineFertilSteril 2006; 86 (suppl 4):S106-S110.
[14]. Hum Reprod.Holter H1, Sandin-Bojö AK2, Gejervall AL3, Wikland M4, Wilde-Larsson B2, Bergh C3 Patient-Centered Quality of Care in An IVF Program Evaluated By Men And Women. 2014 29(12):695-703.
[15]. Rani K and Paliwal S. A Brief Review on In-Vitro fertilization (IVF): An Advanced and Miraculous Gateway for Infertility Treatments. World journal of pharmacy and pharmaceutical sciences, 2014; 3(4): 647-658.
[16]. Krestian H. Invitro Fertilization (IFV): Step by Step Guide from A Fertility Nurse. Path to fertility. 2019; 4 (23):235-240.
[17]. Wolkowicz M., Digilio L., KlotzJ. ShettyC., Flickinger. Equatorial Segment Protein (ESP) Is a Human Alloantigen Involved in Sperm-Egg Binding and Fusion. Journal of Andrology, Vol. 29, No. 3, May/June 2008.
[18]. Huawang D., Meng R. Richard J., Hackett M., and et al. Rigorous thermal control during Intracytoplasmic Sperm Injection Stabilizes The Meiotic Spindle And Improves Fertilization And Pregnancy Rates, Fertility and Sterility Volume 77, Issue 6, June 2002, Pages 1274-1277
[19]. Raja Z. Karaki M.,Sadoon S., Samarraie C., Nagham A., et al. Blastocyst Culture and Transfer: A Step Toward Improved In Vitro Fertilization Outcome, fertility And Sterility Volume 77, Issue 1, January 2002, Pages 114-118

[20]. Matheus M., and AcKarinna L. Fresh Embryo Transfer Versus Frozen Embryo Transfer In Vitro Fertilization Cycles: A Systematic Reviewed Meta-Analysis, Fertility and Sterility Volume 99, Issue 1, January 2013, Pages 156-162
[21]. Bergh C., Wennerholm U. Obstetric Outcome and Long-Term Follow Up of Children Conceived Through Assisted Reproduction. Best Practice & Research Clinical Obstetrics and Gynaecology (2012), 3(10): 1016-1035.
[22]. Henk G., Nino T., Arnold H., SimonsF., et al. Modified Natural Cycle Versus Controlled Ovarian Hyperstimulation IVF: A Cost-Effectiveness Evaluation of Three Simulated Treatment Scenarios, Human Reproduction, 2013 28(12): 3236–3246.
[23]. McIlveen J., SkullW., Ledger M. Evaluation of The Utility of Multiple Endocrine And Ultrasound Measures of Ovarian Reserve In The Prediction of Cycle Cancellation In A High-Risk IVF Population, Human Reproduction, Volume 22, Issue 3, March 2007, Pages 778–785
[24]. Lim H., Seong-Ho Y., Cheng C. New Alternative to Infertility Treatment for Women Without Ovarian Stimulation Reproductive Biomedicines Online; 2007; 14 (5): 547-549
[25]. Kathryn L., Suheil J., and Muasher M. Nurses Are An Asset to An In Vitro Fertilization Program, And More So if They are Continually Educated, Division Of Reproductive Endocrinology And Infertility, Obstetrics And Gynecology, Duke University, Durham, North, 2019; 112(2):232.
[26]. Hsin, S. Effects of Using A Nursing Crisis Intervention Program on Psychosocial Responses and Coping Strategies of Infertile Women During Invitro Fertilization. The Journal of Nursing Research: JNR. 2003;11(3):197-208.
[27]. Hammarberg K., Collison L., Johnson, L Nguyen., H and Fisher J. Knowledge, Attitudes and Practices Relating to Fertility Among Nurses Working In Primary Health Care. 2016; 6 (34): 161.
[28]. Gwendolyn P., Ji-Hyun Q, King M., Miree, C.A., Nieder, M., and Vadaparampil,S.T. Trends in Clinical Practice and Nurses' Attitudes About Fertility Preservation for Pediatric Patients With Cancer. PhD Oncology nursing Forum ;3 5(2):249
[29]. Richard P., Robert L.,Kristen E., and Contributor D. Patient Education: In Vitro Fertilization (IVF) (Beyond the Basics). Literature Review Current Through: 2019; 2 (30): 142.
[30]. Fuchs, A., Kashanian, J., Clayman, M., Gosiengfiao Y., Lockart, B., et al. Pediatric Oncology Providers' Attitudes and Practice Patterns Regarding Fertility Preservation in Adolescent Male Cancer Patients. J PediatrHematol Oncol. 2016; 38(2): 118–122
[31]. Yeni Y. University Gaziosmanpaşa Hospital IVF Department Nursing Services; We Continue to Serve Our Patients with Knowledgeable and Expressive, Cheerful, Positive Communication with Planned Nurses To The Patients, 2012; 4 (8): 377-380.
[32]. Obioha JA, Ikechebelu JI, Eleje GU, Joe-Ikechebelu NN. Knowledgeand Attitude of Nurses towards In-vitro Fertilization: A Prospective Cohort Study Gynecol. Cases Rev, (2014) 1:006.
[33]. Afolabi, B., Ajayi, A., Ajayi V., Biobaku, O., Oyetunji, I and Aikhuele. Awareness, Knowledge and Perception of In-Vitro Fertilization among Final-Year Medical Students in South-West Nigeria 2018.
[34]. Myers E., McCrory D., Mills A., Price T., Swamy G., et al. Effectiveness of Assisted Reproductive Technology. Evidence Report/Technology Assessment: Agency for Healthcare Research and Quality. May 2008; 8(12): 452-475.
[35]. Ajayi A., Ajayi V., Biobaku O., Oyetunji I, Aikhuele H., et al. Awareness, Knowledge and Perception of In-Vitro Fertilization among Final Year Medical Students in South-West Nigeria. Int J Pregn& Chi Birth, (2017) 2(1): 00007.
[36]. Smith, A., Coyle, M., Sheryl D., & Johnson. Practice: Attitudes of Reproduction Nurses, Counsellors and Doctors., BioMedicine Online (2014); 2 (29), 3–9
[37]. El-Shazly M., Hassanein M., Ibrahim A., and Nosseir S. Knowledge about Menstruation and Practices of Nursing Students Affiliated to University of Alexandria The Journal of the Egyptian Public Health Association, 01 Jan 2004, 65(5-6):509-523.
[38]. Judith A.,Trudy D. , Lorna M., Brenda H. Identifying and Acquiring The Contextual Skills and Knowledge for Nursing Practice in Assisted Reproductive Technology: A Grounded Theory Study. Journal of Clinical Nursing, Reproductive health, 2013; 22,(11-12): 1738-1747.
[39]. Ghatreh Z. Knowledge and Attitudes Of Nurses And Midwifes About Infertility In Tabriz. Journal: CELL JOURNAL (YAKHTEH) 2008 , 10 (1): 75 To 75.
[40]. Marianne J. Women's Experiences of Childlessness 2 Years After the End Of In Vitro Fertilization Treatment. The Sahlgrenska Academy at Go¨teborg University, Go¨teborg, Sweden 2005 Nordic College of Caring Sciences, Scand J Caring Sci; 2005; 19, 58–63
[41]. Morris J.The Role Of Infertility Nurses in Ovulation Induction Programmes, International, Multidisciplinary Journal Dedicated to Furthering Research And Promoting Good Practice, 2009; 3 (7): 14-17.