

Effect of Instructional Guidelines on In Vitro Fertilization Nurses' Knowledge and Preventive Measures Regarding Ovarian Hyperstimulation Syndrome

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Abstract

Background: Ovarian hyperstimulation syndrome (OHSS) is a common and severe complication for patients who undergoing invitro fertilization (IVF). **Aim:** To evaluate the effect of Instructional guidelines on invitro fertilization nurses' knowledge and preventive measures regarding ovarian hyper stimulation syndrome. **Design:** Quasi experimental research design was used in this study. **Setting:** It was conducted at Amshaj IVF private center & Ajyal IVF private center in Sohag city. **Sample:** purposive sample of all nurses working in previous mentioned centers (30). **Tools:** Two tools were used in this study (1) Structured interviewing questionnaire, (2) Observational Checklist for IVF Nurses' practice Regarding Preventive Measures of OHSS during IVF cycle. **Results:** There is highly statistical significance difference between pre & posttest regarding total knowledge level and total practice level of preventive measures about OHSS of the studied nurses . **Conclusion:** Implementation of the instructional guidelines was effective in improving IVF nurses' knowledge level and practice of preventive measures regarding OHSS. **Recommendations:** Implementing this instructional guidelines with a learning booklet for nurses on the other IVF centers to improve & update their level of knowledge and practice of preventive measures regarding ovarian hyperstimulation Syndrome.

Keywords: Instructional guidelines, IVF nurses, Knowledge, preventive measures, ovarian hyperstimulation syndrome.

Introduction

By the end of the 20th century, infertility treatment centralized around controlled ovarian hyperstimulation along with in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI).

Ovarian hyperstimulation Syndrome (OHSS) is the most remarkable complication in assisted reproductive technique (ART) (**Choudhary et al.,2021**).

Ovarian hyperstimulation syndrome (OHSS) is a common and

severe complication for patients who undergoing in vitro fertilization (IVF) which characterized by coexistence of multiple ovarian cysts with increased vascular hyperpermeability , a fluid shift from the intravascular to the extravascular space (third spacing), hypovolemia, and hemoconcentration (**Jahromi et al., 2018**).

The well-established risk factors of Ovarian hyperstimulation syndrome (OHSS) include prior hyper-response/OHSS, polycystic ovary syndrome, young age, and low body mass index. In recent years, research has focus on identifying hormonal markers as a potential predictors of OHSS such as high antral follicle count ,high levels of anti-Mullerian hormone and high serum E2 levels) (**Shen et al.,2021**).

Ovarian hyperstimulation syndrome (OHSS) contains a broad spectrum of clinical manifestations including massive ovarian enlargement, high level of 17-β estradiol (E2), ascites, pleural effusion, high vascular permeability (VP), reduced renal perfusion, thrombotic complications and possibly death (**Zhai et al.,2017**).

Depending on the clinical manifestation and laboratory findings, Ovarian hyperstimulation syndrome (OHSS) is classified as mild, moderate, severe .Additionally, based on the timing of occurrence, OHSS is classified as early OHSS that occurs within 9 days of hCG trigger; and late OHSS is seen after 10 days of administering hCG (**Choudhary et al.,2021**).

Serious complications of Ovarian hyperstimulation syndrome (OHSS) may

include electrolyte imbalance, hydrothorax, ascites, hypovolemic shock and even threatening life(**Li et al.,2019**). Ovarian hyperstimulation syndrome (OHSS) can cause life-threatening conditions, such as acute respiratory distress, acute renal insufficiency, in severe cases, it causes venous thrombosis and mortality. (**Liu et al.,2021**).

Although there is no way to completely prevent Ovarian hyperstimulation syndrome (OHSS), there are various measures that may be used to lower the risk, and early identification of risk factors is the first step in a multi-stage approach. The preventive measures could be divided into primary and secondary. Primary prevention involves customised stimulation techniques tailored to the unique characteristics of each patient. Secondary prevention encompasses all techniques aimed at reducing an exaggerated ovarian response, such as cycle cancellation, coasting, low-dose hCG or other agents to stimulate ovulation, cryopreservation of oocytes/embryos, and sufficient luteal phase support (**Soave et al.,2014**).

Nurses are crucial in vitro fertilization (IVF) since they are in the best position to observe the patients' response to IVF medications. They also serve as a source in alerting the physician about the potential complications. So, the nurse should have good knowledge and practice of infertility drugs and its complications as OHSS (**Noha & Noura , 2021**).

Significance of the study:

In vitro fertilization (IVF) is a cornerstone in management of infertility. Ovarian stimulation is an essential part in IVF. Ovarian hyperstimulation syndrome (OHSS) is the most serious iatrogenic complication of ovarian stimulation and is life-threatening in its severe form (**Braam et al.,2020**).

The prevalence of Ovarian hyperstimulation syndrome is increasing where ,Mild OHSS occurs in 32% of IVF cycles, Moderate OHSS occurs in 10–15% of IVF cycles and severe OHSS occurs in 5–8% of IVF cycles (**Zhai et al.,2017**).

Therefore, health professionals including nurses must aware of this condition and its myriad of Clinical presentations, which causes multi-organ dysfunction and potentially death.

Aim of the study

The aim of this study is to evaluate the effect of Instructional guidelines on in vitro fertilization nurses' knowledge and preventive measures regarding ovarian hyper stimulation syndrome through the following objectives:

- Assessment of in vitro fertilization (IVF) nurses' knowledge & practice of preventive regarding ovarian hyper stimulation syndrome(OHSS).
- Developing & implementing instructional guidelines regarding ovarian hyper stimulation syndrome(OHSS).

- Evaluating the effect of Instructional guidelines for OHSS on nurses' knowledge and practice of preventive measures.

Hypothesis

Implementation of the Instructional guidelines will be effective in improving IVF nurses' knowledge level and Practice of preventive measures regarding ovarian hyperstimulation syndrome (OHSS) during IVF cycles.

Subjects and methods:**Research Design:**

Quasi experimental research design with Pre-test and post-test was used in this study that well suited to evaluate causal effects on long-term outcomes of special intervention.

Setting:

This study was carried out in Amshaj IVF private unit & Ajial IVF private unit in Sohag city.

Amshaj and Ajial Hospitals are from the first dedicated hospitals for treatment of infertility and its related services. They have a privileged location in the center of Egypt (Sohag city). They contain IVF/ICSI units that specialized in treatment of infertility.

Subjects:**Sample type:**

A purposive sample was used in this study.

Sample size:

The study sample consisted of all nurses working in the previous mentioned IVF units who agree to participate in the study and their number was (30) nurse.

Inclusion criteria

All nurses working in the IVF unit in Amshaj and A jial hospitals who agree to participate in the study.

Tools of the study:**Tools of data collection:****Tool I: Structured interviewing questionnaire**

It was developed by the researcher and included two parts.

Part I: It included personal data as age, professional qualification, years of experience and if they receive similar teaching program about OHSS

Part II: It included 11 open ended questions created by the researchers to assess nurses' knowledge about Ovarian hyperstimulation syndrome (OHSS) as definition, signs and symptoms,risk factors, complications and management (**Noha & Noura , 2021**)

❖ Scoring system

Each question was scored as (2) for a correct answer,(1) for incomplete answer and (0) for incorrect answer. the scores of the items were added-up and the total was divided by the number of the items, giving a percentage score.

Finally the total knowledge score will be classified as the following:

- Inadequate(If the percentage score $<75.0\%$) (Score < 12).
- Adequate (If the percentage score $\geq 75.0\%$) (Score ≥ 12).

Tool II: Observational Checklist for IVF Nurses' practice Regarding Preventive Measures of Ovarian hyperstimulation syndrome (OHSS) during in vitro fertilization (IVF) cycles

It included 11 practice items about preventive measures of OHSS .It was adopted from RCOG (2016) and modified by the researcher. It Consisted of two main parts as the Following:

Part I: Preventative measures before ovarian stimulation: It included three practices that the nurse should do it before ovarian stimulation as:-

1. Identify OHSS risk factors by taking a thorough medical history.
2. Use a suitable ovulation induction regimen with appropriate doses using the minimum dose and duration of gonadotrophin therapy required to achieve the therapeutic target.
3. Prior to treatment, give antagonist to women who have been identified as high-risk, as it has been shown to reduce risk of OHSS by 43.0%.

Part II: Preventative measures During Ovarian stimulation: It included eight practices that the nurse should do it during ovarian stimulation as:

- 1.Cancellation of cycle treatment and continuation of down regulation until next period.
- 2.Coasting and monitoring follicular development as well as E2 levels.
- 3.Withholding the ovulatory trigger (HCG),if ovarian response is excessive.
- 4.Reducing the dose of the HCG trigger to 5,000 IU rather than the standard 10,000 IU.
- 5.In high-risk cases, Administering intravenous prophylactic 25.0% albumin (20-50g) at the time of oocyte retrieval .
- 6.Instructing the woman who at risk for OHSS that frozen cycles of therapy reduce the risk of late OHSS.
- 7.Providing the woman with written information about OHSS including risks, symptoms as well as a 24-hour contact number for immediate access to a qualified professional with experience in the diagnosis and management of OHSS.
8. Reassuring the women that, despite OHSS, pregnancy can proceed normally and that there is no evidence of a higher risk of congenital defects. (**Noha & Noura , 2021)**

❖ A scoring system:

For practice items, the (done)observation was given a score of 2 and the (not done) observation was given a score of 1. The scores were added up and the total was divided by the number of items, giving a percentage score.

Finally the total Practice score was classified as the following: - . Satisfactory (If the percentage score $\geq 75.0\%$) (Score ≥ 17).

- Unsatisfactory (If the percentage score $<75.0\%$) (Score < 17).

Supportive materials

A self-learning booklet containing the recent and evidence based information based up on instructional guidelines about OHSS was designed by the researcher using a simple and clear Arabic language supported with photo in order to use it as a guide to update IVF nurses' knowledge and practice about OHSS.

Content validity:

The study tools were tested for content validity by just a panel of four experts in the fields of maternity and newborn health nursing, and Obstetric and gynecology medicine, and modifications were made as needed.

Content reliability:

Cronbach's Alpha was used to assess reliability of the tools.,it was (0.811) for knowledge tool&(0.74) for practice tool.

Ethical and legal considerations:

Before starting the research, ethical approval was obtained from the scientific research ethical committee of faculty of nursing. An official permission was obtained from the manager of Amshaj & Ajial IVF center. Before data

Collection, the nurses were informed about the aim and the nature of the study which don't cause any harm or pain & agreement for participation in the study was taken from them . Also, they were assured that the Information was confidential and used only for purpose of research. The nurses were informed that participating in the study is voluntary, they have the right to withdraw from the study at any time.

Pilot study:

A pilot study was carried out on 10% of the total sample (3 nurses) to assess the clarity and applicability of the tools. No changes were made in the tools .Three nurses were recruited for the pilot study and were included in the total sample.

Procedure:

Actual fieldwork was carried out in a period of six months from August 2021 to January 2022 involving development, implementation, and evaluation of the instructional guidelines program.

The preparatory phase:

The researchers reviewed past and current available literature relevant to the study topic in order to acquire in-depth theoretical knowledge of the various aspects of the problem. The researcher prepared the contents of the sessions about the standard nursing guidelines about OHSS based up on instructional guideline in the Arabic language to address gaps in IVF nurses's knowledge and Preventive measures. A self-learning booklet was prepared by the researcher

using the recent and evidence based information based up on RCOG guidelines about OHSS as a guide for IVF nurses to upgrade their knowledge and practice.

The implementation phase:

This phase included the following stages

pre intervention stage (assessment)

- Upon securing an official permission to conduct the study. The researcher interviewed with each nurse individually, explain the purpose of the study , and took their oral consent for participation in the study. After that the personal data was assessed and the researcher asked them to fill data regarding knowledge about OHSS as a form of pretest. This took a time from 15-20 minutes & Finally the researcher evaluated the observational checklist regarding preventive measures of OHSS during IVF before implementation of the instructional guidelines.

- Then the researcher observed nurses' Practice of preventive measures of OHSS during IVF cycles by observing nurses in during ordinary work. Each observation checklist was given a code number. The observation was taken within 10 to 30 Minutes. This phase took two weeks.

Intervention stage (Instructional guidelines):

The intervention involved four interactive sessions for each group and each session was conducted for half hour and the total time of the sessions was 2

hours. Sessions were conducted for the nurses in the most suitable time for them after they have completed their duties. Sessions were given to the nurses in the form of lectures and group discussion by using audio-visual aids.

To facilitate the learning process and allow every nurse to engage in the discussion, the researcher divided the nurses into small groups, each of which had five nurses. At the initial meeting with the group, An orientation to the intervention such as; importance of the topic, the rationale ,location and time of the sessions were elaborated

The sessions

Each session was started by a summary about what has been explained in the previous session and the intended learning outcomes of the current session, using a simple Arabic language, also the session ended by a summary of its content and discussion about nurses' feedback and any questions to ensure that the nurses got the maximum benefit. Each session was implemented through lecture, Photos, videos and posters in arabic language. The researcher also communicated with nurses' via telephone call or what's app for instructions and reinforcement. This phase took four weeks.

The first session : The researcher explained the definition of ovarian hyper stimulation syndrome ,causes of it & risk factors of it .

It was implemented through lecture, Photos, videos and posters in arabic language.

The second session : The researcher explained classification of OHSS, signs and symptoms of it , complications of it . It was implemented through lecture, Photos, videos and posters in arabic language.

The third session : The researcher explained the management and care of OHSS. It was implemented through lecture, Photos, videos and posters in arabic language.

The fourth session: The researcher explained the preventative measures before ovarian stimulation , the preventive measures during ovarian stimulation .

A self-learning booklet containing the recent and evidence based information based up on RCOG guidelines about OHSS was distributed to the nurses at the end of session to use it as a guide to update their knowledge and practice about OHSS.

Post intervention stage (Evaluation)

Evaluation of the effect of this instructional guidelines on improving IVF nurses ' knowledge and practice of preventive measures of OHSS was done after two month from the instructional guidelines using the same data collection tools .

Statistical analysis

Data entry and data analysis were done using statistical package for the social science (SPSS) version 23. Data were presented as number, percentage means and standard deviation. McNemar and Chi-square test was used

to show relation between variables. P-value considered statistically significant when $p < 0.05$

Results

Table (1): Shows personal data of The studied nurses, and reports that 66.7% of them Less 30 years with a mean SD of 28.07 ± 3.8 , about 46.7% have a technical institute of nursing, 50% have 5- 10 years of experience in their work even though, 100.0% of the studied nurses hadn't received previous knowledge about OHSS.

Table (2): Demonstrates nurses' Knowledge regarding ovarian hyper stimulation syndrome (OHSS) in pre and posttest and displays that there is highly statistical significance difference between pre &posttest in all knowledge areas with p-value (0.001).

Figure (1): Reveals total knowledge of IVF nurses regarding ovarian hyper stimulation syndrome (OHSS) in pre-test and posttest, and clarifies that there is highly statistical significance difference between pre & posttest p- value (0.001) Where the majority of the nurses had inadequate level of knowledge pre-test and compared with the minority of the nurses in post-test.

Table (3): Shows nurses' practices regarding preventive measures of OHSS in pre and posttest , and finds that there is highly statistical significance difference between pre &posttest with p-value (0.008,0.003,0.001)

Figure (2): Shows total nurses' practices level regarding preventive measures of OHSS in pre and posttest, and clarifies that there is highly statistical significance difference between pre & posttest with p- value (0.001) where (46.7%) of the nurses had satisfactory level before implementation of the instructional guidelines and reached to (100.0%) of the nurses after Implementation of the Instructional guidelines.

Table (4): Illustrates the mean and SD of total knowledge and practice score in pre and posttest, and displays that there is highly statistical significance difference between pre &posttest with p-value (0.002,0.001) respectively.

Table (5): Shows that there is a significant relation between total knowledge level in pretest and nurses' qualifications with p- value (0.01) and clarifies that there is no statistically significant relation between total knowledge level in pretest&age group & years of experience wih p-value (**0.150** , **0.596**) respectively.

Table (6): Shows that there is no statistically significant relation between total practice level and personal data of the studied nurses in pretest with p- value (0.796,0.490,0.765)

Table (7): Shows that there is a significant relation between total knowledge level and total practice level of nurses in pretest with p- value 0.001.

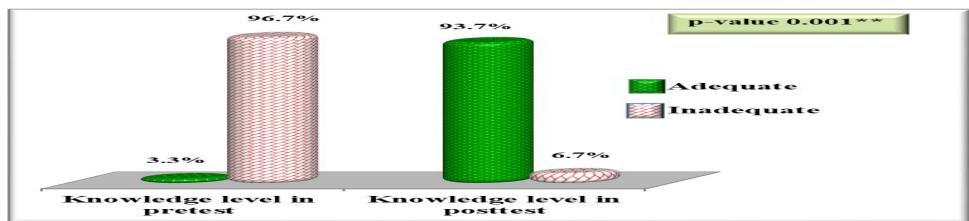
Table (1): personal data of the studied nurses.

	Personal data	N(30)	%
Age group / years			
• Less than 30 years		20	66.7
• 30 and more		10	33.3
Age mean and SD		28.07±3.8	
Nurses' qualification:			
• Nursing school		13	43.3
• Technical institute		14	46.7
• Bsc Nursing		3	10.0
Years of experience:			
• Less than 5 years		10	33.3
• 5-10 years		15	50.0
• More than 10 years		5	16.7
Previous educational program on OHSS:			
• Yes		0	0.0
• No		30	100.0

Table (2): Nurses' Knowledge regarding ovarian hyper stimulation syndrome (OHSS) in pre and posttest.

Knowledge regarding OHSS	Pretest		Posttest		p- value
	N(30)	%	N(30)	%	
Definition of OHSS					
Complete correct answer	0	0.0	24	80.0	0.001**
Incomplete correct answer	18	60.0	6	20.0	
Wrong answer or don't know	12	40.0	0	0.0	
Causes of OHSS					
Complete correct answer	0	0.0	28	93.3	
Incomplete correct answer	16	53.3	2	6.7	0.001**
Wrong answer or don't know	14	46.7	0	0.0	
Risk factors of OHSS					
Complete correct answer	0	0.0	26	86.7	
Incomplete correct answer	18	60.0	4	13.3	0.001**
Wrong answer or don't know	12	40.0	0	0.0	
Signs and symptoms of OHSS					
Complete correct answer	1	3.3	26	86.7	
Incomplete correct answer	19	63.4	4	13.3	0.001**
Wrong answer or don't know	10	33.3	0	0.0	
Classification of OHSS					
Complete correct answer	0	0.0	24	80.0	0.001**
Incomplete correct answer	12	40.0	6	20.0	
Wrong answer or don't know	18	60.0	0	0.0	
Method of prevention of OHSS					
Complete correct answer	1	3.3	26	86.7	0.001**
Incomplete correct answer	18	60.0	4	13.3	
Wrong answer or don't know	11	36.7	0	0.0	
What's management of OHSS					
Complete correct answer	0	0.0	26	86.7	0.001**
Incomplete correct answer	17	56.7	4	13.3	
Wrong answer or don't know	13	43.3	0	0.0	
Complications of OHSS					
Complete correct answer	2	6.6	23	76.7	0.001**
Incomplete correct answer	11	36.7	7	23.3	
Wrong answer or don't know	17	56.7	0	0.0	

(**) highly statistical significant difference

**Figure (1):** total knowledge level in pre and post test regarding OHSS.

(**) highly statistical significant difference

Table (3): Nurses' practices regarding preventive measures of OHSS in pre and posttest.

Practices regarding OHSS	Pretest N(30)	%	Posttest N(30)	%	p-value
Preventive measures before ovarian stimulation					
Taking complete history of patient.					
• Done	3	10.0	30	100.0	0.001**
• Not done	27	90.0	0	0.0	
Administer suitable ovulation induction regimen with suitable doses to achieve the therapeutic goal.					
• Done	19	63.3	30	100.0	
• Not done	11	36.7	0	0.0	0.003**
Administer antagonist to women identified as high-risk prior to treatment.					
• done	18	60.0	30	100.0	0.003**
• Not done	12	40.0	0	0.0	
Preventive measures during ovarian stimulation					
Cancellation of cycle treatment and continuation of down regulation until next period.					
• Done	22	73.3	30	100.0	0.008**
• Not done	8	26.7	0	0.0	
Coasting and monitoring follicular development as well as E2 levels.					
• Done	22	73.3	30	100.0	0.008**
• Not done	8	26.7	0	0.0	
Withholding the ovulatory trigger (HCG), if ovarian response is significantly high.					
• Done	28	93.3	30	100.0	0.040*
• Not done	2	6.7	0	0.0	
Reducing the dose of the HCG trigger to 5,000 IU instead of the standard 10,000 IU.					
• Done	17	56.7	30	100.0	0.003**
• Not done	13	43.3	0	0.0	
Administer intravenous prophylactic 25.0% albumin (20-50g) at the time of oocyte retrieval in high-risk cases.					
• Done	18	60.0	30	100.0	0.003**
• Not done	12	40.0	0	0.0	
Instruct woman who at risk for OHSS that frozen cycles of therapy reduce the risk of late OHSS.					
• Done	6	20.0	30	100.0	0.001**
• Not done	24	80.0	0	0.0	
Provide woman with written information about OHSS including risks, symptoms and a 24hour contact number.					
• done	3	10.0	30	100.0	0.001**
• Not done	27	90.0	0	0.0	
Reassure woman that pregnancy may continue normally despite OHSS, and there is no evidence of an increased risk of congenital abnormalities.					
• done	4	13.3	30	100.0	0.001**
• Not done	26	86.7	0	0.0	

(**) highly statistical significant difference

(*)statistical significant difference

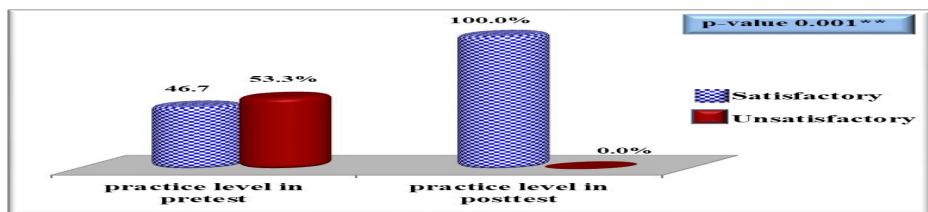


Figure (2): Total nurses' practices level regarding preventive measures of OHSS in pre and posttest.

(**) highly statistical significant difference

Table (4): Mean and SD of total knowledge and practice score in pre and posttest.

Variable	Pre test		Posttest		p-value
	Mean	SD	Mean	SD	
Total knowledge score	4.63	2.67	14.7	1.49	0.002**
Total practice score	16.10	2.53	21.83	0.91	0.001**

(**) highly statistical significant difference

Table (5): Relation between total knowledge level and socio-demographic characteristics of nurses in pretest.

Variable	Total knowledge in pretest				p-value	
	Adequate (1)		Inadequate (29)			
	N	%	N	%		
Age group / years						
• Less than 30 yrs	0	0.0	20	69.0		
• 30 and more	1	100.0	9	31.0	0.150	
Nurses' qualification:						
• Nursing school	0	0.0	13	44.8		
• Technical institute	0	0.0	14	48.3	0.010**	
• Bsc Nursing	1	100.0	2	6.9		
Years of experience:						
• Less than 5 years	0	0.0	10	34.5		
• 5-10 years	1	100.0	14	48.3	0.596	
• More than 10 yrs	0	0.0	5	17.2		

(**) highly statistical significant difference

Table (6): relation between total practice level and socio-demographi characteristics of nurses in pre and posttest.

Variable	Total practice in pretest				P-value
	Satisfactory (14)		Unsatisfactory (16)		
	N	%	N	%	
Age group / years					
• Less than 30 years	9	64.3	11	68.8	
• 30 and more	5	35.7	5	31.3	0.796
Nurses' qualification:					
• Nursing school	7	50.0	6	37.5	
• Technical institute	5	35.7	9	56.3	0.490
• Bsc Nursing	2	14.3	1	6.3	
Years of experience:					
• Less than 5 years	4	28.6	6	37.5	
• 5-10 years	7	50.0	8	50.0	
• More than 10 yrs	3	21.4	2	12.5	0.765

(**) highly statistical significant difference

Table (7): Relation between total knowledge and total practice level of nurses in pretest.

Total practice in pretest	Total knowledge in pretest				p-value
	Adequate (1)		Inadequate (29)		
	N	%	N	%	
Satisfactory	1	100.0	13	44.8	
Unsatisfactory	0	0.0	16	55.2	0.001**

(**) highly statistical significant difference

Discussion

Ovarian hyperstimulation syndrome (OHSS) is considered serious iatrogenic complication of ovulation induction during the management of infertility during in vitro fertilization (IVF) cycles. (Jahromi et al., 2018) Nurses play an important role in the IVF cycle since they are in the best position to observe the patients' response to ovulation induction medications. They also serve as a source in alerting the physician about the potential complications. So,

the nurse should have good knowledge and practice of infertility drugs and its complications as OHSS (Noha & Noura , 2021). Thus this study aimed to evaluate the effect of instructional guidelines on invitro fertilization nurses' knowledge and preventive measures regarding ovarian hyper stimulation syndrome.

Regarding Nurses' knowledge about OHSS before implementation of the instructional guidelines , the knowledge was inadequate in the majority of the studied nurses. This was

similar to (Devi & Upashe, 2019) who conducted their study in India to assess the pretest knowledge scores, to determine the effectiveness of structured teaching programme regarding ovarian hyperstimulation syndrome among staff nurses and reported the majority of the nurses had inadequate knowledge concerning OHSS in pretest.

Also (Judith et al., 2013) stated that the nurses lack knowledge and were in great need for specific knowledge related to assisted reproductive technology (ART) practice such, as treatment protocols; complications of ovulation induction, supportive counseling strategies, patient instructional guidelines and preventive measures toward ovarian hyperstimulation syndrome (OHSS).

This result may back to all studied nurses hadn't received previous educational or training program about ovarian hyperstimulation syndrome (OHSS).

Concerning, total knowledge of studied nurses regarding OHSS in pre-test and posttest, the current study clarifies that there is highly statistical significance difference between pre & posttest in all knowledge areas with p-value 0.001. Where (96.7%) of the nurses had inadequate level of knowledge pre-test and reached to (6.7%) of the nurses in post-test. This was in line with (Noha & Noura, 2021) who conducted their study in Egypt, Zagazig city, to assess the effectiveness of structured teaching program on staff nurses knowledge and preventive measures regarding Ovarian hyperstimulation syndrome (OHSS) and reported a statistical significant

improvements in all areas of knowledge at both post intervention.

Also, similarly to (El-Adham and Shaban, 2020) who conducted their study in Egypt, Tanta to assess the effect of instructional guideline on nurses' knowledge and attitude regarding invitro fertilization and reported that there was a statistically significant difference between the studied nurses regarding the instruction guidelines before and after the intervention

Regarding, the practice of preventive measures of the studied nurses in pretest and post-test, the current study clarifies that there is highly statistical significance difference between pre & posttest where (46.7%) of the nurses had satisfactory level before implementation of the instructional guidelines and reached to (100.0%) of the nurses after implementation of the Instructional guidelines.

This was in line with previous (Noha & Noura, 2021) who reported there was a statistically significant improvements at all practice acquired in the post intervention (<0.001) after application of the program

This improvement in knowledge and practice level since continuing education for nurses not only keeps them up to date on the latest advances and informations but it affords nurses an opportunity to improve their practice particularly this instructional guideline highlighted many aspects that nurses should consider during care of women undergoing IVF for preventing OHSS.

When look to the relation between the total knowledge level and personal

data of IVF nurses in pretest, the current study clarifies that there is a significant relation between total knowledge level and nurses' qualifications with p-value 0.01 and clarifies that there is no a statistically significant relation between total knowledge level & age group & years of experience with p-value 0.150 , 0.596 respectively.

This result is well corresponded with (**El Adham and Shaban ,2020**) who found that there was a significant relation between nurses' knowledge and educational level but no statistically significant relation between the studied nurses' knowledge & years of experience.

This similarity may back to the fact that the level of education is an essential factor in the consolidation of person' knowledge.

This was different with (**Devi and Upashe, 2019**) who stated that there is significant association with clinical experience & previous knowledge about the topic and there is no association with age& professional qualification.

This discrepancy may back to difference between the current study and(**Devi and Upashe, 2019**) in study subject and study setting.

Also this study demonstrates that there is a significant relation between total knowledge level and total practice level of nurses in pretest with p-value 0.001. This agreed with (**Noha & Noura , 2021**) who reported that there was a significant Correlation between practice score as a positive parameter and knowledge score throughout the study phases ($p<0.05$).

But ,When looking to the relation between the total practice level and personal data of the studied nurses in pretest, the current study clarifies that there is no a statistically significant relation between total practice level & personal data with p-value (0.796,0.490,0.765) respectively.

Conversely with (**Noha & Noura , 2021**) who reported there was a significant correlation between total practice score and the years of experience in the maternity unit (0.016).

This discrepancy return to difference in sample size where this study included IVF nurses only that are limited in their number especially in this geographical area but (**Noha & Noura , 2021**) included all infertility nurses.

Limitations of this study

The current research study has some limitations including:

Firstly, the limited number of the nurses that work in IVF center in this particular geographical area in sohag city.

Secondly, the lack of national and International researches that study the Current research topic.

Conclusions

Implementation of the instructional guidelines was effective in improving IVF nurses' knowledge level and practice of preventive measures regarding OHSS.

Recommendations:

Based on the results of the present study, the researchers recommended the following:

1-Implementing this instructional guidelines with a learning booklet for nurses on the other IVF centers to improve & update their level of knowledge and practice of preventive measures regarding Ovarian Hyperstimulation Syndrome.

2-Encouraging IVF nurses to update their knowledge continuously through attending workshops& training programs.

3-Further research should be conducted in other IVF centers to re-confirm the validity and reliability of nursing knowledge and practice tools toward OHSS.

References

Braam S C., de Bruin J P., Mol B W J., Wely M.(2020):The perspective of women with an increased risk of OHSS regarding the safety and burden of IVF: a discrete choice experiment, Human Reproduction Open, Volume 2020, Issue 2, hoz034, <https://doi.org/10.1093/hropen/hoz034>

Choudhary RA, Vora PH, Darade KK, Pandey S, Ganla KN. (2021):A prospective randomised comparative clinical trial study of luteal phase letrozole versus ganirelix acetate administration to prevent severity of early onset OHSS in ARTs. Int J Fertil Steril.; 15(4): 263-268. Doi:10.22074/IJFS.2021.139562.1042.

Devi, R.P.L.D. and Upashe, S.P. (2019): Staff NursesKnowledge Regarding Ovarian Hyperstimulation Syndrome - Effectiveness of Structured Teaching Programme". Acta Scientific Women's Health; 1:2: 12-17.

El-Adhamn, A.F.M.N and Shaban, R.E. (2020): Effect of Instructional Guideline on Fertility Nurses' Knowledge and Attitude regarding Invitro Fertilization. IOSR Journal of Nursing and Health Science; 9(1) 33-46.

Ghraib, S. and Khait, A.A. (2017): The Relationship between Primary Infertility and Depression among Women Attending Royal Medical Services Hospitals in Jordan. Journal of Community Medicine and Health Education. 7, 533.

Judith, A., Trudy, D., Lorna, M., et al. (2013): 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; 22, (11-12): 1738-1747.

Jahromi, N.B., Parsanezhad, M.E., Shomali, Z., et al. (2018): Ovarian Hyperstimulation Syndrome: A Narrative Review of Its Pathophysiology, Risk Factors, Prevention, Classification, and Management. Iran J Med Sci May; 43: 3.

Li, Y., Fang, L., Yu, Y. et al. (2019):Higher melatonin in the follicle fluid and MT2 expression in the granulosa cells contribute to the OHSS occurrence. Reprod Biol

Endocrinol, 17, 37.
<https://doi.org/10.1186/s12958-019-0479-6>

Liu K., Yang W., Hu M., Xie W., et al.(2021): Exosomal miR-27 negatively regulates ROS production and promotes granulosa cells apoptosis by targeting SPRY2 in OHSS. *Journal of Cellular and Molecular Medicine*, 8,25, p. 3976-3990.

<https://doi.org/10.1111/jcmm.16355>

Shen, X., Yang, Q., Li, L., & Lu, W. (2021): Clinical Pregnancy and Incidence of Ovarian Hyperstimulation Syndrome in High Ovarian Responders Receiving

Different Doses of hCG Supplementation in a GnRH-Agonist Trigger Protocol. *Evidence-based complementary and alternative medicine : eCAM*, 2021, 2180933. <https://doi.org/10.1155/2021/2180933>

Soave I., Marci R., Ginecol M.(2014): Ovarian stimulation in patients in risk of OHSS. *Int J Fertil Steril*; 66 (2), 165-178.

Zhai J., Liu J., Zhao S., Zhao H., et al.(2017): Ovarian hyperstimulation syndrome: classifications and critical analysis of preventive measures . *Reproduction* 154 (4), 355-362.