Effect of Supportive Guidelines on Nurses' Knowledge and Practices regarding Ovarian Hyperstimulation Syndrome

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Abstract

Ovarian hyperstimulation syndrome (OHSS) is an iatrogenic and potentially life-threatening complication of fertility treatment. **Aim:** To evaluate the effect of supportive guidelines on nurses' knowledge and practices regarding ovarian hyperstimulation syndrome. **Study design:** quasi-experimental pre and posttest research design was applied. **Setting:** The current research was carried out at all infertility treatment centers in Minia city (El Nile, Jannah, Minia center, and Egypt center). **Sample**: A convenient sample was utilized in the current study, 60 nurses who agree to participate. **Tools:** data were gathered via three tools: the first include socio-demographic data, knowledge assessment tool, and practices observational checklist regarding OHSS prevention. **Results:** it reveals that 76.7 % of the participants had poor knowledge about OHSS in pretest reduced to 6.7% in posttest. And 71.7 % of the participants had unsatisfactory practices regarding OHSS prevention in pretest which decreased to 21.7% in posttest. Furthermore there was a positive correlation between studied sample's knowledge and practices in pretest and posttest with statistically significant differences where p_ value was .001. **Conclusion:** There were highly statistically significant improvements in nurses' knowledge and practices regarding OHSS after implementation of supportive guidelines. **Recommendation:** Provide a continuous planned educational courses for nurses in infertility treatment centers and clinics to update their knowledge continuously and improving their practices regarding preventing OHSS and, routinely provide a brochure or a booklet that contain all information about OHSS for every women receiving ovulation induction medication in all infertility centers or clinics.

Keywords: Knowledge, Nurses, Ovarian Hyperstimulation Syndrome Practices, Supportive Guidelines.

Introduction

Infertility is defined as the failure to become pregnant following 12 months of regular unprotected sexual relation. Infertility is considered a major consequence nowadays. Worldwide, about 8% to 12% of reproductive-age couples suffers from infertility. However, the infertility rates are much higher in some countries of the world, reaching 15% in Egypt, So it is considered a major complication in Egypt nowadays **(Ghraib and Khait, 2017**).

The first line of infertility management is ovulation induction. ovarian hyperstimulation syndrome (OHSS) is the most serious complication of ovarian stimulation and is life-threatening in its severe form of ovulation induction. The reported OHSS incidence varies largely, with prevalence ranging from 20–33% in its mild form and in its moderate or severe form is 3–8% (**Mourad, et al., 2017**).

Up to the present time, the mechanism of OHSS is not completely known, but it's pathogenesis as follows, During the follicular phase, many follicles develop simultaneously with the use of ovulation-stimulating drugs (**Humaidan, et al., 2016).** Supposing that the completely OHSS prevention is impossible, several plans could be carried out to minimize the risk and early detection of risk factors represents the first step of a multi-stage process. (**Soave & Marci, 2014**)

It is essential to early detect OHSS in women at high risk so that they will first and foremost not be cured with long (Gonadotropin-releasing hormone) GnRH-agonist protocols and great (Follicle stimulating hormone) FSH doses, while in those subjects still presenting with an extraordinary ovarian response, individualized secondary preventive measures can be applied. Risk factors associated with OHSS include, young age, low body weight, polycystic ovary syndrome (PCOS) or high basal antral follicle count (AFC), elevated or rapidly increased serum estradiol levels during ovarian stimulation (OS), history of an elevated

response to gonadotrophins (prior hyper response or OHSS), a large number of small follicles (8–12 mm) during OS, the use of HCG instead of progesterone for luteal phase support after in vitro fertilization (IVF), a large number of oocytes retrieved (>20) ,early pregnancy and high basal anti-Mullerian hormone (AMH) concentrations (**Humaidan, et al., 2010).**

Ovarian hyper stimulation syndrome (OHSS) characterized by presence of multi 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).** Ovarian hyperstimulation syndrome (OHSS) contains a broad spectrum of clinical manifestations including massive ovarian enlargement, ascites, pleural effusion, high vascular permeability (VP), reduced renal perfusion, thrombotic complications and possibly death **(Zhai, et al., 2017).**

Based on the onset of OHSS incidence, it divided into two types. Early onset which appears within 10 days after administration of HCG and late onset appears ≥10 days after oocyte retrieval (**Humaidan, et al., 2016).**

Although there is no way to completely prevent Ovarian hyperstimulation syndrome (OHSS), there are several 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 includes customized stimulation techniques tailored to the unique criteria of each patient. Secondary prevention encompasses all practices aimed to reduce 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 & Marci, 2014**).

The treatment of OHSS depends on its severity, complications, and whether the woman pregnant or not. It involves managing electrolytic disturbances, hemodynamic alterations, liver problems, pulmonary signs, hypoglobulinemia, febrile morbidity, thromboembolic events, adnexal torsion, and neurological problems. Prevention is the most effective treatment. Completely preventing OHSS does not appear to be possible without cycle cancelling and continuing of GnRH agonist in patients stimulated using a long GnRH agonist protocol. Nurses knowledge can have a profound impact on the quality of healthcare received to patients undergoing OHSS. There is nonetheless an increasing knowledge among nurses regarding the different measures to prevent OHSS which, in careful hands, will decrease its occurrence to a little ratio **(Jahromi, 2018).**

The fertility nurse should be aware, with high knowledge level and well equipped in all plans of fertility management to be able to assist spouses to deal with their problem and to handle the psychosocial situation experienced. They act as practitioner in diagnosis, treatment and follow-up from first meeting with spouses. They assess the couples' needs with a comprehensive perspective in accordance with their medical knowledge, identify problems, select care practices, planning and applying the protocols of management and evaluating the effect of care (**Smith, et al., 2014**).

Significance of the study

With increasing the usage of ovulation induction medication and IVF ratio to manage couples infertility, ovarian stimulation is a critical factor for better clinical outcomes. OHSS is one of serious complication of it and has been estimated to happen in 9% to 24% of women with IVF that can result in cycle cancelling **(Anwar and Anwar, 2016**). The maternity nurse who is the first one contacting the couples is responsible for providing complete care about infertility medication problems.

The prevalence of OHSS is in increase, 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).** From the researcher's clinical experience, OHSS is a very difficult consequence ever felt as a result of ovarian stimulation medication. Hence, health professionals including nurses should be aware of this condition and its many clinical signs, which causes wide range-organ failure and potentially death. Since they are in the best

position to observe the patients' response to ovulation induction drugs.

Aim of this study

To evaluate the effect of supportive guidelines on nurses' knowledge and practices regarding ovarian hyperstimulation syndrome.

Research hypothesis

Implementation of supportive guidelines has positive effect on nurses' knowledge and practices regarding ovarian hyperstimulation syndrome.

Subjects and Methods

Study design: Quasi-experimental research design (pre and post-test) was applied in this study to achieve its purpose.

Setting: The current research was carried out at all infertility treatment centers in Minia city (El Nile, Janna, Minia center, Egypt center).

Sample type: A convenient sample was used in the present research.

Sample size: The sample of the study consisted of all nurses working in the previous mentioned centers who accept to share in the study and their number was (60) nurse.

Study Tools:

Three tools were utilized in the current study for data collection:

1. **Tool (1): Structured interviewing questionnaire (pretest)**

It established by the researchers after extensive revising of the associated literature. It involved demographic characteristics: such as (name, age, residence, educational qualification, years of experience, attending previous educational training about OHSS and source of information).

2. **Tool (2): Knowledge assessment tool (pre/post):**

It established by the researchers to assess nurse's knowledge about ovarian hyperstimulation syndrome (OHSS). It involved (10) questions about OHSS (definition, causes, risk factors, signs and symptoms, classification of OHSS, diagnosis, treatment, management, complication, and prevention of it).

Scoring System: The complete correct reply of question was given a score of (3), the incomplete correct reply was given a score of (2), and don't know reply was given a score of (1). The total marks will be summed; the percentage will be calculated for all participants and judged as the following: poor (<50%) or (<15scores), average (50%-75%) or (15-< 23 scores), good (≥ 75%) or (≥ 23 scores).

3. **Tool (3): Observational Checklist for Nurses Practices Regarding Preventive Measures of OHSS (pre/post):** It adopted by ***South Australian Maternal, Neonatal and Gynecology Community of perinatal Practice (Guidelines for Ovarian Hyperstimulation Syndrome, 2018) and RCOG (2014)*** then modified by the researchers to assess nurse's preventive practices regarding ovarian hyper stimulation syndrome (OHSS). it involved four parts:

Part (1): Preventive practices measures before ovarian stimulation: It included (10) practices that the nurse should do it before ovarian stimulation (Primary prevention) such as (taking complete history to identify risk factors, perform general examination, perform abdominal examination., receive antagonist to high-risk women prior to treatment, avoid HCG for luteal phase support,…….. etc.)

Part (2): Management practices for mild to moderate OHSS cases: It included (17) practices that the nurse should do it during the management of mild to moderate ovarian hyperstimulation syndrome cases (secondary prevention for mild to moderate OHSS cases) such as (assess women with OHSS symptoms at least once daily, advise about fluid intake and output monitoring, mobilization and simple analgesia (paracetamol/codeine), avoid NSAIDs because it affects the renal function and possibility of pregnancy, advise to avoid strenuous exercise and sexual intercourse due to risk of injury or torsion, instruct women who managed on outpatient clinics to take

thromboprophylaxis as doctor order, receive antagonist to as high-risk women prior to treatment, individualized the treatment duration, the risk factors and whether or not pregnancy occur should be taken into account……. etc.)

Part (3): Management practices for sever OHSS cases: It included (17) practices that the nurse should do it during the management of sever ovarian hyperstimulation syndrome cases (secondary prevention for sever OHSS cases) such as (vital signs should be monitored every 4 hours, fluid intake and output monitoring (daily, or more often as needed), administer IV fluids if vomiting or decreased urine output. crystalloid (normal saline one liter 8hrly), urinary catheterization if oligo/anuric, monitoring oxygen saturation, daily weight and daily abdominal girth measurement, change intravenous access every 72 hours…… etc.)

Part (4) Management practices for critical OHSS cases: It included (10) practices that the nurse should do it during the management of critical ovarian hyperstimulation syndrome cases (secondary prevention for critical OHSS cases) such as (referral/transfer to ICU, consider draining ascites if needed, physician review (suspected pulmonary embolism or infection), consider drainage of pleural effusions, physiotherapy, administration of NSAIDs to be avoided in severe and critical OHSS patients…… etc.)

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 total marks will be summed; the percentage will be calculated for all participants and judged as the following: satisfactory (≥ 60%= ≥ 65 scores) and unsatisfactory (< 60%= < 65 scores)

Tools Validity and Reliability

Validity: The sheet was provided by five-panel specialists in Women Health and Obstetrics Nursing who revised the tools for accuracy, eligibility, inclusiveness, feasibility, applicability, and simplicity

Reliability: The test was assessed via the Cronbach's alpha coefficient test, it was (0.976, 0.997) for knowledge and practices regarding OHSS, hence the sheets were found to be highly reliable.

Ethical Consideration:

An official approval was obtained from authorities' personnel in all infertility treatment centers. Researchers introduced themselves to nurses who agree to share in the research and the study aim was explained to them in order to gain their acceptance to participate in the study voluntary and attain their consent. It was ensured that, the study had no risk or hazards on their health. Each participant had the right to withdrawal from the research at any time and all data that obtained were considered confidential.

Pilot study:

The tools of data collection were pretested on a random sample of 10% (6 nurses) selected from the same setting of the study to check the clearness, pertinence, any problems with their application, and the needed time to complete the tools. No changes were done, so nurses who participate in the pilot study were involved in the total sample.

Procedure:

The research was carried out through three phases: preparatory, implementation, and evaluation. The program was be implemented over a period of three months from the beginnings of May 2019 to the end of July 2019.

1. Preparatory phase:

- In this phase the researcher interview nurses who decide to share in the study after took their acceptance for participation. The researchers conducting the first meeting with the nurses in each center and explained in brief the essence and the intent of the research. The interview took around 15-20 minutes for them in each center.
- After getting the nurses agreement to share in the study, the researchers explained to them an overview and illustration about the

evaluation tools. Therefore, the questionnaire was used to evaluate data individually related to the nurse's demographic characteristics, knowledge and the researcher evaluated the observational checklist regarding preventive measures of OHSS during infertility treatment before implementation of the supportive guidelines. It took about 20-30 mins to complete.

2- Implementation phase:

- Implementation carried out in two educational sessions for theoretical and practical information about OHSS for each group of nurses in each center. The number of nurses in each group was 5 nurses in order to facilitate the learning process and allow every nurse to participate in the discussion as well as ensure adequate supervision. Sessions conducted based on their agreement on a suitable date and time for them after finishing their duties in the waiting room of each center and the total number of sessions were 6 educational sessions in each center.
- At the starting, the nurses were informed about the educational sessions' outlines. The 1st session concerned information about the definition of OHSS, causes, risk factors, clinical pictures, classification, diagnosis, treatment, management, complication, and prevention. The 2nd session concerned with a discussion of preventive practices measures should be done before ovarian stimulation, practices should be done for management of mild to moderate OHSS cases, practices should be done for management of sever OHSS cases, and practices should be done for management of critical OHSS cases. Each session took about one an hour.
- Health education was provided to the nurses in the form of lectures and group discussion to improve their knowledge by using audio-visual aids (PPT, Photos, videos and posters in Arabic language) and the researcher used demonstration and redemonstration for practices information which emphasized on improving their practices regarding OHSS. At the finishing of the sessions, feedback from the nurses was obtained to ensure the ultimate benefits were get.
- A self-learning booklet containing information about the topic was given to each nurse at the end of the sessions to achieve the aim of study. It consists of significant information about OHSS (definition of OHSS, causes, risk factors, clinical picture, classification, diagnosis, treatment, management, complication, and prevention, also, preventive practices measures before ovarian stimulation, management practices for mild to moderate OHSS cases, management practices for sever OHSS cases, management practices for critical OHSS cases and, the researchers communicated with nurses via telephone call or what's app for instructions and reinforcement.

3. Evaluation phase:

- Evaluation phase were conducted after one month of supportive guidelines implementation to ensure that the nurses follow it and to ensure the effectiveness of supportive guidelines program through posttest knowledge assessment tool and observational checklist for practices.
- The researcher observed nurses' practice of preventive measures of OHSS during induction cycles by covert observation during their usual work. Each questionnaire and observational checklist was given a code number. The observation was taken within 20 to 30 Minutes.
- The influence of the supportive guidelines on improving knowledge and practices of nurses was achieved through comparison between a pre- and posttest that was conducted after one month of supportive guidelines implementation to determine their improvement on their knowledge and practices level.

Statistical analysis

The data collected were organized, classified, and examined by the statistical package for the social sciences (SPSS) program, Released 2013, IBM SPSS Statistics for Windows, and Version 22.0. Armonk, NY: IBM Corp. Statistics were offered by descriptive statistics in the form of frequencies and percentages for qualitative variables and mean and SDs for quantitative

variables. The statistical tests used were paired t test, $\chi 2$ test, and r test. Statistical significance was considered as significant when P value less than or equal to 0.05 and highly significant when P value less than or equal to 0.001, and no statistically significant difference was considered when P value was more than 0.05

Results:

Table 1, illustrates demographic characteristics of the participants, it showed that 65% of them their age between 20- < 30 years, with Mean and SD 29.52±6.570 years, 70% were from rural area, 46.7% of them graduate from technical nursing institute, and 48.3% of them their experience from 5 to 10 years.

Figure 1, illustrates previous educational training about ovarian hyperstimulation syndrome, it reveals that 73.3 % of the participants didn't attend any educational training about OHSS.

Figure 2, illustrates source of information about ovarian hyperstimulation syndrome, it shows that (39%) of the participants their source of information about ovarian hyperstimulation syndrome from electron media.

Table (2): illustrates participants mean knowledge regarding OHSS pre and post supportive guidelines among the participants . It exhibits that there were significant increase in all items of participants knowledge about OHSS after the supportive guidelines with highly statistically significant improvement in each item of their knowledge (where p-value = 0.001 in each one)

Figure 3: demonstrates total knowledge regarding OHSS among the participants pre and post supportive guidelines, it reveals that 76.7 % of the participant had poor knowledge about OHSS in pretest which decreased to 6.7% in posttest. Mean score of their knowledge was 12.0833± 4.943 in pretest, increased to 26.750±5.602 in posttest with highly statistically significant improvements in their knowledge level.

Table (3): shows the mean distribution of the participants according to their primary prevention practices of (OHSS) pre and post supportive guidelines. It shows that all items of participants primary prevention practices of (OHSS) were improved after the supportive guidelines with highly statistically significant (where p-value = 0.001 in each one).

Table (4): explains the mean distribution of the participants according to their secondary prevention practices for mild to moderate cases of OHSS in pre and post supportive guidelines. It presents that all items of participants secondary prevention practices for mild to moderate cases of OHSS were improved after the supportive guidelines with highly statistically significant (where p-value = 0.001 in each one).

Table (5): demonstrates the mean distribution of the participants according to their secondary prevention practices for sever cases of OHSS in pre and post supportive guidelines. It presents that all items of participants secondary prevention practices for sever cases of OHSS were improved after the supportive guidelines with highly statistically significant (where p-value = 0.001 in each one).

Table (6): reveals the mean distribution of the participants according to their secondary prevention practices for critical cases of OHSS in pre and post supportive guidelines. It presents that all items of participants secondary prevention practices for critical cases of OHSS were improved after the supportive guidelines with highly statistically significant (where p-value = 0.001 in each one)

Table (7): explains the total mean of OHSS prevention practices in pre and post supportive guidelines among the participants. It shows that prevention practices of OHSS, were improved also it reveals that the total practices Mean and SD was 66.72±21.21 in pretest, increased to 94.43±21.98 in posttest with highly statistically significant improvements in their practice level.

Figure (4): proves total practices regarding OHSS among the participants pre and post supportive guidelines, it reveals that 71.7 % of the participants had unsatisfactory practices about OHSS in pretest which

decreased to 21.7% in posttest. Mean score of their practices was 66.72±21.21 in pretest, increased to 94.43±21.98 in posttest with highly statistically significant improvements in their practices level.

Table (8): demonstrates that there were highly statistically significant relation between the participants total knowledge about OHSS and their demographic data related to their years of experience and educational qualification in pretest.

Table (9): shows relation between previous educational training about OHSS and total knowledge before supportive guidelines among the participants . It shows that (71.7%) of the participants who didn't attended educational training about ovarian hyperstimulation syndrome had poor knowledge.

Table (10): explains that there were highly statistically significant relation between the participants total practices about OHSS and their demographic data related to their years of experience and educational qualification in pretest.

Table (11): displays correlation between the participants knowledge and practices regarding OHSS in pretest and posttest. It reveals that there was a positive correlation between studied sample's knowledge and practices in posttest with statistically significant differences where p_ value was .001.

Table (1): Demographic characteristics among the participants : (N = 60)

Demographic characteristics	The participants (60)	
	No	**%**
Age		
20 -<30 years	39	65.0
30 -< 40 years	15	25.0
> 40 years	6	10.0
Mean ± SD	**29.52±6.570**	
Residence		
Urban	18	30.0
Rural	42	70.0
Educational qualification		
Nursing school	25	41.7
Technical Nursing institute	28	46.7
B.Sc. Nursing	6	10.0
Higher	1	1.6
Years of experience		
Less than 5 years	22	36.7
5 -10 years	29	48.3
10 -20 years	6	10.0
More than 20	3	5.0

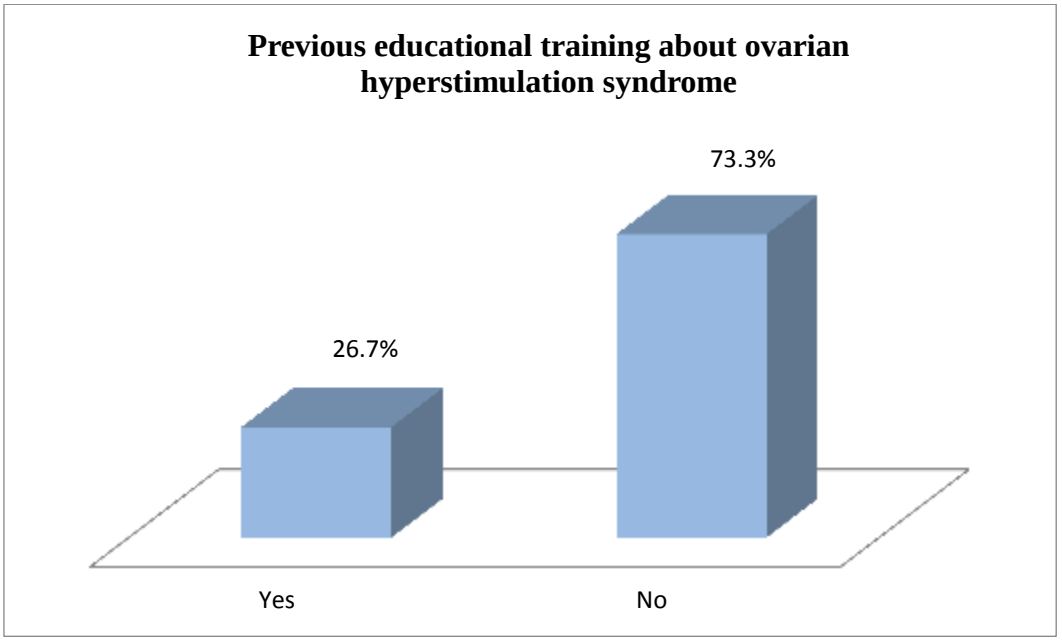

Figure (1): Previous educational training about ovarian hyperstimulation syndrome

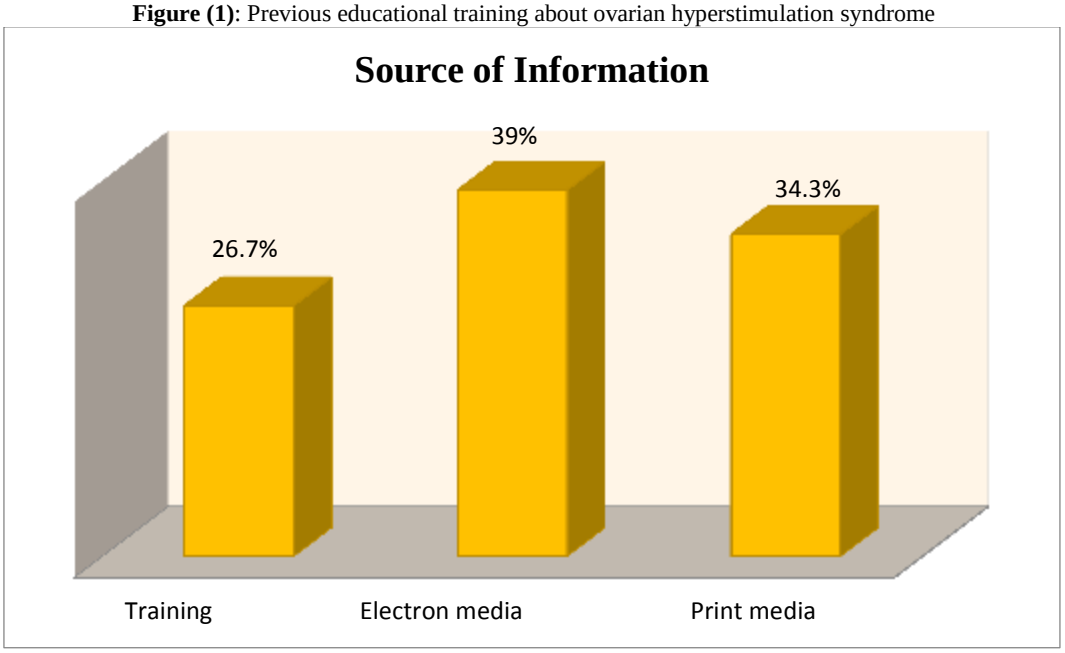

Figure (2): Source of information about OHSS

Table (2): Mean knowledge about OHSS pre and post supportive guidelines among the participants (N=60)

Items	Pretest	Posttest	T	P
	Mean ±SD	Mean ±SD		
Definition of OHSS	1.40±.669	2.78±.490	14.981	0.001**
Causes of OHSS	1.27±.578	2.68±.651	14.333	0.001**
Risk factors of OHSS	1.27±.607	2.70±.591	14.905	0.001**
Early signs that appear on women with OHSS	1.20±.514	2.75±.541	17.798	0.001**
The classification of OHSS	1.22±.555	2.68±.596	15.690	0.001**
Diagnostic criteria of OHSS	1.15±.444	2.65±.577	17.849	0.001**
Complications of OHSS	1.15±.481	2.67±.601	16.762	0.001**
Treatment of OHSS	1.15±.515	2.65±.547	17.176	0.001**
Management of OHSS	1.17±.493	2.58±.645	15.241	0.001**
Prevention of OHSS	1.12±.415	2.60±.669	15.855	0.001**

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

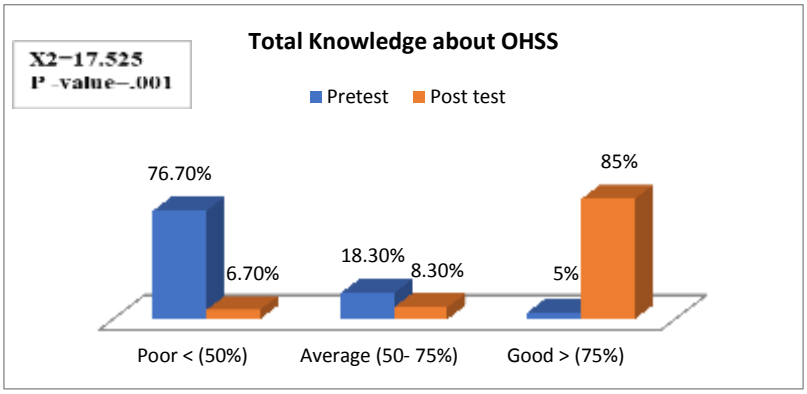

Figure (3): Total knowledge about OHSS among the participants pre and post supportive guidelines (N= 60)

Table (3): The mean distribution of the participant according to their primary prevention practices of (OHSS) in pre and post supportive guidelines (N=60)

Primary prevention practices of (OHSS)	Pretest	Posttest	T	P-value
	Mean ±SD	Mean ±SD		
1. Taking complete history to identify risk factors.	1.30±.462	1.75± .437	6.948	0.001**
2. Perform general examination.	1.27±.446	1.72±.454	6.948	0.001**
3. Perform abdominal examination.	1.35±.481	1.78±.415	6.717	0.001**
4. Instruct women to call the hospital if she suffer from any complaining symptoms of OHSS such as abdominal pain, abdominal distension, nausea, vomiting or diarrhea, breathlessness, or having passed urine less than 3 times in 24 hours	1.22±.415	1.73±.446	7.942	0.001**
5. the ovulation induction regimens should be individualizing by given the minimum dose and duration of gonadotrophin therapy.	1.28±.454	1.72±.454	6.717	0.001**
6. Receive antagonist to high-risk women prior to treatment.	1.25±.437	1.77±.427	7.942	0.001**
7. Avoid HCG for luteal phase support.	1.22±.415	1.75±.437	8.211	0.001**
8.Avoid any medications contraindicated in pregnancy as doctor order.	1.18±.390	1.72±.454	8.211	0.001**
9. Educate woman regarding condition and inform women all information about induction risks, warning symptoms of OHSS, its prevention and possible complications.	1.23±.427	1.75±.437	7.942	0.001**
10. Provide emotional support and arrange counselling if needed.	1.32±.469	1.68±.469	5.844	0.001**
Total primary prevention practices of (OHSS)	**12.616±4.10**	**17.37±4.262**	**8.035**	**0.001****

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

Table (4): The mean distribution of the participants according to their secondary prevention practice for mild to moderate OHSS cases pre and post supportive guidelines (n=60).

The secondary prevention practice for mild to moderate OHSS cases	Pretest	Posttest	T	P-value
	Mean ±SD	Mean ±SD		
1. Assess women with OHSS symptoms at least once daily.	1.28± .454	1.73±.446	6.948	0.001**
2. Advise about fluid intake and output monitoring, mobilization and simple analgesia (paracetamol/codeine).	1.25±.437	1.73±.446	7.429	0.001**
3. Avoid NSAIDS because it affects the renal function and possibility of pregnancy.	1.22±.415	1.77±.427	8.492	0.001**
4. Advise to avoid strenuous exercise and sexual intercourse due to risk of injury or torsion.	1.18±.390	1.78±.415	9.407	0.001**
5. Instruct women who managed on outpatient clinics to take thromboprophylaxis as doctor order.	1.17±.376	1.73±.446	8.784	0.001**
6. Receive antagonist to as high-risk women prior to treatment.	1.20±.403	1.72±.454	7.942	0.001**
7. individualized the treatment duration, also the risk factors and whether or not pregnancy occur should be taken into account.	1.15±.360	1.78±.415	10.095	0.001**
8. Inform women if symptoms worsen, contact Hospital urgently.	1.18±.390	1.77±.427	9.088	0.001**
9. Termination of cycle treatment, and maintenance of down regulation until the following period.	1.25±.437	1.75±.437	7.681	0.001**
10. Coasting and follicular development should be monitored as well as E2 levels.	1.22±.415	1.82±.390	9.407	0.001**
11. the ovulatory trigger (HCG) should be Withheld, if ovarian response is significantly high.	1.25±.437	1.80±.403	8.492	0.001**
12. the dose of the HCG trigger should be decreased to 5,000 IU instead of the standard 10,000 IU.	1.28±.454	1.73±.446	6.948	0.001**
13. Post oocyte retrieval, Dopamine agonist (Cabergoline 0.5mg) should be used daily	1.18±.390	1.68±.469	7.681	0.001**
14. progesterone should be used not HCG for luteal phase support.	1.18±.390	1.73±.446	8.492	0.001**
15. at the time of oocyte retrieval administer intravenous prophylactic 25.0% albumin (20-50g) in high-risk patients.	1.30±.462	1.67±.475	5.844	0.001**
16. Instruct woman who at risk for OHSS that frozen her follicle.	1.25±.437	1.70±.462	6.948	0.001**
17. Arrange follow up visits	1.20±.403	1.67±.475	7.185	0.001**
Total secondary prevention practices for mild to moderate cases of OHSS	**20.75±6.58**	**29.57±7.01**	**8.912**	**0.001****

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

Table (5): The mean distribution of the participants according to their secondary prevention practices for sever cases of OHSS in pre and post supportive guidelines (N=60).

Secondary prevention practice for sever cases of OHSS	Pretest	Posttest	T	P- value
	Mean ±SD	Mean ±SD		
1. Vital signs should be monitored every 4 hours, decrease observations according to condition.	1.23± .427	1.77±.427	8.211	0.001**
2. Fluid intake and output monitoring (daily, or more often as needed).	1.20±.403	1.68±.469	7.429	0.001**
3. Administer IV fluids if vomiting or decreased urine output. Crystalloid (normal saline one liter 8hrly), urinary catheterization if oligo/anuric.	1.18±.390	1.72±.454	8.211	0.001**
4. Monitoring oxygen saturation.	1.23±.427	1.82±.390	9.088	0.001**
5. Daily weight and daily abdominal girth measurement.	1.20±.403	1.70±.462	7.681	0.001**
6. Encourage use of Triflow to prevent atelectasis.	1.23±.427	1.77±.427	8.211	0.001**
7. Change Intravenous access every 72 hours.	1.20±.403	1.70±.462	7.681	0.001**
8. Daily Examination	1.15±.360	1.82 ±.390	10.86	0.001**
9. Daily blood tests (May be required every 12 hours if abnormal or if oliguria)	1.20±.403	1.72±.454	7.942	0.001**
10.Administer thromboprophylaxis as order.	1.27±.446	1.83±.376	8.784	0.001**
11. Administer antiemetics Prochlorperazine (PR/IM) can be prescribed for nausea and/or vomiting as order.	1.32±.469	1.73±.446	6.492	0.001**
12. Avoid diuretics in patients with decreased blood volume and decreased renal perfusion as they deplete intravascular volume as order.	1.23±.427	1.78±.415	8.492	0.001**
13. Administer analgesia (pain relief) as doctor order.	1.15±.360	1.73±.446	9.088	0.001**
14. Paracentesis if needed.	1.23±.427	1.77±.427	8.211	0.001**
15. Anticoagulants as prescribed.	1.33±.475	1.72±.454	6.056	0.001**
16. Inform pregnant women that pre-eclampsia and preterm delivery may be occurs as a complication of OHSS.	1.28±.454	1.73±.446	6.948	0.001**
1. Follow-up visits will be arranged with discharged Patients after providing health education about treatment regimen.	1.25±.437	1.72±.454	7.185	0.001**
Total Secondary prevention practices for sever cases of OHSS	**20.90±6.63**	**29.70±6.94**	**8.941**	**0.001****

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

Table (6): The mean distribution of the participants according to their secondary prevention practices for critical cases of OHSS in pre and post supportive guidelines (N=60).

Secondary prevention practices for critical cases of OHSS	Pretest	Posttest	T	P- value
	Mean ±SD	Mean ±SD		
1. Referral/Transfer to ICU.	1.27± .446	1.72±.454	6.948	0.001**
2. Early involvement of renal physician may be required in addition to Gynecology/ ITU anesthetists.	1.18±.390	1.75±.437	8.784	0.001**
3. Monitoring on level 2 intensive therapy units (ITU) care (continuous oxygen saturation, ECG, non-invasive BP, strict fluid balance, long line. Direct intra-arterial pressure monitoring to facilitate frequent blood tests and blood gas analysis.	1.23±.427	1.82±.390	9.088	0.001**
4. Respiratory function should be maintained if oxygen saturation decreased / respiratory compromise, Commence oxygen and Arterial blood gases	1.18±.390	1.77±.427	9.088	0.001**
5. Consider draining ascites if needed.	1.25±.437	1.87±.343	9.742	0.001**
6. Physician review (suspected pulmonary embolism or infection)	1.20±.403	1.78±.415	9.088	0.001**
7. Consider drainage of pleural effusions	1.25±.437	1.83±.376	9.088	0.001**
8. Physiotherapy.	1.22±.415	1.78±.415	8.784	0.001**
9. Critical OHSS patients may require level 3 intensive therapy units (ITU) care.	1.35±.481	1.73±.446	6.056	0.001**
10. Administration of NSAIDS to be avoided in severe and critical OHSS patients.	1.32±.469	1.75±.437	6.717	0.001**
Total secondary prevention practices for critical cases of OHSS	**12.45±3.985**	**17.80±3.861**	**9.307**	**0.001****

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

Table (7): The total mean of OHSS prevention practices in pre and post supportive guidelines among the participants (N=60).

Practice scores	Pretest	Posttest	T	P- Value
	Mean ±SD	Mean ±SD		
1.Total primary prevention practices of Ovarian hyper stimulation syndrome (OHSS)	12.616±4.10	17.37±4.262	8.035	0.001**
2.Total secondary prevention practices for mild to moderate cases of OHSS	20.75±6.58	29.57±7.01	8.912	0.001**
3.Total secondary prevention practices for sever OHSS cases	20.90±6.63	29.70±6.94	8.941	0.001**
4.Total secondary prevention practices for critical OHSS cases	12.45±3.985	17.80±3.861	9.307	0.001**
Total practice scores	**66.72±21.21**	**94.43±21.98**	**8.897**	**0.001****

Test used: paired sample T test. **Highly statistically significant at P value ≤ 0.01.

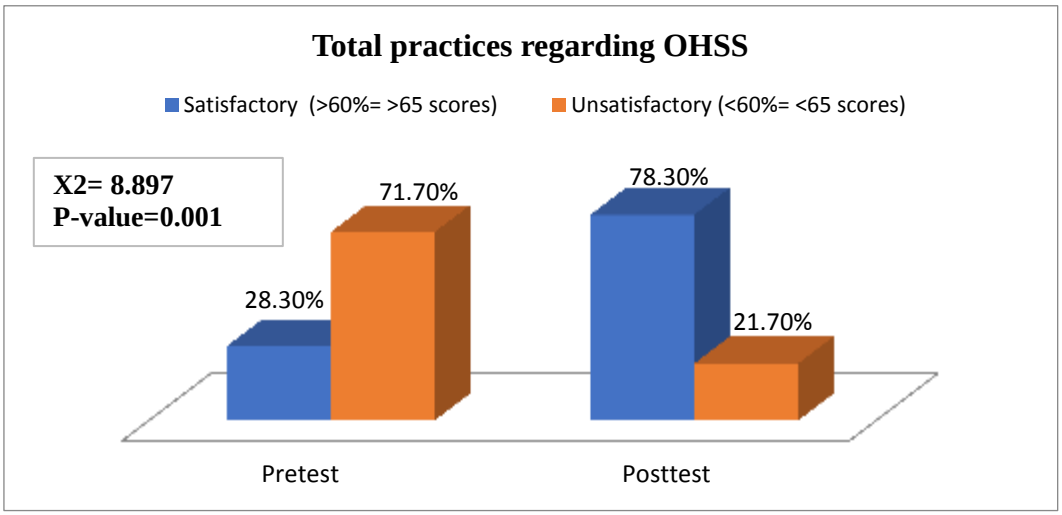

Figure (4): Total practices regarding OHSS among the participants pre and post supportive guidelines. (N=60)

Table (8): Relation between the demographic characteristics of the participants and their total knowledge before supportive guidelines (n= 60).

Demographic characteristics	Total knowledge before supportive guidelines (n= 60).						Fisher Test	P- value
	Poor (n= 46)		average (n =11)		Good (n=3)			
	No	%	No	%	No	%		
Age/ years								
20 -<30 years (n=39)	32	53.3	4	6.7	3	5.0	7.579	0.108
30 -< 40 years (n=15)	11	18.3	4	6.7	0	0.0		
40 (n=6)	3	5.0	3	5.0	0	0.0		
Residence								
Urban (n=18)	11	18.3	6	10.0	1	1.7	3.983	0.136
Rural (n=42)	35	58.3	5	8.3	2	3.3		
Years of experience								
Less than 5 years (n=22)	22	36.7	3	5.0	0	0.0	36.144	0.001**
5 -10 years (n=29)	23	38.3	4	6.7	1	1.7		
10 -20 years (n=6)	1	1.7	4	6.7	1	1.7		
More than 20(n=3)	0	0.0	0	0.0	1	1.7		
Educational qualification								
Nursing school (n=25)	18	30.0	4	6.7	0	0.0	33.786	0.001**
Technical Nursing institute (n=28)	26	43.3	3	5.0	0	0.0		
B.Sc. Nursing (n=6)	2	3.3	3	5.0	1	1.7		
Higher (n=1)	0	0.0	1	1.7	2	3.3		

Fisher test for qualitative data less than 5 cases **Highly statistically significant at P value ≤ 0.01.

Table (9): Relation between previous educational training about OHSS and total knowledge before supportive guidelines among the participants(n= 60).

Item	Total knowledge before supportive guidelines (n= 60).						Fisher	P- value
	Poor (n= 46)		average (n =11)		Good (n=3)			
	No	%	No	%	No	%		
Previous educational training about ovarian hyperstimulation syndrome								
Yes (n=16)	3	5.0	10	16.7	3	5.0	41.011	0.001**
No (n=44)	43	71.7	1	1.7	0	0.0		

Fisher test for qualitative data less than 5 cases **Highly statistically significant at P ≤ 0.01.

Table (10): Relation between demographic characteristics of the participants and total practice before supportive guidelines (n= 60).

Demographic characteristics	Total practice (n= 60).				Fisher Test	P- value
	Satisfactory (n= 17)		Unsatisfactory (n =43)			
	No	%	No	%		
Age/ years						
20 -<30 years (n=39)	10	16.7	29	48.3	1.547	0.461
30 -< 40 years (n=15)	4	6.7	11	18.3		
40 (n=6)	3	5.0	3	5.0		
Residence						
Urban (n=18)	8	13.3	10	16.7	3.287	0.070
Rural (n=42)	9	15.0	33	55.0		
Years of experience						
Less than 5 years (n=22)	6	10.0	16	26.7	14.962	0.002**
5 -10 years (n=29)	4	6.7	25	41.6		
10 -20 years (n=6)	4	6.7	2	3.3		
More than 20(n=3)	3	5.0	0	0.0		
Educational qualification						
Nursing school (n=25)	3	5.0	22	36.7	21.144	0.001**
Technical Nursing institute (n=28)	7	11.7	21	35.0		
B.Sc. Nursing (n=6)	6	10.0	0	0.0		
Higher (n=1)	1	1.7	0	0.0		

Fisher test for qualitative data less than 5 cases **Highly statistically significant at ≤ to 0.01.

Table (11): Correlation between participants knowledge and practices regarding OHSS in pretest and posttest

Variables	Pretest		Posttest	
	Knowledge	Practices	Knowledge	Practices
Knowledge				
r. value	1	.209	1	.723
P. value	-	.108 NS	-	.001**
Practices				
r. value	.209	1	.723	1
P. value	.108 NS	-	.001**	-

** Correlation is significant at the 0.01 level (2- tailed).
NS: not statistically significant.

Discussion

Ovarian hyperstimulation syndrome (OHSS) is an iatrogenic effect of ovarian stimulation during infertility treatment, identifying risk factors is vital for OHSS prevention as preventive measures can be taken before the onset of full-blown disease. The prevention of OHSS is based on its prediction. There is no manner that can perfectly avoid OHSS. However, its prevention can be lifesaving and is principally preferred over its treatment **(Jahromi, et al., 2018).**

The key principles of OHSS management therefore are early recognition and the prompt assessment and treatment of women with moderate or severe OHSS **(Royal College of Obstetricians and Gynecologists, 2014).** Nurses must be aware regarding OHSS to identify its onset and safely monitor its progression. Nurses cooperate with the physician in the assessment and care of the patients. A protocol for the nursing care of the patient with OHSS helps ensure comprehensive and safe care to improve continuity and quality of care **(Figueiredo, et al., 2017).**

The aim of the current study was to evaluate the effect of supportive guidelines on nurses' knowledge and practices regarding ovarian hyperstimulation syndrome.

Regarding demographic characteristic of the participants, it showed that near two third of the participants their age between 20- < 30 years, with Mean and SD 29.52±6.570 years, and near three quadrant were from rural area, regarding educational level near half of the participants graduated from technical nursing institute, while concerning years of experience near half of them had experience from 5 to 10 years.

This findings came in the same line with **(Shivaleela, 2019)** who concluded that about two thirds of respondents within the age group 21-30 years, and regarding their professional qualification, about half of respondents have completed diploma in general nursing & midwifery (GNM), Meanwhile, more than one third of respondents had 5-10 years of clinical experience.

These findings disagreed with the study of **(Obioha et al., 2014)** who stated that near two thirds of studied sample ranging from 30-39 years with mean age 35.6 ± 5.1 years and near half of studied sample had less than 5 years related to their clinical experience in fertility clinics.

By looking to previous educational training about OHSS and source of information, it was revealed that near three quadrants of the participants didn't attend any educational training about OHSS and near half of the participants their source of information about OHSS from electronic media. This finding partially in agreement with **(Shivaleela, 2019)** who founded that two thirds of responders didn't attend any educational training about OHSS and more than two thirds their source of information from training.

In relation to total knowledge regarding OHSS pre and post supportive guidelines, the finding of this study revealed that a significant increase in all items of participants knowledge about OHSS after the supportive guidelines with highly statistically significant improvement in each item of their knowledge. Also, it discovered that more than three quadrants of the participants had poor knowledge about OHSS in pretest which decreased in posttest. furthermore, the Mean score of their knowledge was 12.0833±

4.943 in pretest, increased to 26.750±5.602 in posttest with highly statistically significant improvements in their knowledge level.

This lack of knowledge in pretest may be rendered to the majority of studied nurses didn't receive previous educational training program about ovarian hyperstimulation syndrome. Also, the improvement of their knowledge in posttest indicates the effectiveness of supportive guidelines regarding OHSS.

This came in accordance with **(Shivaleela, 2019)** who reported that the knowledge level mean percentages of respondents in pretest were about two fifths of respondents if compared with posttest who were four fifths regarding OHSS. Hence the hypothesis that there will be significant differences between pre-test and post-test knowledge scores regarding OHSS is accepted. Also, supported with **(Applegarth, et al., 2013)** who revealed that the participants had a low level of knowledge and were in great need for special information regarding (assisted reproductive technology) ART practice such, as treatment protocols; complications of ovulation induction, patient instructional guidelines supportive counseling strategies and preventive measures toward OHSS.

In relation to the total practice regarding OHSS, the current results found a significantly improvement in all items of participants practices about OHSS after the supportive guidelines with highly statistically significant improvement in each one of their practices. Also, it reveals that less than three quarters of the participants had unsatisfactory practices about OHSS in pretest which decreased to less than one quarter in posttest. Furthermore, the Mean and SD was 66.72±21.21 in pretest, increased to 94.43±21.98 in posttest with highly statistically significant improvements in their practice level. This improvement in participants practices may be rendered to the interesting of nurses to improve and upgrading their practices and the effectiveness of the supportive guidelines.

This finding came in contact with (**Ajayi et al., 2017)** who stated that if fertility nurses have adequate knowledge they will have more effective role, practices and training. Moreover, In the same line **(Applegarth, et al., 2013 & RCN 2016)** who showed that the nurses role in fertility induction care and treatment is central to successful outcomes. The nursing role is important in effective treatment and care. As for all areas of practice the level of nurses contribution highly dependent on their skill, knowledge and confidence. This stresses on the importance of such supportive programs to improve and correct the nursing practices regarding OHSS to prevent its complications.

Regarding the relation between previous educational training about OHSS and total knowledge before supportive guidelines among the participants . It shows that near three quadrant of the participants who didn't attend educational training about ovarian hyperstimulation syndrome had poor knowledge. This indicate the need and the importance of such supportive guidelines to ensure improvement and update of nurses knowledge continuously and improving their practices regarding OHSS to avoid its complications.

Regarding to the relation between total knowledge scores with selected demographic data before supportive guidelines, it was found that there was a high statistical significant relation between the participants total knowledge about OHSS with years of experience and educational qualification in pretest. From researcher's point of view this is a normal finding as more experience means more knowledge acquired and the better professional qualification revenue the better level of knowledge.

These results partially agreed with **(Shivaleela, 2019)** who found a significant association between participants total knowledge about OHSS with their clinical experience but there is no association between participant's total knowledge about OHSS with professional qualification.

Regarding to the relation between total practices scores with selected demographic data before supportive guidelines, a highly statistical significant relation was found between the participants total practices regarding OHSS with years of experience and educational level in pretest. From researcher's point of view this is a normal finding as nurses with more clinical years of experience acquiring more practices and the higher professional qualification the better level of practices.

Finally, concerning the relation between the knowledge of the participants and practices regarding OHSS in posttest. a positive correlation between studied sample's knowledge and practices in posttest with statistically significant differences where p_ value was .001. this came in contact with **(Applegarth, et al., 2013)** who stated that the role of nurse is important for effective ART treatment and care. The standard of clinical practice will depend in part on the ability of specialist nurses to articulate their practice, and their professional development needs to optimize quality and effectiveness. The results of this study demonstrate that contextual knowledge and practices are a key aspect of this specialized nursing role. This implies that the supportive guidelines was quite efficient in raising nurse's knowledge and improve their practices, Also the natures of participant nurse's work in infertility centers help to more understanding of the study topic.

Conclusion:

This study concluded that there were highly statistical significant difference between total level of knowledge, total practices scores, P<0.001 before and after implementation of supportive guidelines and there was a positive correlation between participant's knowledge and practices in posttest with statistically significant differences where p_ value was .001. So, application of supportive guidelines was effective on improving knowledge and practices for nurses in infertility treatment centers about OHSS.

Recommendations:

- Provide a continuous planned educational courses for nurses in infertility treatment centers and clinics to update their knowledge continuously and improving their practices.
- Further studies are needed because there were a few previous studies that discussed the current research topic.
- Further researches are needed to evaluate women's awareness about OHSS.
- Provide counseling for infertile women receiving ovulation induction medication for early detection of OHSS.
- Routinely provide a brochure or a booklet that contain all information about OHSS for every women receiving ovulation induction medication in all infertility centers or clinics.

Limitation of study:

- There was a few previous studies that discussed the current research topic and the researcher could overcome this limitation through:
  - In the part of discussion the researcher provided their justification for some results.
  - The researcher recommended further studies about these concern.

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