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The effect of applying virtual reality on women's level of pain and anxiety during intra-uterine device insertion

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Abstract

Anxiety and pain are common symptoms during intra uterine device insertion, can be experienced by many women's and influences their experience of the procedure. Virtual reality is which very useful in medical field as a distraction technique for non-pharmacological pain relief, so virtual reality decrease pain and has been used to distract pain and decrease anxiety in medical field. The current study aimed to evaluate the effect of applying virtual reality on women's level of pain and anxiety during intra uterine device insertion. A quasi-experimental research design was used to achieve the aim of the study. The study was conducted at outpatient gynecological clinic at Souad Kafafi hospital at Misr university for science and technology, Egypt. A purposive sample of 80 women (40 study group-40 control group) selected according to inclusion criteria. Five tools were used; Tool (I): structured interviewing questionnaire, Tool (II): assessment of women knowledge regarding (intra uterine device- virtual reality), Tool (III): assessment of pain, Tool (IV): anxiety rating scale, Tool (V): women satisfaction for using virtual reality. The finding of this study showed that the majority of study group women increased Knowledge about IUD and VR post study. Level of pain and anxiety decreased in majority of study group women during application and experience satisfied regarding virtual reality that helped to decreased level of pain and anxiety during IUD insertion and prefer to use virtual reality to reduce pain and anxiety during medical procedures in the future. Significant statistical positive correlation between total level of satisfaction of study group and their total level of pain and anxiety during application of virtual reality. Application of virtual reality decreased women's level of pain and anxiety during intra uterine device insertion. Development of instructional guidelines about application of virtual reality on women's level of pain and anxiety during IUD procedure.

Keywords: Anxiety, Intra-uterine device (IUD), Pain, Virtual reality (VR).

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1. Introduction

Intra uterine device (IUD) is a small object that goes inside the uterus, are one of the most effective methods of contraception, with an efficacy greater than 99% per year. There are two main IUD types - hormonal IUDs and non-hormonal copper IUD (Cu-IUD), this is the terminology recommended by the World Health Organization [1]. Evidence is also that women's have anxiety about IUD insertion and that pre-procedure anxiety may influence perceptions of pain. Worry and apprehension can be experienced by many women before IUD insertion and this likely influences their experience of the procedure. There is some evidence that certain strategies, such as reassurance and distraction, may reduce anxiety related to IUD insertion [2]. Anxiety of IUD insertion pain, pre-procedure anxiety and negative perceptions of IUDs may lead women to anticipate or feel a higher level of pain. Women education to correct negative perceptions of IUDs and counseling to inform

women of the true benefits and risks of IUDs and lower pre-procedure anxiety are a suggested strategy to manage IUD insertion pain in parous women [3].

Virtual reality (VR) is defined as a computer-generated simulation, such as a set of images and sounds that represents a real place or situation, that can be interacted with, in a seemingly real or physical way by a person using special electronic equipment. It can transmit visual, auditory, and various sensations to users through a headset to make them feel as if they are in a virtual or imagined environment [4]. Virtual reality (VR), a relatively new intervention, has been studied as a distraction technique for non-pharmacological pain relief. The cost, quality and accessibility of virtual reality devices have significantly improved in recent years and offer novel application in the medical field. Virtual reality for managing pain has been studied in pediatrics, dentistry, burns treatment, chronic pain, labor, episiotomy and phobias [5]. Family planning nurses play a crucial and essential part in determining how much pain and anxiety a woman experiences during getting an IUD by recording and measuring degree of pain and worry and informing of the hospital's methods for pain treatment. Effective and skilled nurses must be informed about the physiology of women and the fetus, the benefits and drawbacks of family planning, the implications of therapy, and typically work to reduce pain-related anxiety and react immediately to reports of pain [6].

2. Significance of the study

Most emerging nations have significant challenges related to population increase. According to United Nations predictions the world's population will reach over 8 billion people by the year 2025, up from the 7.8 billion people that live there today (as of July 2019). The population of Egypt is expanding rapidly. According to information from the UN's 2018 World Population Prospects Report there are currently 97 million people living in Egypt. The population increased to 99.4 million in July 2019 [7]. Worldwide, 70 million unwanted pregnancies occur every year; with 20 million resulting in unsafe abortion which contributes to 13% of all maternal mortality. An estimated 358,000 maternal deaths occurred worldwide in 2019 with developing countries accounting for 95% of all the deaths, so family planning (FP) promotion, in settings with high birth rates, reduces poverty and hunger, and averts 32% of all maternal deaths and nearly 10% of childhood deaths [8-9]. Intrauterine device (IUD) usage has increased to an estimated 159 million worldwide users in 2019, constituting 8.4% of women of reproductive age. IUD insertion is experienced by 6 million women in the world every year. tenaculum can cause pain and discomfort by using to hold the cervix and straightening the uterus for the proper placement of the IUD [10]. Stress and anxiety cause muscle contraction and results in the increase of pain. This pain also increases the women's stress and anxiety, because patterns of an autonomic pain and anxiety are similar to each other [11]. Pain and anxiety caused from IUD insertion could make women unwilling to use this method and instead of using IUD might request early sterilization or use less effective and inappropriate methods that puts them at the risk of unwanted pregnancy. Virtual reality is one of the non-pharmacological methods of treatments in regard to pain and anxiety which is developing in most of the countries. Therefore, this study aims to evaluate the effect of applying virtual reality on women's level of pain and anxiety during intra uterine device insertion [12].

3. Aim of the Study

This study aimed to evaluate the effect of applying virtual reality on women's level of pain and anxiety during intra uterine device insertion. This aim will be achieved through the following objectives:

- Assess women knowledge regarding IUD.
- Assess women knowledge regarding virtual reality.
- Assess women's level of pain during intra uterine device insertion during application of virtual reality.
- Assess women's level of anxiety during intra uterine device insertion during application of virtual reality.
- Assess women's satisfaction for using virtual reality during intra uterine device insertion.
- Evaluate effect of applying virtual reality on women's level of pain and anxiety during intra uterine device insertion.

4. Research Hypothesis

The current study hypothesized that application of virtual reality will be decrease women's level of pain and anxiety during intra uterine device insertion.

5. Research design

Quasi-experimental research design was utilized to conduct this study. Quasi-experimental design aims to establish cause and effect relationship between independent and dependent variables. However, a quasi-experiment does not rely on random assignment. Instead, subjects are assigned to groups based on non-random criteria [13].

6. Setting*:*

This study was conducted at outpatient gynecological clinic at Souad Kafafi hospital at Misr University for Science and Technology (MUST). Outpatient gynecological clinic at Souad Kafafi hospital is located at 1st floor of hospital at 6october city, Consists of waiting area and one Room contains of (Doctor table , 2 chairs ,one obstetric examination bed, one bed, one monitor with sphygmomanometer and pulse oximeter , one height and weight scale ,one emergency carts, one Cardiotocography (CTG), one ultrasound scan, tray for intrauterine device (IUD) insertion and removal (for insertion tray contains :flashlight-tenaculum-sound-scissors-forceps-narrow forceps- Bowl with cotton balls),Tray for IUD removal contains(surgical hooker" IUD extraction"-IUD hooker-cytobrush-alligator forceps), Fetal aspiration device. A purposive sample for 80 women (40 study group-40 control group) for 3 months during the period of data collection from outpatient gynecological clinic at Souad Kafafi hospital at Misr university for science and technology (MUST).

7. Inclusion Criteria

- Women at reproductive age (18-35) years.
- Women who free from any medical disorder.

8. Exclusion criteria

- Women who have previous intra uterine device insertion.

- The women taking pharmacological methods (Local or general) to relieve pain during Intra uterine device insertion procedure.
- Women who have visual and hearing problems.

9. Sampling Technique

Women were collected from hospital registration book in outpatient gynecological clinic according to the inclusion criteria till reach the determined sample size. The study samples were taken in odd weeks and the control samples were taken in even weeks for a period of three months.

10. Tools for data collection

Five tools were used to collect data of this study as follow:

10.1. Tool (I): Structured interviewing questionnaire (Appendix I)

That tool adapted from**,** and modified by the researcher, and it was written in simple clear Arabic language [14]. It comprised of two parts:

10.1.1. Part I: Socio-demographic data

This part was used to assess Socio-demographic characteristic of the studied women such as: (age, level of education and occupation).

10.1.2. Part II: Past obstetric history

This part was used to asses past obstetric history of women such as; number of Gravida, parity, abortion, living children, mode of delivery and family planning history: such as (definition of family planning, used family planning before, type of family planning used, duration, complications of using a family planning, who advised to install IUD).

10.2. Tool (II): Assessment of women knowledge (Appendix II)

That tool it was adapted and modified by the researcher based on literature review of the current and past available national and international references related literature, and it was written in simple clear Arabic language. It comprised of two parts:

10.2.1. Part I: Assessment of women knowledge regarding IUD

That tool adapted from and it was modified by the researcher. This tool was prepared by the researcher used to assess the studied women's questionnaire contained nine items such as: Definition of intrauterine device (IUD), types, complication, advantage, disadvantage, duration of installed, when is the IUD installed, and who installed [15].

10.2.1.1. Scoring system

Concerning women's knowledge about IUD, the questionnaire contained eight knowledge items each was 2 points liker scale (1-2) as (1) for incorrect answer, (2) for correct answer. The women's knowledge about IUD was evaluated giving a score of 8-16. The total score of each woman was categorized into:

- "Poor knowledge" when achieved < 50%.
- "Fair knowledge" when achieved 50% - <75%.
- "Good knowledge "when achieved ≥75.

10.2.2. Part II: Assessment of women knowledge regarding Virtual reality

That tool adapted from, and modified by the researcher used to assess the studied women's questionnaire contained eight items such as:-(meaning of virtual reality, how does virtual reality to reduce pain and anxiety, uses of virtual reality at health field, advantages, disadvantages, mention examples of virtual reality, types of virtual reality, purpose of virtual reality) [16].

10.2.2.1. Scoring system

Concerning women's knowledge about VR, the questionnaire contained eight knowledge items each was 2 points liker scale (0-2) as (0) for don't know, (1) for correct incomplete answer, (2) for correct complete answer. The women's knowledge about virtual reality (VR) was evaluated giving a score of 8-16. The total score of each woman was categorized into:

- "Poor knowledge" when achieved < 50%.
- "Fair knowledge" when achieved 50% - <75%.
- "Good knowledge "when achieved ≥75.

10.3. Tool (III): Assessment of pain (Appendix III)

That tool adapted and modified by the researcher: It comprised of two parts:

10.3.1. Part I: Behavioral rating scale (qualitative pain assessment)

That adopted from [17], the behavioral pain assessment scale rated by each of the 5 measurement categories:

- **Face:** (Face muscles relaxed - Facial muscle tension, frown, grimace - Frequent to constant frown, clenched jaw).
- **Restlessness:** (Quiet, relaxed appearance, normal movement - Occasional restless movement shifting position - Frequent restless movement may include extremities or head).
- **Muscle tone:** (Normal muscle tone - Increased tone, flexion of fingers and toes - Rigid tone).
- **Vocalization:** (No abnormal sounds - Occasional moans, cries, whimpers and grunts - Frequent or continuous moans, cries, whimpers and grunts).
- **Consol ability:** (Content, relaxed - Reassured by touch distractible - Difficult to comfort by touch or talk).

10.3.1.1. Scoring system

Concerning behavioral pain assessment items (qualitative pain assessment), it was five items each one was three points liker scale (0-2) as (0) for tolerable pain sensation, (1) for moderate pain sensation, and (2) for sever intolerable pain sensation. The women behavior pain during using virtual reality (VR) in intra-uterine device (IUD) insertion was evaluated giving score of 0-10. The total score of each woman was categorized into:

- "Tolerable pain sensation" when achieved <50% of the total score (<5points of the total score).
- "Moderate pain sensation" when achieved 50% - 70% of the total score (5-7 points).
- "Sever intolerable pain sensation" when achieved ≥70% of total score (8-10 points).

10.3.2. Part II: Visual analogue scale sheet (quantitative pain assessment)

That adopted from [18]. This tool was used to assess pain during intra uterine device insertion procedure. It consists of 10-cm horizontal line. The right end is marked 0 indicates no pain at all. The left is marked 10 indicate sever intolerable pain.

10.3.2.1. Scoring system

Concerning Visual analogue scale sheet (quantitative pain assessment), it was 0-10 numerical rating scale with 0 on the right end denoted no pain,5 on the middle of the scale denoted moderate pain, and 10 on the left end denoted worst possible pain. The researcher used the faces rating scale (FRS)reported by Wong Baker face scale, to assess the pain category of each woman. The women were select the face with denotes her pain status, then the researcher decided which score the chosen face denoted. If women unable to select the face from pain the researcher select. Score of evaluated from 0 to 2 evaluated as tolerable pain. If score from 3 – 6 evaluated as moderate pain, and if score from 7 – 10 evaluated as the worst possible pain.

10.4. Tool (IV): Anxiety rating scale (Appendix IV)

This tool adapted from**,** and modified by the researcher. It was used to assess the anxiety level among women who do intra uterine device insertion procedure. It consists of 10 items (Feel nervous and anxious, mouth dry, difficulty breathing, shiver, increase heart rate, Excessive sweating, faint, hard to be calm, felt annoyed, afraid of inserting IUD) [19].

10.4.1. Scoring System

The item scoring ranged from 0 to 2. Score 0 for not at all, score 1 for little, and score 2 for much. The total score ranged from 10 (the lowest possible anxiety) and 20 (the highest possible anxiety) and was categorized as:

- "Mild anxiety" when she achieved < 50%.
- "Moderate anxiety" when she achieved 50%- < 75%.
- "High anxiety" when she achieved ≥ 75%.

10.5. Tool (V): Women satisfaction for using virtual reality (Appendix V)

This tool adapted from, and modified by the researcher based on literature review of the current and past available national and international references related literature, and it was written in simple clear Arabic language, used to assess women satisfaction for using virtual reality during IUD insertion procedure by using a journal, textbook, and internet search, approved by supervisors: which included (virtual reality help to reduce anxiety, virtual reality help to divert attention, virtual reality help to relax and rest during IUD insertion, satisfied with the virtual reality used to reduce pain , prefer to use virtual reality to reduce pain and anxiety in future) [16].

10.5.1. Scoring system

Regarding women's satisfaction about using VR during intra-uterine device (IUD) insertion, the women questionnaire contained, 5 satisfaction assessment items, each was three points liker scale (1-3) as (1) for dissatisfy, (2) for uncertainly, and (3) for satisfy. The women's satisfaction about (VR) during IUD insertion was evaluated giving a range of 5-15. The women's satisfaction about Virtual reality (VR) during IUD insertion was categorized into:

- "Dissatisfy" when achieved < 50% of total score (5-7 points).
- "Uncertainly" when achieved 50% to < 75% of the total score (8-11 points).
- "Satisfy" when achieved ≥ 75% of total score (12-15 points).

11. Validity

Content validity was conducted to determine whether the content of the tools cover the aim of study, it was measured by jury of 3 experts, two Assistant Professors of maternity and new-born health nursing and one assistant professor of community health nursing at Faculty of Nursing, Helwan University. The expertise reviewed the tool for clarity of sentences, relevance, accuracy, comprehensiveness, simplicity and applicability and minor modification were done such as: (clarity of sentences of the tool). Finally, the final forms were developed.

12. Reliability

Reliability of tools was applied by investigator for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar condition on one or more occasion. Cronbach's alpha was 0.85 for structured interviewing questionnaire, 0.86 for total knowledge regarding IUD-VR, 0.84 for assessment of pain, 0.85 for anxiety rating scale, 0.90 for women satisfaction for using virtual reality, which is accepted and indicates good internal consistency.

13. Ethical considerations

An official permission to conduct the proposed study was obtained from the scientific research ethics committee at faculty of nursing Helwan University. Participation in the study was voluntary and subjects were given complete full information about the study and their role before signing the informed consent (written consent). The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information, where they weren't be accessed by any other party. Ethics, values, culture and beliefs were respected.

14. Pilot study

A pilot study was conducted to test feasibility and applicability of the study tools. It was carried out on 10% of total study subjects (8). There were no modifications of tools and the women's included in the pilot study were included in the main study group.

15. Fieldwork

- An official approved was obtained from the dean of the faculty of Nursing Helwan University and directors of Souad Kafafi Hospital (Misr University for science and technology (MUST) university hospital)., to carry out this study, explaining the purpose of the study and requesting the permission for data collection.

- Data collection was started and completed within Three months, from beginning of June 2023 to the end of August 2023. After obtaining all official permissions.
- The Researcher visited the study setting Two days weekly from 10 am- 3pm and met the nurse supervisor of setting and women's, introduced herself, the aim of the study was explained and gave them a complete background about the study and sheet format which used to collect the required data.
- After the approval to conduct the study was achieved, the nurses help the researcher to interview the women who attended outpatient gynecology clinic.
- All ethical considerations were respected. The gathered date helped the researcher to assess their general condition and provide appropriate intervention accordingly.

Firstly, regarding women the data collection was carried out 4 steps as the following: (Preparatory-assessment-implementation-evaluation phase):

15.1. Preparatory Phase: (Study group)

- Explained the use of glass of virtual reality for all studied women individually.
- The goal of the research was explained to the women, and the application of the virtual reality was rejected by some of the women, but they were persuaded by the researcher by explaining the application, and that it is harmless and will satisfy the woman and reduce her pain rate without side effects such as other medication, and the application was persuaded and applied.
- Then studied women were offered to choose from different videos. This video was designed by two applications includes: VR movies collection VR player was downloaded from play store, it designed by the researcher.
- The applied VR contained imagery of a blossoming tree, Ocean waves accompanied by meditative auditory guidance specific for divert attention and relation as: soft music, birdsong, and waterfall sounds.

15.2. Assessment (Control and study group)

- Structured interview questionnaire was done to assess the women's Socio-demographic characteristics, women's past obstetric history and Family planning history. The researcher gathered group of 2-3 women in waiting area Women were collected from hospital registration book in outpatient gynecological clinic according to the inclusion criteria and take questionnaire about 10 minutes. Questionnaire answers were taken from women who cannot read or write, and they were recorded in the questionnaire form by the researcher.
- Then the researcher assessed women knowledge regarding (IUD, virtual reality) in group of women and this assessment take about 10 minutes.
- After assessed women knowledge regarding (IUD , virtual reality) distribute booklet to women of study group contain information about virtual reality and family planning this booklet developed by the researcher and give the women in control group brochure contain information about proper nutrition for women in childbearing age, instruction to protect from osteoporosis and appropriate nutrition before, during and after menstrual period to gain trust and create an atmosphere of cooperation for benefit of women.
- After that had assess the level of pain and anxiety level for each woman individually before and during procedure of intra uterine device insertion by 2 tools (Visual analogue scale (quantitative pain assessment) - Behavioural rating scale (Qualitative pain assessment) among the women who insert (IUD) and anxiety rating scale. Fulfilling that consumed around 5-10 minutes for each woman.

15.3. Implementation phase (study group)

- Firstly, the study samples were taken in odd weeks from period of study.
- Applied glass of virtual reality for studied women individually (study group) during IUD insertion, this application takes about 5-10minutes.
- Before applied VR videos were prepared (videos create virtual environment to divert attention and relaxation in the phone, then apply the phone in the VR glass.
- Notified the women that the researcher at the bedside for any needs or help.
- Then assess pain and anxiety level during IUD insertion by pain and anxiety assessment tools.
- After that stop the applied VR If women felt with any discomfort.
- Finally disinfected the VR glass from women to another by alcohol to prevent infection.

15.4. Control group

The control samples were taken in even weeks for a period of study. Undergoing the routine care (according to policy of study setting) during IUD insertion to assess pain and anxiety level during insertion based on the previous assessment, and assess women knowledge regarding (IUD, virtual reality) again for control group immediately after distribute brochure that contain information about proper nutrition for women in childbearing age, instruction to protect from osteoporosis and appropriate nutrition before, during and after menstrual period.

15.5. Evaluation

- Evaluate knowledge of virtual reality and IUD from study group immediately after give booklet and illustrate information contains in this booklet that to women by the same knowledge tool that used before application.
- Finally, immediately after applied virtual reality had assessed studied women's satisfactions through tool of women's satisfactions.

16. Statistical item

The data were collected and coded, then the collected data were organized, analyzed using appropriate statistical significance tests using the computer Statistical Package for Social Science (SPSS), version 24. Data were presented using descriptive statistics in the form of frequencies and percentages. Degrees of significance of results were considered as follow: P value > 0.05 was considered non-significant (NS), P value ≤ 0.05 was considered significant (S) [20]**.** Standard deviation (SD) & arithmetic mean ($\overline{X}$) for quantitative data: age, frequency and percentage for qualitative data: gender, chi-square test used to compare between two or more groups, Mann Whitney Test(U) for behavioral pain rating scale, spearman Correlation Coefficient= R.

17. Results

Table 1 shows that more than two thirds (67.5%) and about two thirds (60.0%) of study and control group were in age group 26-35years with mean age 28.70+4.61and 26.85+3.61 respectively. In relation to educational level, more than half (57.5%) and the majority (75.0%) of study and control group had university education. Regarding to occupation, about two thirds (65.0%) and the majority (75.0%) of study and control group were employee. There was no statistically significant difference between both groups regarding all items of demographic data. Table 2 shows that more than two thirds (67.5% and 72.5%) of study and control group respectively had correct knowledge regarding meaning of IUD. Also, the most (95.0% and 92.5%) of study and control group respectively had correct knowledge regarding advantage of IUD. Additionally, the majority (82.5% and 77.5%) of study and control group respectively had correct knowledge regarding disadvantage of IUD. About two thirds (65.0% and 60.0%) of study and control group respectively had correct knowledge regarding when the IUD is installed. Also, all (100.0%) of study and control group had correct knowledge regarding who installed the IUD. On the other hand, about two thirds (65.0% and 60.0%) of study and control group respectively had incorrect knowledge regarding types of IUD. Also, the majority (77.5%) and more than half (57.5%) of study and control group respectively. Additionally, had incorrect knowledge regarding complication of IUD. more than half (55.0% and 57.5%) of study and control group respectively had incorrect knowledge regarding duration of IUD. Additionally**,** there were no significant statistical differences between study and control groups regarding all items of knowledge about IUD pre application at p-value >0.05. There was a significant statistical difference between study and control groups regarding all items of knowledge about IUD post application at p-value <0.05. Table 3 shows that more than half (57.5%) of study and control group had incorrect knowledge regarding meaning of virtual reality. Also, about two thirds (62.5%) and more than two thirds (72.5%) of study and control group respectively had incorrect knowledge regarding how does virtual reality to reduce pain and anxiety. The majority (77.5% and 85.0%) of study and control group respectively had incorrect knowledge regarding uses of virtual reality at health field. Additionally, more than two thirds (67.5%) and about two thirds (62.5%) of study and control group respectively had incorrect knowledge regarding advantages of virtual reality. the majority (77.5% and 87.5%) of study and control group respectively had incorrect knowledge regarding disadvantages of virtual reality. The most (90.0% and 95.0%) of study and control group respectively had incorrect knowledge regarding types of virtual reality. Moreover, there were no significant statistical differences between study and control groups regarding all items of knowledge related to virtual reality at p-value >0.05. There was a significant statistical difference between study and control groups regarding all items of knowledge related to virtual reality at p-value <0.05. Table 4 shows that there was no significant statistical relation between study and control group pre application of virtual reality (VR) regarding all items of behavioral pain rating scale at p-value=>0.05. While, there was a significant statistical difference between study and control group during application regarding all items of behavioral pain scale at p-value = 0.000. Figure 1 illustrates that there was no significant statistical difference between study and control group pre application at p-value=0.356. There was a significant statistical difference between study and control group during application regarding knowledge at p-value=0.000. Figure 2 illustrates that there was no significant statistical difference between study and control group pre application at p-value=0.467. While, there was a significant statistical difference between study and control group during application at p-value=0.006. Figure 3 illustrate that there was no significant statistical difference between study and control group pre application at p-value=0.891. There was a significant statistical difference between study and control group during application at p-value=0.000. Figure 4 illustrate that more than two thirds (67.5%) of the study group was satisfied regarding virtual reality and less than one quarter (22.5%) of them were uncertainly while minority (10.0%) of them were dissatisfied.

18. Discussions

One of the most widely used forms of long-term contraception is the intrauterine device (IUD). A lot of women choose not to have an IUD because the insertion process involves several instruments such a speculum insertion, cervix manipulation, tissue forceps (vollesellum), can be uncomfortable. There are currently no drugs that effectively lessen women's pain during the insertion of an IUD in outpatient clinic setting. Because of this, virtual reality can be utilized as a distraction technique for pain alleviation. Known as a non-pharmacological pain management tool that provides an immersive and captivating experience while acting as a diversion strategy [21]**.**

18.1. Regarding socio-demographic characteristics of the studied women

The present study findings showed that, more than two thirds and about two thirds of the study and control group were in age group 26-35 years with mean age 28.70+4.61and 26.85+3.61 respectively. These findings agreed with the study performed by Ibrahim et al., (2022), who studied "Effect of educational program on knowledge and attitude of childbearing women about intrauterine cupper device as emergency contraceptive method, in Egypt" found that; about two thirds of the participants have age from 20-30 years with a mean age of 28.19±5.9 [22]. Also, these findings supported with the study performed by Braga & Paiva (2023), who

studied "Satisfaction of users of copper intrauterine device: Analysis of patients at the family planning outpatient of a public hospital, in Brazil" found that; more than half of the studied women were aged 25-34 years [23].

18.2. Concerning educational level

More than half and the majority of study and control group had university education respectively. These findings were in the same line with the study performed by Safty et al., (2022), who studied "Efficacy of immediate insertion of an intrauterine contraceptive device during cesarean section in comparison with late insertion after the puerperium, in Egypt" found that; more than half of the study and control group had university education respectively. However, these findings came inconsistent with the study performed by Maged et al., (2021), who studied "The value of virtual reality during IUD insertion in women with RVF uterus, in Egypt" found that; the majority and the most of the study and control group had intermediate education [24-25].

18.3. According to occupation

About two thirds and the majority of the study and control group were employee respectively. The findings agreed with the study performed by Hashem et al., (2022), who studied "Comparative efficacy of lidocaine–prilocaine cream and vaginal misoprostol in reducing pain during levonorgestrel intrauterine device insertion in women delivered only by cesarean delivery, in Egypt" found that; more than half of the study and control group respectively were employed. However, these findings came inconsistent with the study performed by Sahu et al., (2023), who studied "Awareness and reason for refusal of post placental intrauterine device in a tertiary centre of Madhya Pradesh: A cross sectional study, in India" found that; the majority of the participant women hadn't worked [26-27].

18.4. Regarding the women knowledge about IUD pre application

The present study findings showed that; there were no significant statistical differences between study and control groups regarding all items of knowledge about IUD pre application at p-value > 0.05. These findings were in the same line with the study performed by Woldeyohannes et al., (2022), who studied "Reasons for low utilization of intrauterine device utilization amongst short term contraceptive users in Hossana town, in Southern Ethiopia" found that; there were no significant statistical relation between the two studied groups regarding all items of knowledge about IUD pre application. Thus, an objective was achieved assess women knowledge regarding IUD [28].

18.5. As regard to the women knowledge about IUD pre application

The present study findings showed that; more than two thirds of study and control group respectively had correct knowledge regarding meaning of IUD. These findings were in the same line with the study performed by Mvandal et al., (2020), who studied "Knowledge and attitude concerning use of intrauterine contraceptive device among women attending family planning in Njombe-Tanzania" found that; the majority of the women had sufficient knowledge regarding meaning of IUD [29]. Also, these findings agreed with the study performed by Marimirofa et al., (2023), who studied "Barriers and facilitators influencing utilization of intrauterine contraceptive device (IUCD) in Zimbabwe" found that; the most of the studied women had excellent knowledge regarding meaning of IUD [30]. This might be due to women's social communication about IUDs. Also, the present study findings showed that; majority and more than half of the study and control group respectively had incorrect knowledge regarding complication of IUD. These findings came inconsistent with the study performed by Sumini & Farida, (2020), who studied "The relationship between mother's knowledge and participation in the use of intrauterine device contraception at Jombang Health Center, in Indonesia" found that; majority of the studied women had sufficient knowledge regarding complication of IUD [31]. This might be due to lack of awareness and lack of the health education program provided to the studied women. The present study findings showed that; more than half of the study and control group respectively had incorrect knowledge regarding duration of IUD. These findings were in the same line with the study performed by Safriana et al., (2020), who studied "Determinant factors affecting influencing eligible women with the selection of contraceptive intrauterine devices, in Indonesia" found that; most and more than two thirds of the study and control groups respectively had not good knowledge regarding duration of IUD [32]. Concerning the women knowledge about IUD post application, the present study findings showed that; there were a significant statistical difference between study and control groups regarding all items of knowledge about IUD post application at p-value <0.05. These findings agreed with the study performed by Zhao et al., (2023), who studied "The effect of the combined use of an intrauterine device and a Foley balloon in the prevention of adhesion following hysteroscopic adhesiolysis, in China" found that; there were a significant statistical relation between study and control groups regarding all items of knowledge about IUD post application [33].

18.6. Regarding the studied women knowledge about virtual reality pre application

The present study findings showed that; more than half of study and control group had incorrect knowledge regarding meaning of virtual reality. These findings came inconsistent with the study performed by Felemban et al., (2021), who studied "Effect of virtual reality distraction on pain and anxiety during infiltration anesthesia in patients: a randomized clinical trial, in Saudi Arabia" found that; more than two thirds of the studied women had good knowledge regarding meaning of virtual reality [34]. This might be due to the women did not hear about virtual reality technology and its importance in obstetric procedures. Thus, an objective was achieved assess women knowledge regarding VR. Furthermore, the present study findings showed that; the majority of the study and control group respectively had incorrect knowledge regarding uses of virtual reality at health field. These findings were in the same line with the study performed by Mulyani et al., (2023), who studied "The effect of virtual reality media-based health education on healthy lifestyle knowledge, attitude, and healthy lifestyle behaviors among pregnant women, in Indonesia" found that; more than two thirds of the studied women had insufficient knowledge regarding uses of virtual reality at health field [35].

Table 1: Distribution of the studied women according to their demographic characteristics (n=80).

Demographic Data	Study group (n=40)		Control group (n=40)		X2	P-value
	No	%	No	%		
Age (in years)						
18-20	3	7.5	3	7.5	0.568	0.753
21-25	10	25.0	13	32.5		
26-35	27	**67.5**	24	**60.0**		
Mean +SD	**28.70+4.61**		**26.85+3.61**		t=1.996	0.070
Level of Education						
Can't read and write	3	7.5	1	2.5	3.017	0.389
Basic education	6	15.0	4	10.0		
high school education	8	20.0	5	12.5		
University education	28	**57.5**	30	**75.0**		
Occupation						
Working	26	**65.0**	30	**75.0**	0.952	0.465
House wife	14	35.0	10	25.0		

X^2=chi-square test /t= Student T Test * P-value ≤ 0.05 Significant (S). P-value > 0.05= Non-Significant (NS).

Table 2: Distribution of the studied women according to their knowledge about IUD (n=80).

Knowledge about IUD	Pre application										Post application									
	Study group (n=40)				Control group (n=40)				TEST (X^2)	P-value	Study group (n=40)				Control group (n=40)				TEST (X^2)	P-value
	Correct		Incorrect		Correct		Incorrect				Correct		Incorrect		Correct		Incorrect			
	N	%	N	%	N	%	N	%			N	%	N	%	N	%	N	%		
Meaning of IUD	27	**67.5**	13	32.5	29	**72.5**	11	27.5	0.238	0.626	38	**95.0**	2	5.0	32	**80.0**	8	20.0	4.114	0.043*
Types of IUD	14	35.0	26	**65.0**	16	40.0	24	**60.0**	0.287	0.674	38	95.0	2	**5.0**	20	50.0	20	**50.0**	6.275	0.012*
Complication of IUD	9	22.5	31	**77.5**	17	42.5	23	**57.5**	3.647	0.056	37	92.5	2	**5.0**	23	57.5	17	**42.5**	6.275	0.002*
Advantage of IUD	38	**95.0**	2	5.0	37	**92.5**	3	7.5	0.213	0.644	40	**100.0**	0	0.0	30	75.0	10	25.0	1.013	0.034*
Disadvantage of IUD	33	**82.5**	7	17.5	31	**77.5**	9	22.5	0.313	0.576	40	**100.0**	0	0.0	35	**87.5**	5	12.5	5.333	0.021*
Duration of IUD	18	45.0	22	**55.0**	17	42.5	23	**57.5**	1.251	0.263	37	92.5	3	**7.5**	26	65.0	14	**35.0**	9.038	0.003*
When is the IUD installed	26	**65.0**	14	35.0	24	**60.0**	16	40.0	0.213	0.644	37	**92.5**	3	7.5	27	**67.5**	13	32.5	7.813	0.005*

X^2=chi-square test * P-value ≤ 0.05 Significant (S). P-value > 0.05= Non-Significant (NS).

Table 3: Distribution of the studied women according to their knowledge about Virtual reality (n=80).

Knowledge about virtual reality	Pre-Application						Post Application					
	Study group (n=40)		Control group (n=40)		X2	P-value	Study group (n=40)		Control group (n=40)		X2	P-value
	No	%	No	%			No	%	No	%		
Defination of virtual reality												
Don't know	23	**57.5**	23	**57.5**	0.366	0.833	10	**25.0**	18	**45.0**	2.170	**0.038***
Correct incomplete	15	35.0	16	40.0			15	37.5	15	37.5		
Correct complete	2	5.0	1	2.5			15	37.5	7	17.5		
Virtual reality to reduce pain and anxiety												
Don't know	25	**62.5**	29	**72.5**	0.963	0.618	7	**17.5**	24	**60.0**	5.298	**0.001***
Correct incomplete	14	35.0	10	25.0			14	35.0	11	27.5		
Correct complete	1	2.5	1	2.5			19	47.5	5	12.5		
Uses of virtual reality at health field												
Don't know	31	**77.5**	34	**85.0**	0.813	0.660	3	**7.5**	19	**47.5**	6.025	**0.000***
Correct incomplete	8	20.0	5	12.5			13	32.5	17	42.5		
Correct complete	1	2.5	1	2.5			24	60.0	4	10.0		
Advantages of virtual reality												
Don't know	27	**67.5**	29	**72.5**	0.253	0.881	3	**7.5**	21	**52.5**	11.753	**0.003***
Correct incomplete	12	30.0	10	25.0			21	52.5	12	30.0		
Correct complete	1	2.5	1	2.5			16	40.0	7	17.5		
Disadvantages of virtual reality												
Don't know	31	**77.5**	35	**87.5**	1.394	0.498	4	10.0	24	**60.0**	2.036	**0.000***
Correct incomplete	7	17.5	4	10.0			15	37.5	13	32.5		
Correct complete	2	5.0	1	2.5			21	52.5	3	7.5		
Examples of virtual reality												
Don't know	35	87.5	36	90.0	1.014	0.602	4	10.0	27	67.5	2.672	**0.000***
Correct incomplete	4	10.0	4	10.0			11	27.5	6	15.0		
Correct complete	1	2.5	0	0.0			25	62.5	7	17.5		
Types of virtual reality												
Don't know	36	**90.0**	38	**95.0**	2.854	0.240	6	**15.0**	28	**70.0**	4.145	**0.000***
Correct incomplete	4	10.0	1	2.5			14	35.0	11	27.5		
Correct complete	0	0.0	1	2.5			20	50.0	1	2.5		
Purpose of virtual reality												
Don't know	23	57.5	26	65.0	3.184	0.204	9	22.5	22	55.0	4.278	**0.001***
Correct incomplete	14	35.0	14	35.0			16	40.0	18	45.0		
Correct complete	3	7.5	0	0.0			15	37.5	0	0.0		

X^2=Chi-Square Test * P-value ≤ 0.05 Significant (S). P-value > 0.05= Non-Significant (NS).

Table 4: Mean rank of behavioral rating scale and numerical pain scale of the studied women pre and during application (n=80).

Behavioral pain rating scale	Pre application of VR		U Test	P-value	During application of VR		U Test	P-value
	Study group	Control group			Study group	Control group		
	Mean Rank	Mean Rank			Mean Rank	Mean Rank		
Face	48.28	32.37	3.860	0.097	29.79	51.21	5.079	**0.000***
Restlessness	40.95	40.05	0.233	0.816	31.10	49.90	4.230	**0.000***
Muscle tone	40.50	40.50	000	1.000	33.38	47.63	3.514	**0.000***
Vocalization	34.43	46.58	2.897	0.003	21.53	59.48	7.921	**0.000***
Consolability	37.43	43.66	1.711	0.087	31.30	49.70	4.596	**0.000***
Total BRS	40.26	40.74	0.094	0.925	21.34	59.66	7.456	**0.000***
Total NRS	37.50	43.50	1.195	0.232	21.63	59.38	7.374	**0.000***

U=Mann Whitney Test * P-value ≤ 0.05 Significant (S). P-value > 0.05= Non-Significant (NS).

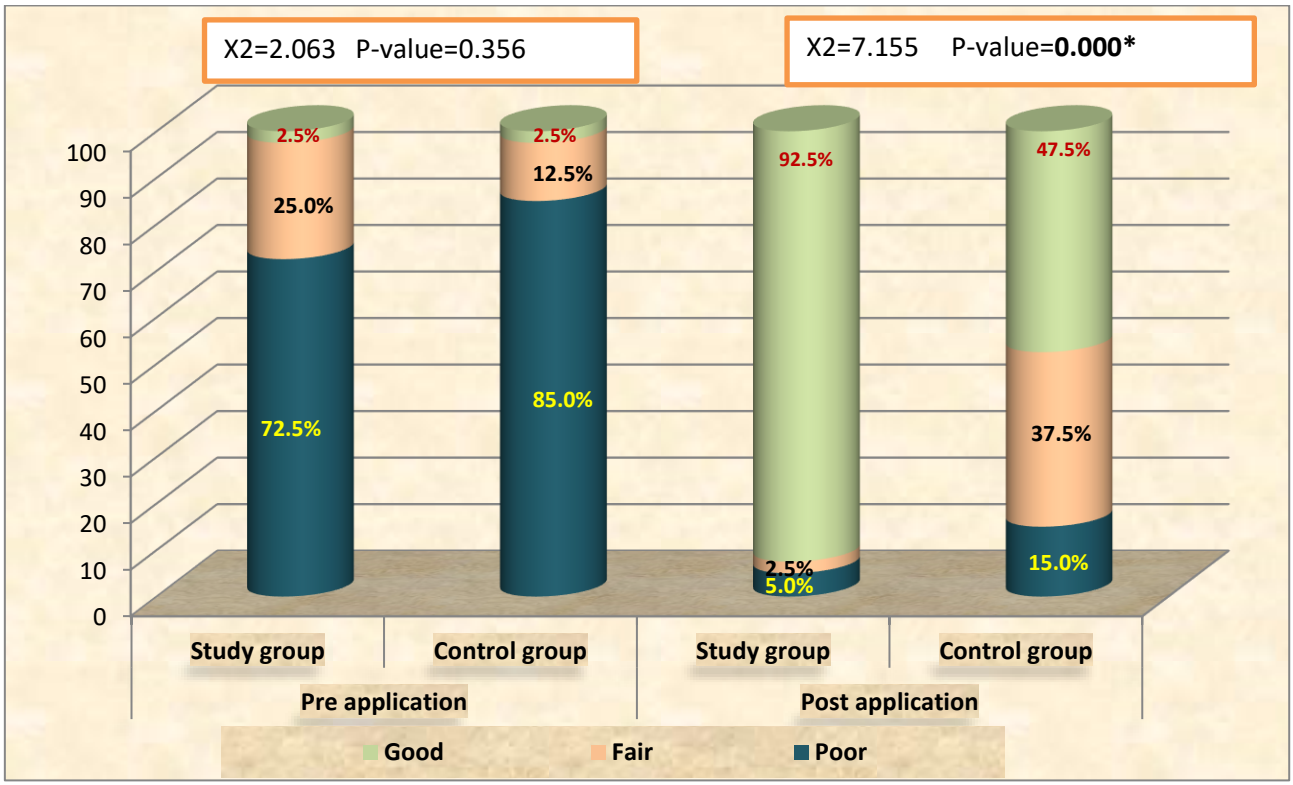
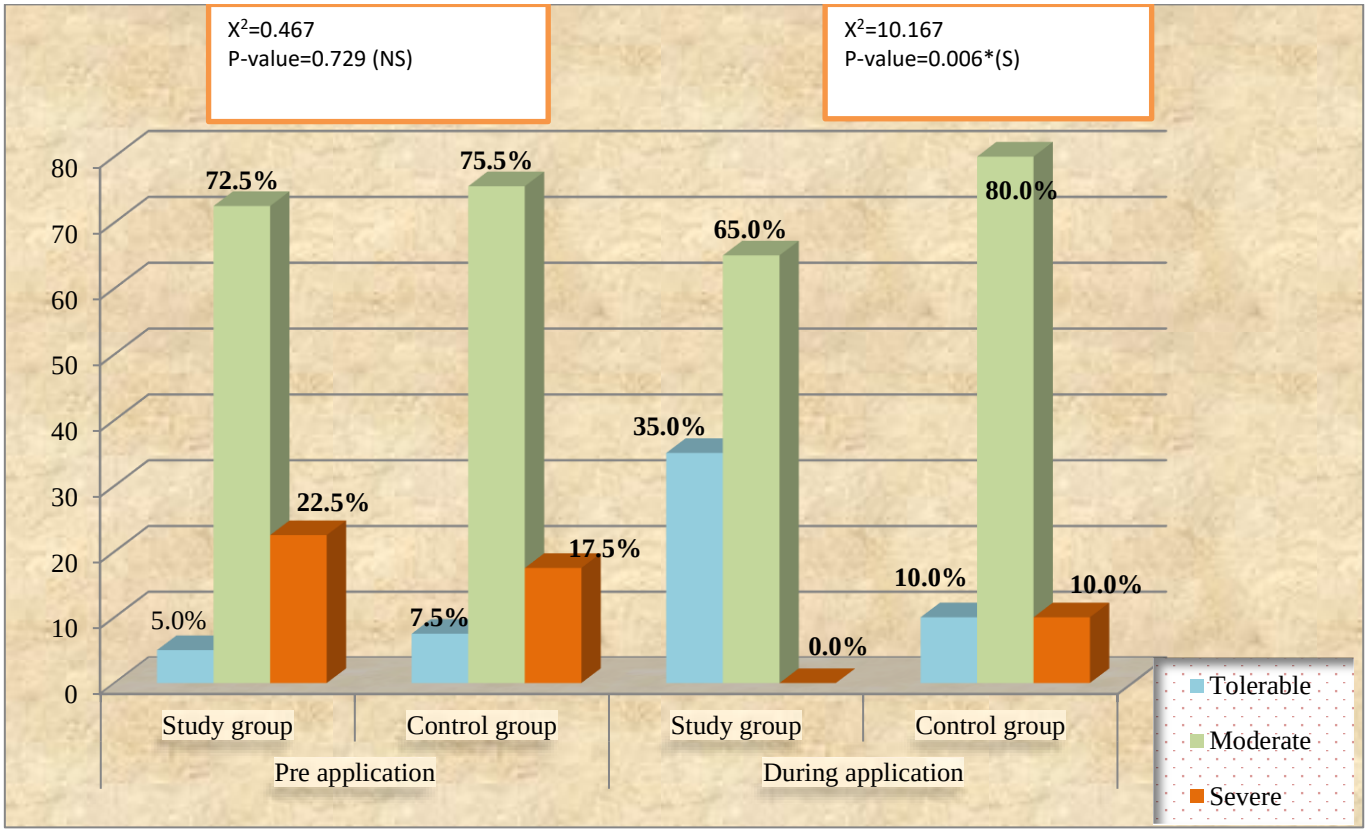
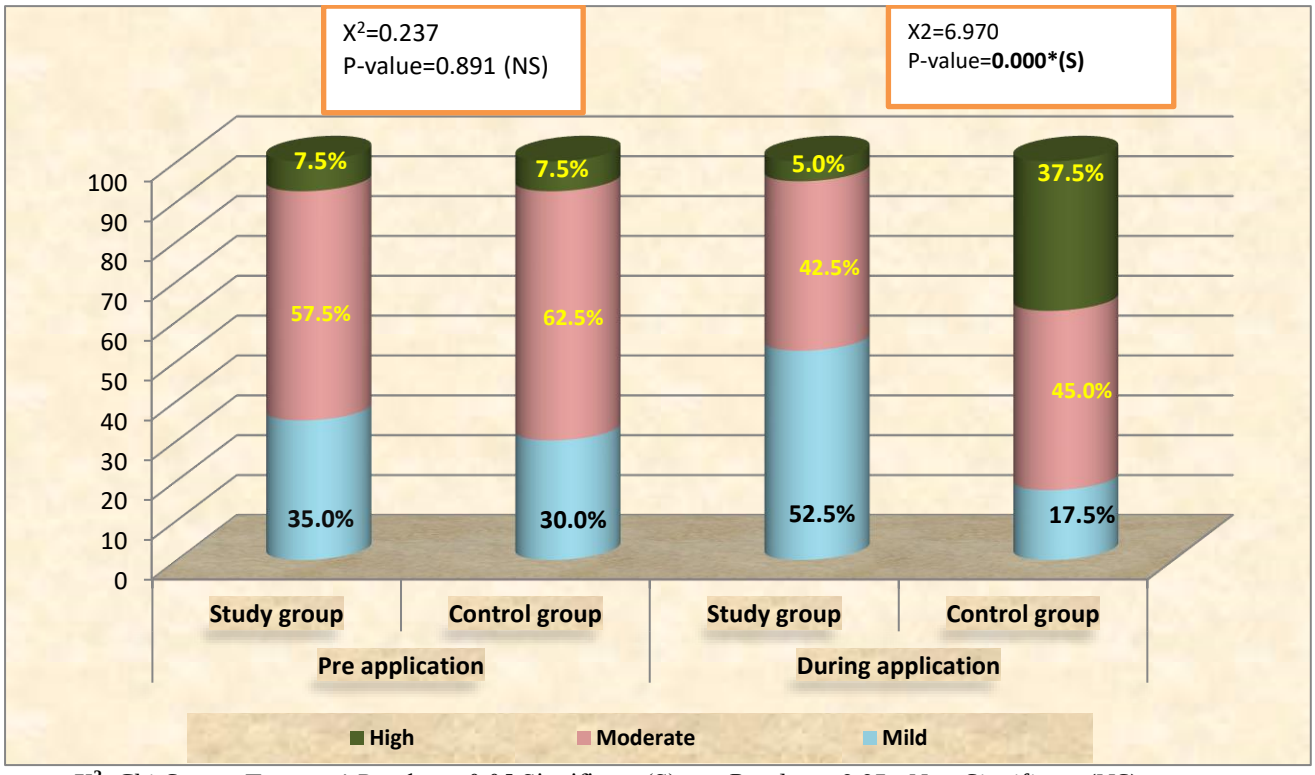


Figure 1: Distribution of both groups regarding their total level of knowledge about IUD and virtual reality pre and post application (n=80).



X^2=Chi-Square Test * P-value ≤ 0.05 Significant (S) P-value > 0.05= Non-Significant (NS)

Figure 2: Distribution of both groups regarding their total level of numerical pain pre and during application (n=80).



X^2=Chi-Square Test * P-value ≤ 0.05 Significant (S) P-value > 0.05= Non-Significant (NS)

Figure 3: Distribution of both groups regarding their total levels of anxiety pre and during application (n=80).

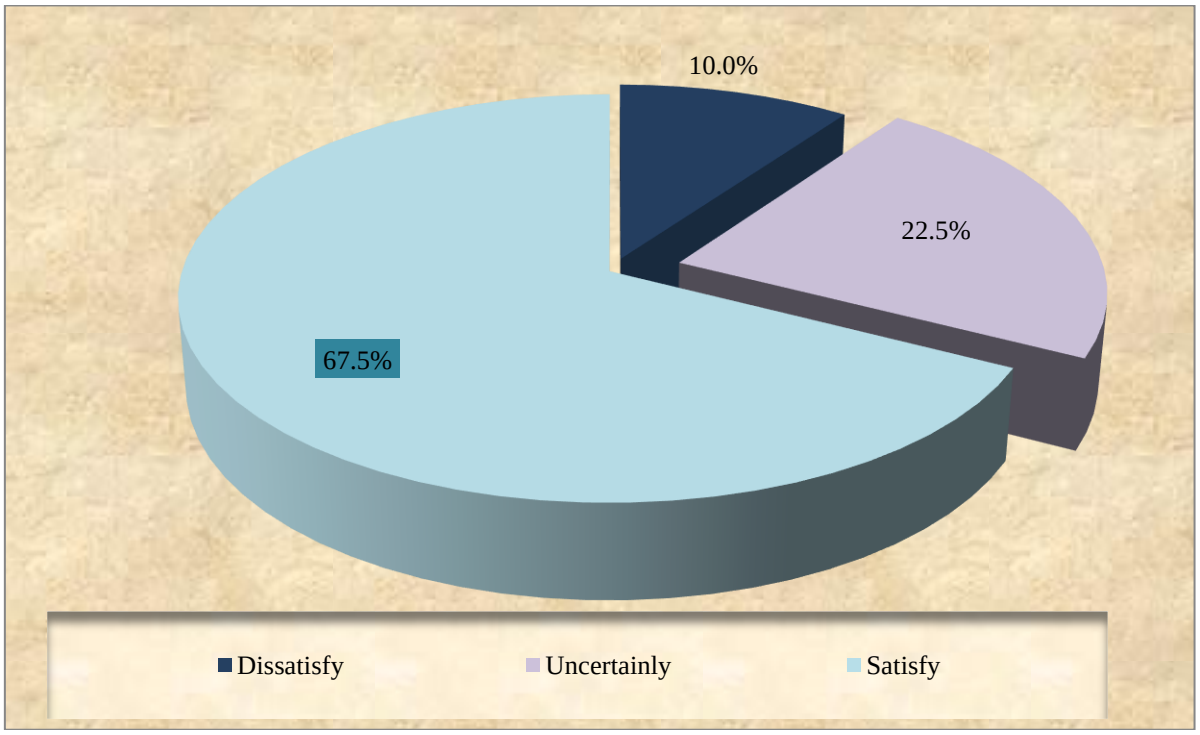


Figure 4: Distribution of studied women in study group according to their total level of satisfaction about virtual reality (n=40).

19. Conclusions

On the light on the finding of the current study, it can be concluded that the current study to support the research hypothesis that application of virtual reality positive effect to decrease women level of pain and anxiety during intra uterine device insertion. Significant statistical positive correlation between total level of satisfaction of study group and their total level of pain and anxiety during application of VR.

Recommendations

Based on the results of the present study the following recommendations are suggested:

- Development of instructional guidelines about application of virtual reality on women's level of pain and anxiety during IUD procedure.
- Replication of the study on large sample to be able to generalize the study results.

Further recommendation

Development of education program for using VR in medical field to nurses.

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