# Nurses' Anxiety level toward Partnering with Artificial Intelligence in Providing Nursing Care: Pre&Post Training Session

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## Abstract

**Context:** Artificial intelligence is evolving and will transform health care. Given the potency of this technology for patient care and its effect on health care providers, it is fundamental for nurses to have an essential comprehension of artificial intelligence concepts. **Aim:** To evaluate the nurses' anxiety level toward partnering with artificial intelligence in providing nursing care, pre&post training session. **Methods:** Quasi-experimental (pretest-posttest) research design was utilized to conduct the study at the Specialized Medical Hospital in different units (Cardiac, Diabetic, and Hepatic) and critical Care Units (CCUs) (Neurological, Convalescence, and Anesthetic ICUs) of Mansoura University Hospital. All available nurses (n=150) who working in the previously mentioned settings, were invited to participate in the study. Two tools were used for data collection; Nurses' demographic characteristics data and the artificial intelligence anxiety scale. **Results:** 28.5% of the studied nurses in medical units had a severe anxiety level, and 43.7% of the nurses in critical units had a moderate anxiety level pre-implementation of training session's activities related to artificial intelligence, compared to 50.8% and 37.9% of the nurses in medical and critical units, respectively who had minimal anxiety levels post-implementation of training session's activities related to artificial intelligence. **Conclusion:** there was a statistically significant difference between the studied nurses in medical units pre and post-implementation of training session's activities related to (AI) (P= 0.044*). Also, a high statistically significant difference between the nurses in critical units pre and post-implementation of training session's activities related to (AI) (P= 0.000**). The study recommended providing a continuous training sessions for nursing staff toward dealing with artificial intelligence technology that can improve quality of care, enhance patients' outcomes, and reduce their level of anxiety.

**Keywords:** Artificial intelligence, Anxiety, Nurses, Nursing care

## Introduction

Artificial intelligence (AI) was conceptualized in 1955 when a group of researchers attempted to see whether computers could use language, problem-solving and improving their own performance (**McCarthy, Minsky, Rochester, & Shannon, 2006)**. As AI continued to be developed and improved over the past 70 years, numerous terms have been authored to depict unique capacities and their overall conceptualization. Machine learning is a computer system that upgrades its own execution dependent on gathered information **(Price, 2018; Zappone, Renzo, & Debbah, 2019)**. Profound learning alludes to a computer system that improves its own performance with the guide of profound neural networks. Deep learning is the awe-inspiring phenomenon behind the most current and outstanding AI systems **(Zappone, *et al*, 2019**).

Artificial intelligence (AI) is defined as the theory and development of computer systems able to complete tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation **(Pan, 2016)**. The artificial intelligence (AI) is the science of using computers to imitate human capacities: discourse, sensory abilities, movement, thus significantly more. Machine learning is a subset of AI; the computer uses a tremendous planning set of data to look for associations and later applies the associations to a new set of data to make anticipated outcomes **(Nevala, 2017)**.

In healthcare, **Galimova, Buzaev, Ramilevich, Yuldybaev, and Shaykhulova (2019)** revealed that the guarantee of AI incorporates the disclosure of disease etiologies; the capacity to select a treatment choice for patients dependent on anticipated

outcomes; and computation of sickness hazard dependent on hereditary, ecological, and social elements. Much like AI, the nursing profession has gotten progressively immersed with advanced technology. However, the nursing profession was initially framed utilizing fundamental scientific standards of the nineteenth century, and nurses were full-time hands-on caregivers **(Buhler-Wilkerson & D'Antonio, 2019)**.

Over the years, nursing care has changed with the inundation of technology. Several technology forms, for example, electronic records, remote vital signs monitoring, and Pyxis machines, have increasingly taken nurses away from the beside. Technology has upgraded nursing from various perspectives and expanded patient safety but at the cost of decreasing nurse-patient interaction, which is vital to progressing physical and psychosocial assessment that empowers holistic healing **(Nevala, 2017)**.

## Significance of the study

Artificial intelligence is a popular topic of discussion, and it is hard to find a conference, committee, article, or report that does not mention it. Because of the challenges associated with AI, nurses need to understand the data produced from nursing care and become involved in the governance of big data. Should nurses fear the robots get up in health care, powered by different types of AI, or should they welcome AI technology to harness and utilize it to improve nursing practice? This article aims to evaluate the nurses' anxiety level toward partnering with AI in providing nursing care, pre&post training session.

## Aim of the study:

This study aims to evaluate the nurses' anxiety level toward partnering with artificial intelligence (AI) in providing nursing care, pre&post training session implementation.

## Subjects and Method

### Research hypothesis

The nurses' anxiety level toward partnering with artificial intelligence in providing nursing care will be reduced post training session implementation on an AI in different health care settings than pre its implementation.

**Study design**: Quasi-experimental study (pretest-posttest research) design was utilized to conduct the study.

**Study Setting:** The study was conducted at the Specialized Medical Hospital in different units (Cardiac, Diabetic, and Hepatic) and Critical Care Units (CCUs) (Neurological, Convalescence, and Anesthetic ICUs) of Mansoura University Hospital.

**Study period:** The study was led between September 2020 and February

**Study Sample**: a convenient sample of all available nurses (n=150) working at the Specialized Medical Hospital (Cardiac, Diabetic, and Hepatic) (total number n= 63) and Critical Care Units (CCUs) (Neurological, Convalescence, and Anesthetic ICUs) of Mansoura University Hospital (total number = 87) and willing to participate in the study were invited to engage.

**Tools of the study:** Two tools were used for data collection:

**Tool I.** **Nurses' demographic characteristics data** regarding their age, gender, hospital, nursing qualification, work position, department of work, working experience & training attendance related to AI.

**Tool II.** **The artificial intelligence anxiety scale** (AIAS) was adapted from **Wang & Wang (2019)**. It consisted of 52 items to evaluate nurses' anxiety toward partnering with artificial intelligence in providing nursing care through a five-point Likert Scale ranging from not present (0) to very severe (4). The main issues covering the items of the tool were about anxiety of nurses regarding development of AI technique & products, using, dealing and interacting with AI technique & products, fear of dependence and replace human…etc. Pretest before providing any intervention and post-test after providing training session about artificial intelligence (AI). The tool is modified and translated into Arabic to be suitable for nurses.

**Scoring system:** Each item scored on a scale of 0 (not present) to 4 (very severe), with a total score range of [0 –208], where [0 - 41] indicated minimal anxiety, [42 – 83] indicated mild anxiety, [84 -124] indicated moderate anxiety, [125–166] indicated severe anxiety, and [167- 208] indicated very severe anxiety **(Lee et al., 2020).**

**Validity and reliability of the tools:** The used tool validity revision was applied by a panel of 9 experts in the field of medical surgical nursing and critical care nursing staff; they agreed and did not comment. The anxiety scale items internal consistency was 0.93. Cronbach's alpha (α) and was rated within the acceptable range.

**A pilot study:** A pilot study was conducted with 10% of the studied nurses from the previously referenced settings to determine the used tools lucidity, clarity, feasibility and applicability. Based on pilot study, some modifications were done and those nurses excluded from the main study.

**Ethical considerations:** The Specialized Medical Hospital directors and the Mansoura Main University Hospital agreements were obtained to proceed with this study. The participants were given detailed information about the study, including the aim, benefits and hazards. They were also informed that their engagement in the research was voluntary, and they had the right to withdraw from the study at any time without any responsibility. Nurses who agreed to take part in the study were asked to sign an informed consent. The content of the data collection tools did not contact ethical, religious or cultural issues of the studied participant.

**Study phases:**

**Assessment phase:** Official permission was obtained for the study. The participants were enrolled respecting the previously stated criteria. Before proceeding with the study, the aim of the study was clarified to them.

**Planning phase:** based on the assessment phase results, the training session content was formulated, and essential modifications were done accordingly.

- **Implementation phase:** All study participants have divided into small groups

  (30 in each) to facilitate their participation in the training meeting's activities like talks and skills related to AI. Various teaching approaches were employed, such as lectures, videos, pictures, and small group discussions. It was one session in the form of PowerPoint slides show talk which covered knowledge related to AI technologies, their impact on nursing care, and their cost, availability of its application in the nursing profession, its advantages& disadvantages, how to be used by nurses' staff according policy of each institution and also according the factory company instructions, and what its prerequisites needed before use.

- The meeting engrossed about 30 - 45 minutes using simple language to track nurses' understanding. The participants' questions were handled through feedback that was requested at the end of each meeting to clarify any misunderstanding.

**Limitations of the study:**

- Lack of suitable place for interviewing nurses and performing the sessions.
- COVIED 19 pandemic poses a limitation on gathering more nurses in one place due to precaution procedures as instructed by WHO.

To overcome these limitations, the researchers obtain permission from the head nurse of each unit to utilize the nursing room, medication room and teaching room of the unit to conduct the training session as well the researcher divided each small group of studied nurses to sub small groups ( 10 in each) to avoid crowdedness

- **Evaluation and Follow-up phase:** Throughout this stage, the training session impact was investigated using the second tool **(AI anxiety scale)** as a posttest.

**Statistical Design**

After data were collected, they were revised, tabulated, and statistically analyzed using Package for Social Sciences "SPSS version 20". Data were tested for normality of distribution prior to any calculations and were

of normal distribution. Continuous data were expressed in mean ± standard deviation while categorical data were expressed in number and percentage. The comparisons were determined using t-test for variables with continuous data. Chi-square test was used for comparison between variables with categorical data.

**Statistical significance was set at p<0.05.**

**The significance of the results was as follows:**

- When P < 0.05, there were statistically significant differences
- When P > 0.05, there were insignificant statistically differences

## Result

Table (1) showed that nearly half of the studied nurses in medical units (47.6%) and the majority of the critical units (95.4%) were in the age group of 20-30 years. The females were more prevalent than males in in medical units (60.3%), while, in the critical units, the males were more prevalent than females (60.9%). In addition, 68.3% of the nurses in medical units were married, while 70.1% of the nurses in critical units were single. Also, 55.6% and 71.3% of the nurses in medical and critical units respectively lived in rural area.

Concerning the level of education: 57.1% of the nurses in medical units had a bachelor's degree, and 56.3% of the nurses in critical units had instituted education. Regarding years of experience: 38.1% and 85.1% respectively of the nurses in medical and critical units had experienced 1-5 years. Finally, 71.4%, 74.7% respectively of the nurses in medical and critical units had no previous training about artificial intelligence.

Table (2) represented that 28.5% of the studied nurses in medical units had a severe anxiety level, and 43.7% of the nurses in critical units had a moderate anxiety level pre-implementation of training session's activities related to artificial intelligence. Thus, there was a high statistically significant difference between medical and critical units pretest (P = 0.000**).

Concerning post-implementation of training session's activities related to artificial intelligence, 50.8% and 37.9% of the nurses in medical and critical units, respectively, had minimal anxiety levels. There was a high statistically significant difference between the nurses in medical and critical units posttest (P = 0.000**).

Table (3) showed a statistically significant relation between the studied nurses demographic characteristics in medical units attended previous training about artificial intelligence and anxiety levels just pre-implementation of training session's activities (P= 0.045*).

Table (4) showed a statistically significant relation between the studied nurses demographic characteristics in critical units (gender, education level, and the attendance of previous training about artificial intelligence) and anxiety levels just post-implementation of training session's activities (P= 0.003, 0.003, 0.017*) respectively.

Table (5) showed a statistically significant difference between the studied nurses in medical units pre and post-implementation of training session's activities related to (AI) (P= 0.044*). Also, a high statistically significant difference between the studied nurses in critical units pre and post-implementation of training session's activities related to (AI) (P= 0.000**).

**Table (1):** Frequency and percentage distribution of the studied nurses demographic characteristics: (n=150)

| Items | Medical units (n= 63) | | Critical units (n= 87) | |
|---|---|---|---|---|
| | No | % | No | % |
| **Age** | | | | |
| ▪ 20-30 y | 30 | 47.6 | 83 | 95.4 |
| ▪ 30-40 y | 24 | 38.1 | 4 | 4.6 |
| ▪ 40-50y | 4 | 6.3 | 0 | 0.00 |
| ▪ 50-60y | 5 | 7.9 | 0 | 0.00 |
| **Gender** | | | | |
| ▪ Male | 25 | 39.7 | 53 | 60.9 |
| ▪ Female | 38 | 60.3 | 34 | 39.1 |
| **Marital status** | | | | |
| ▪ Single | 18 | 28.6 | 61 | 70.1 |
| ▪ Married | 43 | 68.3 | 26 | 29.9 |
| ▪ Divorce | 2 | 3.2 | 0 | 0.00 |
| ▪ Widow | 0 | 0.00 | 0 | 0.00 |
| **Residence** | | | | |
| ▪ Urban | 28 | 44.4 | 25 | 28.7 |
| ▪ Rural | 35 | 55.6 | 62 | 71.3 |
| **Educational level** | | | | |
| ▪ Bachelor | 36 | 57.1 | 34 | 39.1 |
| ▪ Institute | 16 | 25.4 | 49 | 56.3 |
| ▪ Secondary | 11 | 17.5 | 4 | 4.6 |
| **Years of experience** | | | | |
| ▪ 1:5 years | 24 | 38.1 | 74 | 85.1 |
| ▪ 5: 10 years | 9 | 14.3 | 9 | 10.3 |
| ▪ 10:15 years | 8 | 12.7 | 1 | 1.1 |
| ▪ + 15 years | 22 | 34.9 | 3 | 3.4 |
| **Attending previous training** | | | | |
| ▪ Yes | 18 | 28.6 | 22 | 25.3 |
| ▪ No | 45 | 71.4 | 65 | 74.7 |

**Table (2):** Frequency and percentage distribution of the studied nurses' Anxiety Levels at different units Pre and Post-Implementation of Training Session: (n=150)

| Anxiety levels | Pre training session's implementation | | | | Significance test | | Post training session's implementation | | | | Significance test | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Medical units | | Critical units | | P | $X^2$ | Medical units | | Critical units | | p | $X^2$ |
| | No | % | No | % | | | No | % | No | % | | |
| **Minimal anxiety** | 11 | 17.5 | 11 | 12.6 | | | 32 | 50.8 | 33 | 37.9 | | |
| **Mild anxiety** | 11 | 17.5 | 27 | 31 | **0.000**** | 25.311 | 29 | 46 | 22 | 25.3 | **0.000**** | 26.013 |
| **Moderate anxiety** | 14 | 22.2 | 38 | 43.7 | | | 1 | 1.6 | 18 | 20.7 | | |
| **Severe anxiety** | 18 | 28.5 | 11 | 12.6 | | | 0 | 0.00 | 13 | 14.9 | | |
| **Very severe anxiety** | 9 | 14.3 | 0 | 0.00 | | | 1 | 1.6 | 1 | 1.1 | | |

$P > 0.05$ (insignificant) $*P < 0.05$ (significant)

**Table (3):** Relation between Anxiety Levels Pre and Post-Implementation of Training Session's Activities Related to (AI) to the Nurses Demographic characteristics (Medical units) (n=63):

| Items | Pre training session's implementation | | | | | | | | | | | | Post training session's implementation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimal anxiety | | Mild anxiety | | Moderate anxiety | | Severe anxiety | | Very severe anxiety | | Significance test | | Minimal anxiety | | Mild anxiety | | Moderate anxiety | | Severe anxiety | | Very severe anxiety | | Significance test | |
| | No | % | No | % | No | % | No | % | No | % | P | $X^2$ | No | % | No | % | No | % | No | % | No | % | p | $X^2$ |
| Age | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ 20:30 y | 6 | 54.5 | 7 | 63.6 | 6 | 42.9 | 6 | 33.3 | 5 | 55.6 | | | 15 | 46.9 | 15 | 51.7 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| ▪ 30:40 y | 3 | 27.3 | 4 | 36.4 | 4 | 28.6 | 9 | 50.0 | 4 | 44.4 | 0.3 | 13.38 | 13 | 40.6 | 9 | 31.0 | 1 | 100 | 0 | 0.00 | 1 | 100 | 0.9 | |
| ▪ 40:50 y | 0 | 0.00 | 0 | 0.00 | 3 | 21.4 | 1 | 5.6 | 0 | 0.00 | 42 | 8 | 2 | 6.2 | 2 | 6.9 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 03 | |
| ▪ 50:60y | 2 | 18.2 | 0 | 0.00 | 1 | 7.1 | 2 | 11.1 | 0 | 0.00 | | | 2 | 6.2 | 3 | 10.3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | 4.130 |
| Gender | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Male | 2 | 18.2 | 7 | 63.6 | 3 | 21.4 | 9 | 50.0 | 4 | 44.4 | 0.1 | 7.596 | 15 | 46.9 | 8 | 27.6 | 1 | 100 | 0 | 0.00 | 1 | 100 | 0.1 | |
| ▪ Female | 9 | 81.8 | 4 | 36.4 | 11 | 78.6 | 9 | 50.0 | 5 | 55.6 | 08 | | 17 | 53.1 | 21 | 72.4 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 38 | 5.504 |
| Marital status | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Single | 6 | 54.5 | 4 | 36.4 | 2 | 14.3 | 3 | 16.7 | 3 | 33.3 | | | 11 | 34.4 | 7 | 24.1 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0.9 | |
| ▪ Married | 4 | 36.4 | 7 | 63.6 | 12 | 85.7 | 15 | 83.3 | 5 | 55.6 | 0.1 | 12.27 | 20 | 62.5 | 21 | 72.4 | 1 | 100 | 0 | 0.00 | 1 | 100 | 42 | |
| ▪ Divorce | 1 | 9.1 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 1 | 11.1 | 40 | 0 | 1 | 3.1 | 1 | 3.4 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | 1.743 |
| Residence | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Rural | 5 | 45.5 | 4 | 36.4 | 6 | 42.9 | 9 | 50 | 4 | 44.4 | 0.9 | 0.535 | 16 | 50 | 11 | 37.9 | 0 | 100 | 0 | 0.00 | 1 | 100 | 0.4 | |
| ▪ Urban | 6 | 54.5 | 7 | 63.6 | 8 | 57.1 | 9 | 50 | 5 | 55.6 | 70 | | 16 | 50 | 18 | 62.1 | 1 | 0.00 | 0 | 0.00 | 0 | 0.00 | 00 | 2.948 |
| Education | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Bachelor | 7 | 63.6 | 6 | 54.5 | 5 | 35.7 | 13 | 72.2 | 5 | 55.6 | | | 19 | 59.4 | 16 | 55.2 | 0 | 100 | 0 | 0.00 | 1 | 100 | 3.9 | |
| ▪ Institute | 2 | 18.2 | 3 | 27.3 | 6 | 42.9 | 2 | 11.1 | 3 | 33.3 | 0.6 | 5.877 | 7 | 21.9 | 9 | 31.0 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 1 | |
| ▪ Secondary | 2 | 18.2 | 2 | 18.2 | 3 | 21.4 | 3 | 16.7 | 1 | 11.1 | 61 | | 6 | 18.8 | 4 | 13.8 | 1 | 0.00 | 0 | 0.00 | 0 | 0.00 | | 6.298 |
| Experience | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ 1:5 y | 7 | 63.6 | 6 | 54.5 | 4 | 28.6 | 4 | 22.2 | 3 | 33.3 | | | 12 | 37.5 | 12 | 41.4 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| ▪ 5:10 y | 0 | 0.00 | 1 | 9.1 | 2 | 14.3 | 3 | 16.7 | 3 | 33.3 | 0.2 | 14.38 | 7 | 21.9 | 2 | 6.9 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0.2 | |
| ▪ 10:15 y | 2 | 18.2 | 1 | 9.1 | 1 | 7.1 | 2 | 11.1 | 2 | 22.2 | 77 | 2 | 3 | 9.4 | 4 | 13.8 | 0 | 100 | 0 | 0.00 | 1 | 100 | 29 | |
| ▪ +15 y | 2 | 18.2 | 3 | 27.3 | 7 | 50.0 | 9 | 50.0 | 1 | 11.1 | | | 10 | 31.2 | 11 | 37.9 | 1 | 0.00 | 0 | 0.00 | 0 | 0.00 | | 11.727 |
| Previous training | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Yes | 1 | 9.1 | 3 | 27.3 | 7 | 50 | 7 | 38.9 | 0 | 0.00 | **0.045*** | 9.743 | 6 | 18.8 | 12 | 41.4 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0.200 | |
| ▪ No | 10 | 90.9 | 8 | 72.7 | 7 | 50 | 11 | 61.1 | 9 | 100 | | | 26 | 81.2 | 17 | 58.6 | 1 | 100 | 1 | 0.00 | 1 | 100 | | 4.644 |

P > 0.05 (insignificant) *P < 0.05 (significant)

**Table (4): Relation between Anxiety Levels Pre and Post-Implementation of Training Session's Activities Related to (AI) to Nurses Demographic Characteristics (Critical units) (n=87):**

| Items | Pre training session's implementation | | | | | | | | | | | | Post training session's implementation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimal anxiety | | Mild anxiety | | Moderate anxiety | | Severe anxiety | | Very severe anxiety | | Significance test | | Minimal anxiety | | Mild anxiety | | Moderate anxiety | | Severe anxiety | | Very severe anxiety | | Significance test | |
| | No | % | No | % | No | % | No | % | No | % | p | $X^2$ | No | % | No | % | No | % | No | % | No | % | p | $X^2$ |
| Age | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ 20:30 y | 10 | 90.9 | 25 | 92.6 | 37 | 97.4 | 11 | 100 | 0 | 0.00 | | | 29 | 87.9 | 22 | 100 | 18 | 100 | 13 | 100 | 1 | 100 | | |
| ▪ 30:40 y | 1 | 9.1 | 2 | 7.4 | 1 | 2.6 | 0 | 0.00 | 0 | 0.00 | 0.603 | 1.857 | 4 | 12.1 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0.143 | 6.861 |
| ▪ 40:50 y | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| ▪ 50:60y | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| Gender | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Male | 6 | 54.5 | 15 | 55.6 | 24 | 63.2 | 8 | 72.7 | 0 | 0.00 | 0.744 | 1.238 | 12 | 36.4 | 18 | 81.8 | 13 | 72.2 | 10 | 76.9 | 0 | 0.00 | **0.003*** | 16.317 |
| ▪ Female | 5 | 45.5 | 12 | 44.4 | 14 | 36.8 | 3 | 27.3 | 0 | 0.00 | | | 21 | 63.6 | 4 | 18.2 | 5 | 27.8 | 3 | 23.1 | 1 | 100 | | |
| Marital status | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Single | 8 | 72.7 | 18 | 66.7 | 27 | 71.1 | 8 | 72.7 | 0 | 0.00 | 0.971 | 0.241 | 20 | 60.6 | 14 | 63.6 | 15 | 83.3 | 11 | 84.6 | 1 | 100 | 0.278 | 5.096 |
| ▪ Married | 3 | 27.3 | 9 | 33.3 | 11 | 28.9 | 3 | 27.3 | 0 | 0.00 | | | 13 | 39.4 | 8 | 36.4 | 3 | 16.7 | 2 | 15.4 | 0 | 0.00 | | |
| ▪ Divorce | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | | | | | | | | | | | | | | | | | |
| Residence | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Rural | 3 | 27.3 | 4 | 14.8 | 15 | 39.5 | 3 | 27.3 | 0 | 0.00 | 0.194 | 4.718 | 7 | 21.2 | 8 | 36.4 | 6 | 33.3 | 3 | 23.1 | 1 | 100 | 0.354 | 4.406 |
| ▪ Urban | 8 | 72.7 | 23 | 85.2 | 23 | 60.5 | 8 | 72.7 | 0 | 0.00 | | | 26 | 78.8 | 14 | 63.6 | 12 | 66.7 | 10 | 76.9 | 0 | 0.00 | | |
| Education | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Bachelor | 5 | 45.5 | 7 | 25.9 | 18 | 47.4 | 4 | 36.4 | 0 | 0.00 | | | 11 | 33.3 | 14 | 63.6 | 4 | 22.2 | 4 | 30.8 | 1 | 100 | | |
| ▪ Institute | 5 | 45.5 | 18 | 66.7 | 19 | 50.0 | 7 | 63.6 | 0 | 0.00 | 0.558 | 4.888 | 18 | 54.5 | 8 | 36.4 | 14 | 77.8 | 9 | 69.2 | 0 | 0.00 | **0.033*** | 16.701 |
| ▪ Secondary | 1 | 9.1 | 2 | 7.4 | 1 | 2.6 | 0 | 0.00 | 0 | 0.00 | | | 4 | 12.1 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| Experience | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ 1:5 y | 9 | 81.8 | 21 | 77.8 | 33 | 86.8 | 11 | 100 | 0 | 0.00 | | | 25 | 75.8 | 18 | 81.8 | 17 | 94.4 | 13 | 100 | 1 | 100 | | |
| ▪ 5:10 y | 1 | 9.1 | 4 | 14.8 | 4 | 10.5 | 0 | 0.00 | 0 | 0.00 | 0.597 | 7.384 | 4 | 12.1 | 4 | 18.2 | 1 | 5.6 | 0 | 0.00 | 0 | 0.00 | 0.553 | 10.716 |
| ▪ 10:15 y | 0 | 0.00 | 0 | 0.00 | 1 | 2.6 | 0 | 0.00 | 0 | 0.00 | | | 1 | 30 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| ▪ +15 y | 1 | 9.1 | 2 | 7.4 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | | 33 | 9.1 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| Previous training | | | | | | | | | | | | | | | | | | | | | | | | |
| ▪ Yes | 5 | 45.5 | 5 | 18.5 | 9 | 23.7 | 3 | 27.3 | 0 | 0.00 | 0.377 | 3.097 | 3 | 9.1 | 8 | 36.4 | 4 | 22.2 | 7 | 53.8 | 0 | 0.00 | **0.017*** | 12.051 |
| ▪ No | 6 | 54.5 | 22 | 81.5 | 29 | 76.3 | 8 | 72.7 | 0 | 0.00 | | | 30 | 90.9 | 14 | 63.6 | 14 | 77.8 | 6 | 46.2 | 1 | 100 | | |

P > 0.05 (insignificant) *P < 0.05 (significant)

**Table (5):** Total Mean Score Differences of Anxiety Levels in each Study Group Pre and Post-Implementation of Training Session's Activities Related to (AI)

| Anxiety levels | Medical units | | Critical units | |
|---|---|---|---|---|
| | Pre training session's implementation | Post training session's implementation | Pre training session's implementation | Post training session's implementation |
| **Mean ± SD** | 107.58 ± 53.22 | 44.88 ± 27.57 | 85.59 ± 32.63 | 73.00 ± 44.29 |
| **Significance test** | p=0.044* t=8.684 | | p=0.000** t=2.666 | |

## Discussion

Several national and international articles discussed the role of AI in health care settings. Still, there is a scarcity in studying health care workers' attitude toward AI partnership in providing nursing care in Egyptian hospitals. Therefore, the current study aimed to evaluate the nurses' anxiety toward partnering with AI in providing nursing care pre and post training session's activities implementation. The total number of the current studied sample was 150 nurses (medical and critical units).

This study indicated that nearly half of the nurses in medical units and the majority of the nurses in critical units were in the age group of 20-30 years. The females were more prevalent than males in the medical units, while, in the critical units, the males were more prevalent than females. More than two-thirds of the nurses in medical units were married, while more than two-thirds of the nurses in critical units were single. Also, more than half of the nurses in medical units and more than two-thirds of the nurses in critical units were living in rural areas.

This study result was partially agreed with **Ramadan & Ahmed (2015),** who reported that all the studied sample were females aged between 19- ≥ 23 years, and more than three-quarters of the participants were single. At the same time, more than half of them were from urban areas. Another supported study was conducted by **Yazdani, Rezaei, & Pahlavanzadeh, 2010)**, who noted that the mean age in both groups was 20.9 ± 1.3, ranging between 19-25 years. In intervention and control groups, more than half and more than two-thirds of them were females and males, respectively. The majority of the study subjects were single.

Concerning anxiety levels pre and post-implementation of training session's activities related to AI, the present study revealed a significant decrease in nurses' anxiety levels post-implementing the session compared to the pre-session. The study findings devoted that nearly one-third of the nurses in medical units had a severe anxiety level and less than half of the nurses in critical units had a moderate anxiety level pre-implementation with a highly statistically significant difference between both units pretest. While post-implementation, slightly more than half of the nurses in medical units and more than one-third of the nurses in critical units had a minimal anxiety level with a highly statistically significant difference between them posttest.

According to study conducted by **Ramadan & Ahmed (2015)**, who noted that slightly less than half of the study group had mild anxiety, and more than half of the control group had a moderate anxiety pre-program phase. While immediately post-program implementation, more than half 58% had normal anxiety. These results showed the effectiveness of training session activities in minimizing anxiety levels.

As regards the relation between anxiety levels and demographic characteristics among the nurses in medical units pre and post-implementation of training session's activities related to AI, the current study revealed that there was a statistically significant relation between the studied group attendance of previous training about AI with anxiety levels just pre-implementation of training session's activities. This result may be due to a lack of nurses' knowledge that can lead to fear or agitation about out-of-control AI. In the same context, **Kim (2017)** carried out a study aimed

to identify the factors affecting intention and attitude of AI of university students in healthcare using the Unified Theory of Acceptance and Use of Technology (UTAUT) model, and reported that it was essential to increase the expectation factors, social effects, and perceived usefulness through accurate information based on facts and to reduce vague anxiety.

Regarding the relation between anxiety levels and demographic characteristics among the nurses in critical units pre and post-implementation of training session's activities related to AI, the current study revealed that there was a statistically significant relation between their demographic characteristics, gender, education level, and the attendance of previous training about AI with anxiety levels just post-implementation of training session's activities (P= 0.003, 0.003, 0.017*) respectively. This result may be related to several causes as learning to understand all of the special functions associated with an AI technique/product, interacting with an AI technique/product make nurses anxious, being afraid that an AI technique/product may replace humans, and AI technique/product may get out of control and malfunction.

This study finding was in accordance with **Wang & Wang (2019)**, who studied the factor loadings for the 21-items AI anxiety scale and total correlations of AI anxiety measures, and **Sandelowski (1997)** who revealed that nursing romanticism holds a more pessimistic viewpoint, where technology is seen as disruptive and dangerous to nursing practice. In contrast, the finding was disagreed with **Buchanan et al. (2020)**, who revealed that technology has become increasingly entrenched in nursing practice in recent years. And **Sandelowski's** viewpoints may not necessarily be valid of today's nurses; it is essential to recognize both of these perspectives to ensure compassionate care is actualized as AI-driven digital health technologies continue to emerge.

As well as **Mehdipour (2019)** study findings exposed that the participants' skill with the AI system was very low, but the level of awareness and knowledge of nursing managers about AI applications was high. The general attitude of nursing managers toward applying the AI system was optimistic; nevertheless, it required adequate information about the benefits of AI and a positive incentive for managers.

Concerning the total mean score differences of anxiety levels in each study group pre and post-implementation of training session's activities related to AI, the study findings noted that there was a statistically significant difference between the nurses in medical units' pre and post-implementation of training session. Also, a high statistically significant difference between the nurses in critical units' pre and post-implementation of training session. This result was in agreement with **Ramadan & Ahmed (2015)**, who noticed highly statistically significant differences ($p<0.001$) between the mean score of anxiety pre-program and Immediate post-program in the intervention group.

A supporting study was conducted by **Yazdani et al. (2010)** revealed that the anxiety mean scores before and after the intervention had a significant difference using paired t-test ($t = 2.71$; $p = 0.011$). Also, **Ghazavi, Mardany, & Pahlavanzadeh (2016)** reported a significant difference in anxiety mean score comparison in the test group before, immediately after the program (P= 0.04*). The study result was in accordance with the results of **Mehrabi, Fati, Davazdah emami, & Rajab (2009),** who noticed that the mean score of anxiety before and after the intervention had a significant difference ($t = 2.71$; $p = 0.011$).

## Conclusion

Considering the current study results, it is concluded that the training session's activities on partnering with AI in providing nursing care had statistically effect in reducing the studied nurses' anxiety level in different medical and critical care units.

## Recommendation

In light of the study findings, it is recommended for holding continuous periodic training session's activities to reduce nurses' anxiety levels and enhance their attitude toward partnering with AI to provide nursing care and support medical and critical care unites with

printed illustrated posters and booklets concerning with AI in providing nursing care. Conducting more future studies and research related to this concern.

**Conflicts of interest**

There are no conflicts of interest.

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