Assessment of Maternity Students' Perception, Anxiety and Satisfaction Regarding Electronic Exam

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Abstract

Background: Modern technology increases nowadays in the academic institutions as a result of digital transformation. Electronic exam is a new system that becomes a necessary assessment tool in the online learning process due to its efficacy and effectiveness. **Aim:** The current study aimed to assess maternity students' perception, anxiety and satisfaction regarding electronic exam. **Subjects and method:** A descriptive cross- sectional study design was followed. The study was conducted in the Maternity Nursing Laboratory at the Faculty of Nursing, Mansoura University, Egypt. A convenience sample was applied included One hundred and fifty eight undergraduate students who were in active enrollment of Maternity &Gynecology Course. Data collected through an online electronic survey on Google platform to assess students' personal characteristics, levels of perception, anxiety and satisfaction regarding Electronic exam. **Results:** More than fifty percent of the students agreed that electronic exam is a better assessment method than the paper-based exam, it provides them with an opportunity to obtain good results, results can be obtained faster than the paper-based exam, and e-exam improves student technical and computing skills. Despite nearly two-thirds of studied students were highly satisfied about electronic exam, but, more than two-thirds of them had a moderate anxiety level. **Conclusion:** E-exam is an effective assessment tool than paper-based exam, but it is not suitable for clinical courses, doesn't reflect students' full performance, and there are some technical and practical issues that increase student's anxiety during the E-exam. **Therefore,** conducting a regular meeting with the students to provide a clear explanation about the nature of electronic exam and maintaining psychological and technical support during E-exam is recommended to alleviate student's anxiety.

Keywords: Anxiety, Electronic Exam, Satisfaction, Students' Perception

Introduction

Modern technology has progressed rapidly from a novelty to become very prevalent in nursing education during the last 20 to 25 years. Numerous aspects of human life have changed due to technology. Furthermore, it has been widely disseminated and used in a variety of academic institutions. [(1)] This is because technology improves accuracy and efficiency while allowing individuals to acquire error-free results. Therefore, technology is widely used in learning, teaching, and assessment**.** [(2)]

As a result of the digital transformation, the Ministry of Higher Education's interest has been increased regarding the use of modern technology within different departments in the educational organizations. [(3)] In particular, student's evaluation and the way of conduction exams are considered as major concerns. Electronic examinations (E-exams) are regarded as an essential component of the distant educational system. [(4)]

The electronic examination (E-exam) approach is not a modern concept in the area of education but it is constantly increasing. In recent years**,** E-examination software has been used for objective evaluations. Most of the world's best universities employ general-purposed or specialized software to conduct e-exam including Oracle, and Blackboard. The electronic examinations success can be evaluated depending on student feedback, using different assessments, and evaluation methods. [(5)]

The electronic examination conducting system becomes an essential evaluation method in the online learning process. It is very effective for academic institutions to schedule complete electronic exams and save the time taken for papers reviewing and schedule the marking sheets. [(6)] The e-examination system has several advantages which include; enhancing efficiency and effectiveness of the evaluation process, rapid scoring and immediate feedback for the students and the instructors, allowing opportunity for questions banking and item statistics, and ability for integrating multimedia into exam questions, and using new testing formats. [(7)]

However, the electronic-examination has certain drawbacks as consuming more time from the teachers to prepare the exam. [(8)] Also, the possibility for technical problems including internet connectivity and platforms efficacy and in appropriateness of such exams to evaluate practical skills. In addition, concerns regarding the academic dishonesty have been recently raised. [(9)]

Many studies concluded that cheating can occur during e-exam mainly in the un-proctored environment. [(10)] Following measures as not allowing extra time, minimizing number of multiple-choice questions, randomizing patterns of questions, and using plagiarism checkers can help in reducing cheating to some extent. [(11)] Other challenge that the students could face during electronic exam is browser incompatibility which aggravate anxiety during the exam. Exam-related anxiety is also associated with poor academic performance, dropout rates and mental and physical concerns. [(12)]

Exam-related anxiety can be minimized through proper counseling during the course and a more user-friendly technology interface. Before implementing electronic exam, organizations should provide the

policy for students to maintain reliability. Also, supporting students is very essential to reduce anxiety especially if technical problems were encountered. [13]

Student's satisfaction is an important indicator for the success of electronic examination process. To achieve satisfaction during the E- exam, contents and materials used in e-learning must allow students a chance to interact, be synchronous or asynchronous, and allow various kind of student-teacher interaction. [14] For optimizing students' satisfaction, special attention should be given to exam preparation, students' ability to deal with technology, and students' motivational activities. Resources that enhance the effectiveness and productivity of the learning process, the importance of student-teacher interactions, the effect of motivation, and the desire to enhance academic accomplishment should be clearly understood by the administrators and instructors. [15]

Significance of the study

Assessment is an important element of the learning process. An important step in determining the outcomes of learning process is student evaluation. By conduction the evaluation process, the instructors can identify either the academic goals are achieved or not. Therefore, the assessment and evaluation procedures must receive a great attention. [16] The educators started to integrate modern technology and use electronic exam in the evaluation process to shift from the paper exam which is a tiring and time consuming process. [17]

Electronic exams help teachers to save time and work because they can deliver precise information quickly concerning the students' academic achievement**.** [18] Additionally, an electronic exam eliminates the possibility of human error during the correction process and gives educators access to the results immediately after the exam. As a result, it aids academic institutions in saving resources, including time, money, and materials. [19]

Despite some of the developed countries had more positive experience and achievement regarding the implementation of electronic exams, learners in the developing countries faced certain challenges due to limited access to internet or computers, limited experience about the online education, and little computer literacy level. [20, 21] Therefore, to ensure the success of the electronic examination process, it is necessary to evaluate students' perception, anxiety and identify the barriers that affect students' satisfaction, so the current study was conducted.

Aim of the Study

The present study aimed to assess maternity students' perception, anxiety and satisfaction regarding electronic exam.

Research questions

Q1: What is the maternity nursing students' perception regarding electronic exam?

Q2: What are the maternity nursing students' levels of anxiety and satisfaction regarding electronic exam?

Q3: What is the correlation between students' perception, anxiety, and satisfaction regarding electronic exam?

Theoretical definitions

Electronic-Exam: A form of examination that can be taken online with the use of specialized testing software and a computer.

Typically, it appears as multiple-choice questions. [22]

Perception: The extent to which someone believes something is doing more good than bad. [23]

Anxiety: Unpleasant feeling, such as worry or fear that ranged from mild to severe. [24]

Subjects and Method

Research Design

The current study followed a descriptive cross- sectional design. This design is the best method used when the researcher is interested to collect information at certain point of time; it provides a snapshot of the population. The STROBE checklist was used for reporting this study.

Study Setting

The present study was carried out in the Maternity Nursing Laboratory which located in the third floor at the Faculty of Nursing-Mansoura University, Egypt. This laboratory is used for practical training of the 6th level students on Sunday and Tuesday from 8-2 pm weekly; thereafter it can be used by the researchers for conducting the current research.

Sampling

A convenience sample of one hundred and fifty eight undergraduate nursing students who were in active enrollment of Maternity &Gynecology course during the study period and willing to participate in this study were enrolled.

Sample Size

Depending on data from [25] to estimate the sample size with precision/absolute error of 5% and type 1 error of 5%, considering the following formula:

$$n=\frac{(Z1-\alpha/2)^2.P(1-P)}{d^2}$$

where, $Z_{1-\alpha/2}$ at 5% type 1 error ($p<0.05$) is 1.96, P is the expected proportion in population based on previous studies and d is the absolute error or precision. Therefore, sample size

$$n=\frac{(1.96)^2.(0.723)(1-0.723)}{(0.07)^2}=157.01.$$

So, the total sample size for the study was 158 students.

Data Collection Tools: Data collected through three tools;

Tool 1: A structured interview questionnaire: This tool was developed by the researchers after reviewing related national and international literatures. [26] It consisted of two parts**: Part (1): Personal data of the maternity nursing students** as age, educational level, sex, residence and number of online courses.

Part (2): Maternity nursing students' perception regarding e-exam: This part was developed by the researchers following a comprehensive reviewing of the literatures [27, 28] to evaluate students' perception regarding electronic examination. It included 13 items regarding the appropriateness of facilities, timing and question format. This questionnaire was rated on a three-point Likert scale from disagree scored (1), neutral scored (2), and agree scored (3).

Tool II: Electronic Exam Anxiety Scale (EAS): It was adopted from **Arora et al., 2021** [29] and included 9-items self-reported scale to assess the electronic exam anxiety among undergraduate students. Items as (nervousness about unknown aspect of electronic exam, fear from not being able to complete the exam, worry from not being able to successfully access the question paper).

Scoring system

The nine-item questionnaire was scored using a Likert scale with a range of 0 (not at all) to 4 (every day). The sum of all nine items yields the final score. It falls between 0 and 36. Scores between 0 and 9 suggest low levels of anxiety; 10 to 27 indicate moderate levels of anxiety; and 28 and higher indicate higher levels of anxiety associated with taking an electronic exam.[29]

Tool III: Satisfaction regarding Electronic Exam

It was designed by **Qalawa et al., 2021** [15] to evaluate students' satisfaction regarding electronic exam. It entails of 21 items, and it was modified by the researchers to 15 items by omitting 7 items from the original version because of repetition and those were inconvenient for the local policy of the assigned settings. Satisfaction questionnaire included items as (preparedness taken before the exam, time set, guidance, method of assigning exam grades).

Scoring system

Five-points Likert scale was used for scoring the satisfaction scale ranging from (strongly agree scored (5), to strongly disagree scored (1). The highest possible scale score was 75 and the lowest was 15. The higher the score, the higher the students' satisfaction level regarding electronic exam. The total satisfaction score was categorized as follows: low satisfaction <50%, moderate satisfaction was from 50% to <75 %, and high satisfaction ≥75%. [15]

Tools validity and reliability

The face and content validity of the study tools was checked by a jury of five experts, including three professors in woman's health field and two professors in the education field. Their modifications were considered according to their remarks as simplifying and paraphrasing certain statements to be easily understandable by students. The reliability of the study tools was confirmed through Cronbach's alpha test. The Cronbach's alpha values of the perception, anxiety, and satisfaction scales were (0.876, 0.896 & 0.903) respectively which indicating that the study tools have a high reliability.

Pilot study

10% (16 students) of the calculated sample filled out the questionnaire in order to test the questionnaire's objectivity and application, determine whether the research process could be carried out, and determine how long the surveys would take to complete. The study sample didn't include any of the participants in the pilot study.

Ethical considerations

Ethical approval was taken from the Committee of the Research Ethics at the Nursing Faculty, Mansoura University with Ref. No. **(P. 0420).** Before collecting the data, each student voluntary signed a written informed consent after a clear explanation regarding the nature and the scope of the study. Students' participation in the study was voluntary and each one had the right to refuse or not complete the study at any time. Confidentiality and privacy were considered throughout the whole study process.

Research process

This study process included two phases: a face to face interview phase and an online phase as the following:

Face to face interview phase:

The face to face interview phase was conducted in the maternity lab at the end of the second semester on May, 2022-2023.

Students in this course were divided in to six groups. Three groups received their clinical training on Sunday and the other three groups on Tuesday according to their schedule. During the last week of the clinical training, after the clinical section related to the course had been finished, the researchers started with a simple introduction about the study aim and scope.

The eligible students who agreed to participate in the current study were enrolled and a written informed consent was taken after a detailed explaining of the study process. The researchers explained to the students how and when they can able to complete the online questionnaire. At the end of the interview, students' phone numbers were obtained and WhatsApp group was established.

Online phase

This phase started at the same day of Maternity E-exam. After the students took the exam, the online questionnaire was released on the WhatsApp group. The researchers developed the online questionnaire after a detailed review of the literatures. [26]

The researchers followed **Mondal et al., 2018** [30] during establishment of the Online Electronic Survey on Google Platform (Google Form).Google form is a technique to design and submit an online questionnaire by using an online electronic survey on Google platform using quick responses. The questionnaire consisted of MCQs divided into 4sections which included students' personal characteristics, perception, level of anxiety and satisfaction.

It was available at: https://docs.google.com/forms/d/e/1FAIpQLSd2pmrDbzirgvegpliaxOwqpm54DDWpg/viewform?fbclid=IwAR1Zo7eEeo3blRgjuqp8hDut4LhepriMJWvuoeup7MBx12m0-lZh2DgjXSo.

The researchers reviewed with the students how to answer the Google form questions through a WhatsApp massages. The questionnaire remained accessible for two weeks so that students had time to complete it. The questionnaire takes 20-30 minutes to be completed. After all students completed the questionnaire, the researchers thanked them for their collaboration and participation in the current study.

Statistical Analysis

The data were coded and analyzed through SPSS for windows version 29.0 (SPSS, Chicago, IL). Mean ±standard deviation (SD) was used for continuous data. Categorical data were expressed in number and percentage. Chi-square test was used to compare the variables with categorical data. The reliability (internal consistency) of the questionnaires was calculated. Statistical significance was considered at $p<0.05$.

Results

Table 1. Presents that the mean age of the studied students was (20.8 ±1.1year). 57.6% of them were from the rural area. 63.9% of the studied students were female students. Regarding to the number of online courses, 82.9% of studied students had 3 or more online courses.

Table 2. Clarifies that 67.7%, 65.8%, 64.6% & 63.3%, respectively of studied students agreed that electronic exam question format is suitable, E-exam allow students to manage their time effectively during the exam, results can be obtained faster than the paper-based exam, and preparation for electronic exam needs little effort than paper-based exam.

While, 66.5% & 65.2% respectively of them disagreed that e-exam reflect their full performance, and suitable for every course.

Table 3.shows that 23.4% and 22.8% of studied students had anxiety more than 7 days before exam from submitting answer on time and technical issues as internet connection or speed .Also, (48.7%, 39.2%, &37.3%, 36.7%, respectively) of them had anxiety several days before exam from taking exams in electronic mode, electronic exam pressure, unknown aspect of electronic exam and electronic exam fairness. While, 37.3%, respectively of studied students had a rare anxiety(less than a day) from unsuccessful access of the question website.

Figure 1. Illustrates that 67.7% of studied students had a moderate anxiety level, while 12.7% of them had high anxiety.

Table 4. Shows that 62.7% of studied students strongly agreed that E-exam can be announced early and on appropriate date and time, allow opportunity for students' opinions to be considered, and better than the paper-exams. 25.9 % of them agreed that techniques for assigning exam grades were appropriate. While, only 10.8% &9.5% respectively disagreed that E- exam considers individual differences by providing questions diversity and there was enough guidance before the exam.

Figure 2. Describes that 62.7% of studied students were highly satisfied about electronic exam, while only 11.4% of them were less satisfied about electronic exam.

Figure 3. Reveals that 34.2%, 19.6% ,12.7% & 10.8%, respectively of the studied students perceived that power cuts during the exam, computer, application or server fail during exams, lack of availability of electronic exam labs in nursing faculty, lack of financial and technical capabilities of some students and wide spread cheating were the main barriers of E-exam.

Table5. Clarifies that there was a highly statistically significant association between the number of online courses and levels of anxiety as 96.8% of studied students who had 3 or more online courses had a low level of anxiety ($p<0.001$).

According to **Table 6.** There was a statistical significant negative correlation between students' perception and electronic exam anxiety score ($p=0.044$). Also, there was a statistical significant negative correlation between students' satisfaction and anxiety scores ($p=0.004$). While, there was a statistical significant positive correlation between students' perception and satisfaction regarding electronic exam ($p=0.027$).

Table (1): Distribution of the studied students according to their personal characteristics (N = 158)

Items	No.	%
Age (Years)		
19 – 20	61	38.6
21 – 22	97	61.4
Mean ±SD	20.8 ±1.1	
Residence		
Urban	67	42.4
Rural	91	57.6
Gender		
Male	57	36.1
Female	101	63.9
Online Courses number		
Less than 3	27	17.1
3 or More	131	82.9

Table (2): Perception of the studied students' regarding electronic exam (N = 158)

Items	Disagree		Neutral		Agree	
	No.	%	No.	%	No.	%
Electronic exam is suitable for every course	103	65.2	34	21.5	21	13.3
Electronic exam is a better assessment method than the paper-based exam	24	15.2	35	22.2	99	62.7
Electronic exam provides student with opportunity to obtain good results	31	19.6	30	19.0	97	61.4
Electronic exam results can be obtained faster than the paper-based exam	22	13.9	34	21.5	102	64.6
Electronic exam improves student technical and computing skills	37	23.4	32	20.3	89	56.3
Electronic exam assesses students amount of knowledge effectively	29	18.4	30	19.0	99	62.7
Electronic exam reflects students' full performance and expression skills	105	66.5	33	20.9	20	12.7
Electronic exam preparation needs little effort than paper-based exam	30	19.0	28	17.7	100	63.3
Electronic exam allows faster time for answer questions	37	23.4	28	17.7	93	58.9
Electronic exam allows managing time during the exam	22	13.9	32	20.3	104	65.8
Electronic exam allocated time is fair	28	17.7	31	19.6	99	62.7
Electronic exam question format is suitable	17	10.8	34	21.5	107	67.7
Availability of administrative support during electronic exam	27	17.1	33	20.9	98	62.0

Table (3): Electronic exam related Anxiety among the studied students (N = 158)

Items	Not at all		Rare, less than a day		Several Days		More than 7 days		Nearly every Day	
	No.	%	No.	%	No.	%	No.	%	No.	%
I am nervous regarding the unknown aspect of electronic exam.	24	15.2	34	21.5	59	37.3	22	13.9	19	12.0
I am feared that I cannot be able to finish exam on time.	21	13.3	41	25.9	43	27.2	18	11.4	35	22.2
I am worried that I might not be successfully access the question website.	18	11.4	59	37.3	50	31.6	15	9.5	16	10.1
I am afraid that I might not be able to submit my answer on time.	15	9.5	48	30.4	45	28.5	37	23.4	13	8.2
I am feared about technical issues as weak internet connection or low speed.	18	11.4	28	17.7	57	36.1	36	22.8	19	12.0
I am uncomfortable about taking exams in electronic mode	15	9.5	31	19.6	77	48.7	28	17.7	7	4.4
I am anxious about the digital proctoring.	21	13.3	41	25.9	46	29.1	31	19.6	19	12.0
I am worried about the fairness of electronic examinations.	9	5.7	59	37.3	58	36.7	15	9.5	17	10.8
I am dread that I might not perform well because of electronic exam pressure.	21	13.3	37	23.4	62	39.2	31	19.6	7	4.4

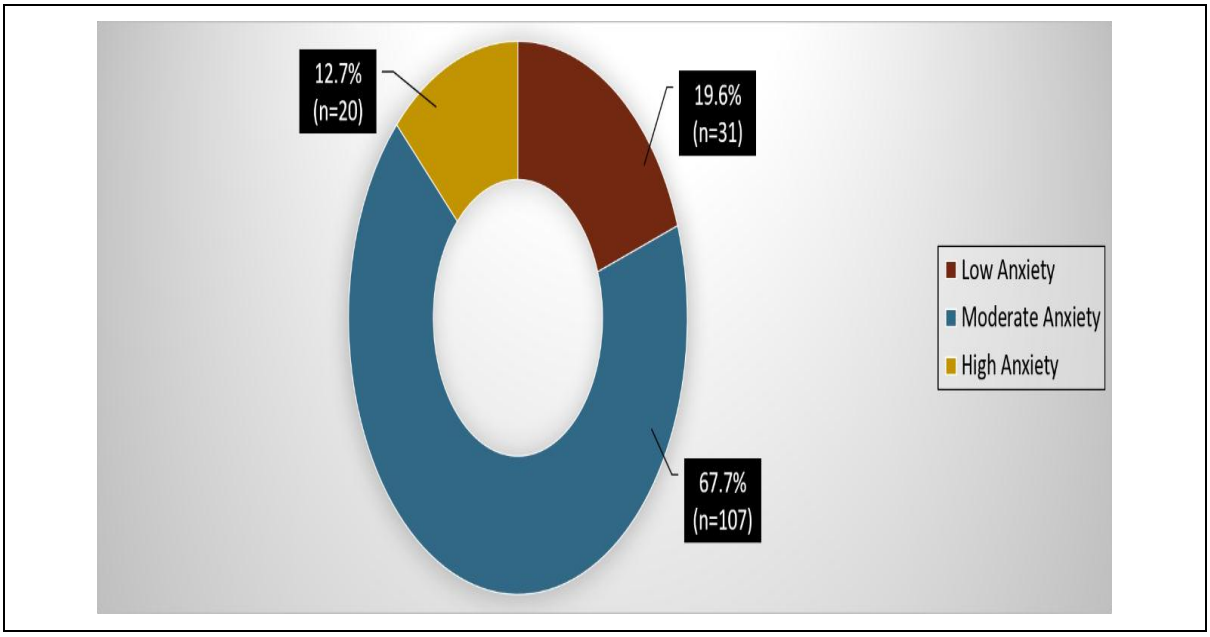

Figure (1).Total score of studied maternity nursing students' anxiety regarding electronic exam

Table (4): Satisfaction of the studied students regarding electronic exam (N = 158)

Items	Strongly Disagree		Disagree		Natural		Agree		Strongly Agree	
	No.	%	No.	%	No.	%	No.	%	No.	%
Instructors consider students' needs and desires during electronic examination scheduling.	9	5.7	9	5.7	24	15.2	38	24.1	78	49.4
Exam schedule can be announced early and on appropriate date and time	6	3.8	12	7.6	21	13.3	20	12.7	99	62.7
The tests results can be announced on the websites.	9	5.7	13	8.2	19	12.0	32	20.3	85	53.8
Electronic exams allow opportunity for students 'opinions to be considered.	9	5.7	12	7.6	12	7.6	26	16.5	99	62.7
Time set for the electronic exam is sufficient	9	5.7	12	7.6	15	9.5	33	20.9	89	56.3
Electronic testing methods vary and suit students	12	7.6	9	5.7	23	14.6	29	18.4	85	53.8
Before electronic exam, there was enough guidance	9	5.7	15	9.5	18	11.4	26	16.5	90	57.0
Electronic exam questions are appropriate and clear	6	3.8	9	5.7	15	9.5	32	20.3	96	60.8
Electronic exam questions depends on the announced course content	6	3.8	9	5.7	18	11.4	29	18.4	96	60.8
Electronic exam questions cover all parts of the course content	9	5.7	13	8.2	15	9.5	26	16.5	95	60.1
Techniques for assigning exam grades are appropriate	9	5.7	9	5.7	21	13.3	41	25.9	78	49.4
Electronic exam can measure thinking, analysis, and designing skills	9	5.7	9	5.7	21	13.3	33	20.9	86	54.4
Electronic exam is better than the paper-exam	9	5.7	12	7.6	12	7.6	26	16.5	99	62.7
Electronic exam considers individual differences by providing questions diversity	12	7.6	17	10.8	18	11.4	29	18.4	82	51.9
The course instructor provide a clear explanation around the probationary period	9	5.7	9	5.7	15	9.5	38	24.1	87	55.1

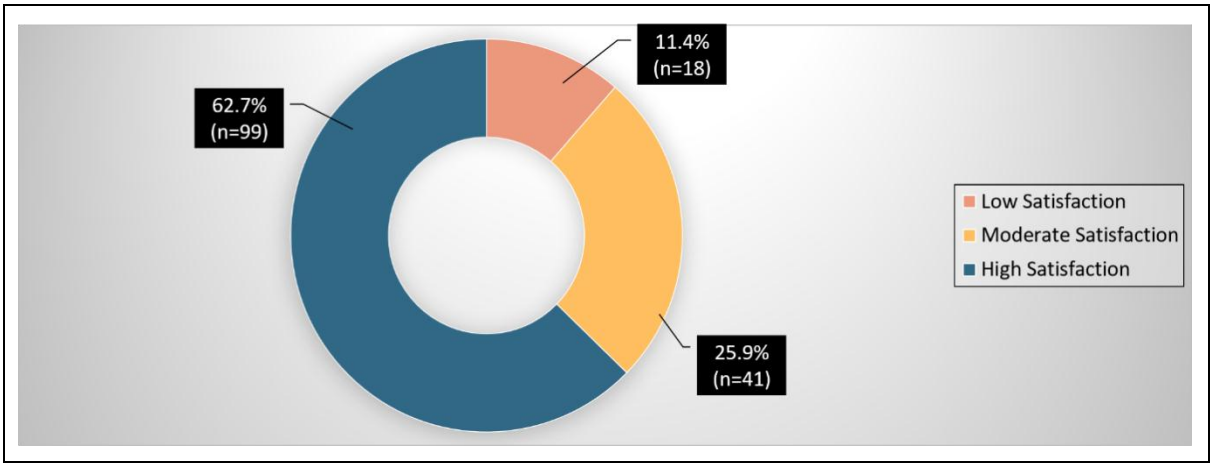

Figure (2). Total score of studied maternity nursing students' satisfaction regarding electronic exam.

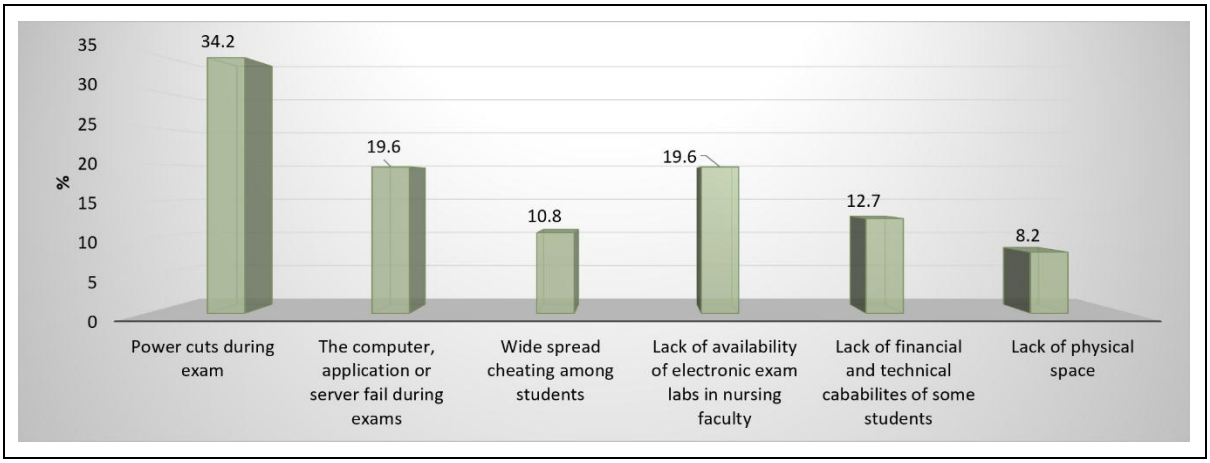

Figure (3). Barriers of electronic exam from studied maternity nursing student perspectives

Table (5): Association between personal characteristics of the studied maternity nursing students and total electronic exam anxiety score (N = 158)

Items	Low Anxiety (n=31)		Moderate Anxiety (n=107)		High Anxiety (n=20)		Significance test	
	N	%	n	%	N	%	X^2	P
Age (Years)								
19 – 20	12	38.7	39	36.4	10	50.0		
21 – 22	19	61.3	68	63.6	10	50.0	1.306	0.520
Residence								
Urban	15	48.4	40	37.4	12	60.0		
Rural	16	51.6	67	62.6	8	40.0	4.094	0.129
Gender								
Male	12	38.7	39	36.4	6	30.0		
Female	19	61.3	68	63.6	14	70.0	0.420	0.811
Online Courses								
Less than 3	1	3.2	10	9.3	16	80.0		
3 or More	30	96.8	97	90.7	4	20	64.601	<0.001**

****Highly Statistically Significant at P<0.001**

Table (6): Correlation between studied maternity nursing students' perception, satisfaction and anxiety scores regarding electronic exam

Items	Perception Score		Anxiety Score		Satisfaction Score	
	R	P	R	P	R	p
Perception Score			- 0.160	0.044*	0.176	0.027*
Anxiety Score	- 0.160	0.044*			- 0.252	0.004*
Satisfaction Score	0.176	0.027*	- 0.252	0.004*		

Discussion

The use of electronic exams is a crucial strategy in the e-learning process, which is characterized by all types of assessment and evaluation that rely on digital technologies. E-exams are tests that are administered using computers and the internet. Students are given questions, their incorrect answers are corrected right away, they receive feedback on how they answered, their scores are reported, and appropriate security measures are used to protect their anonymity. E-exams are also timed and easily monitored. [27]

The present study aimed to assess maternity students' perception, anxiety and satisfaction regarding electronic exam. The study aim was achieved; also the study results handled the answer of the study questions as introducing electronic exam which considered a method of electronic learning affect students' perception, anxiety and satisfaction levels.

Considering the general characteristics of the students under the study, the results showed that, more than half of the studied students aged from 21-22 years with mean age 20.8 ± 1.1 years and nearly two-thirds of them were females. Moreover, more than half of them from the rural areas and the majority of them had three or more online courses during this semester. This conclusion may be due to the fact that female students in Egypt frequently choose nursing as a career. Additionally, men have recently begun enrolling in nursing faculties.

This finding was in consistent with **Sulaiman et al., (2023)** [31] who evaluated the nursing students' anxiety during electronic exams and reported that, about two-thirds of the participants aged 22 years and nearly two-thirds of them were females. Moreover, this finding was in the same line with a study done by **Aljawarneh's, (2020)** [32] who found that more than three-quarters of the sample were females.

Considering students' perception regarding electronic exam, the current study revealed that more than two-thirds of studied students respectively agreed that E- exam question format is suitable, E-exam helps them to control their time while taking the exam, E-exam results can be obtained faster, and E-exam preparation requires less effort than paper based exam. These study findings were supported by **Shraım, (2019)** [33] who assessed the learner's perspective regarding the online exam in Palestine and reported that more than half of the learners agreed that the electronic exam question format is easier, and its results appeared faster than paper-based exam.

Also, **Kundu&Bej, (2021)** [34] who explored an Indian student perception regarding the E-exam and reported that more than two-thirds of the students agreed that-exam is an effective examination tool that enables them to track their time during the exam, and the time required for e-exam was less than paper exam. This can be explained as most of the E-exam questions are MCQ questions which require less time and effort to answer than open ended questions in the paper-based exam.

Meanwhile, the current study revealed that more than half of the studied students disagreed that E-exam reflects their full performance and expression skills, and E-exam is suitable for every course. This result was in the same line with **Valdez & Maderal, (2021**) [35] who studied the Philippines students' perception toward electronic assessment and revealed that the electronic assessment was suitable for specific courses only. Also, **Shraım, (2019)** [33] found that E-exam is not appropriate for all

courses. This is because nursing faculty is one of the clinical facilities and most of the courses require a practical assessment or clinical skills, in contrast with theoretical facilities that depend commonly on knowledge assessment rather than skills.

As regard to the studied student's level of anxiety regarding electronic exam, the current study finding show that, more than two- thirds of the studied students had a moderate level of anxiety, and only low percentage of them had a high level of anxiety. This finding was in agreement with **Khoshhal et al., (2017)** [(36)] who revealed that around two-thirds of students had a moderate anxiety when undergoing electronic exams. Furthermore, in a report by **Amer, (2020)** [(27)] who assessed the effectiveness of e-exams in Saudi Universities and found that e-exam didn't reduce the anxiety associated with the assessment process. This can be explained as the e-exam is a new technology that has been introduced recently in educational institutions and the students did not have any experiences before regarding this evaluation method, so it is normally for the students to experience anxiety.

According to the current study's findings, the highest percentage of students strongly agreed that the exam schedule had been announced earlier and at a suitable time, that electronic exams had provided opportunities for students to express their opinions, and that they preferred electronic exams to the traditional method. Additionally, more than half of them stated that the electronic exam questions were understandable, appropriate to the course, and did not exceed the content of the announced course. This conclusion was comparable to **Tawafak et al., (2019)** [(37)] assessment of the effectiveness of the e-learning model for students in higher education universities, which revealed that most students were quite satisfied with electronic tests due to their simplicity.

The results of the present study clarified that, nearly two- thirds of the studied students had a higher satisfactory level regarding the electronic exam. These results were in accordance with **Omran et al., (2022)** [(38)] **who** assess facilitators and barriers of electronic exams by nursing students and reported that more than two-thirds of the nursing students had a higher level of satisfaction regarding electronic exams. In addition, this finding consistence with a study done by **Donovan et al., (2019)** [(39)] who evaluate the online vs. traditional course and revealed that more than four-fifth of students preferred electronic exam as a method of evaluation.

As regards to the barriers of electronic exam from student perspectives, the current study revealed that power cuts during the exam, failure of computer, application or server fail during exams, cheating between students and lack of availability of electronic exam labs in nursing faculty were the main barriers of E-exam. These findings were supported by **Oladimeji et al., (2017)** [(40)] study that evaluated Nigerian students' perception regarding e-exam and found that electricity or server connection concerns are the major barrier of e- exam, also electronic exam is associated with cheating among students. In addition **Chirumamilla et al., (2020)** [(28)] who assessed cheating differences in e-exam and paper exam among students and staff in Norway universities and revealed that both students and teachers perceived that cheating as easier with e-exams than paper exam

While, the present study results were in disagreement with **Amer,(2020)** [(27)] who found that electronic exam hinders students from cheating. This disagreement may be due to the difference in designing of the examination halls

including distance among students, arrangement of the questions, and number of observers during the exam.

Concerning relations between study variables, the study results showed that there was no statistically significant association between the studied students' personal characteristics like gender and their electronic exam anxiety scale. This finding indicated that the electronic exam anxiety levels didn't affect by sex. This finding was agreed with a study by **Sreedevi et al., (2016)** [41] which reported that there is no statistically significant difference between females and males in exam anxiety levels.

Furthermore, the current study findings revealed that there was a highly statistically significant association between the number of online courses and levels of anxiety as most of studied students who had three or more online courses had a low level of anxiety. This finding was supported by **Eltahir et al., (2022)** [42] who studied implementation of E-exams during the COVID-19 pandemic at Ajman University and discovered that students who took a lot of online courses experienced less anxiety.

Regarding the association between anxiety scores and students' perception and satisfaction regarding electronic exam, the current study finding clarified that, there was a statistical significant negative correlation between students' perception and electronic exam anxiety score. Also, there was a statistical significant negative correlation between students' satisfaction and anxiety scores. While, there were a statistical significant positive correlation between students' perception and satisfaction regarding electronic exam.

These results were in agreement with a study conducted by **Elsalem et al., (2020)** [43] who assess stress and behavioral changes with remote E-exams during the COVID-19 and reported that there a significant negative association between students' anxiety and satisfaction as the greater the satisfaction level, the lower anxiety scores. Furthermore, the present study finding was supported by **Sulaiman et al., (2023)** [31] who clarified the there was a significant negative correlation between electronic exam anxiety levels and the participants' perception. Also, there was a significant positive correlation between participants' perception and satisfaction toward e-exam as their level of the perception increases, their satisfaction increases.

Limitations of the study

During the research process, no limitations were presented.

Conclusions

The present study concluded that more than two-thirds of studied students agreed that E-exam question format was suitable, E-exam helped them to control their time during taking the exam, E-exam results can be obtained faster, and preparation for E-exam required less effort than paper based exam. Also, more than half of studied students were highly satisfied with electronic exam. More than half of them were strongly agreed that the schedule of the e-exams was announced earlier and in an appropriate date, electronic exams allowed times for their opinion to be taken and they preferred electronic exams than the paper-based exam.

However, e-exam is associated with certain psychological aspects as nearly one third of studied students were nervous and fearful about the unknown aspect of electronic mode of examinations for several days before the exam. Moreover, about one third of them were worried and anxious that they might not be able to successfully access or upload the question in

their time. Furthermore; there are certain barriers that were associated with e-exam as power cuts, server failure during the exam. Also, about half of them studied students disagreed that electronic exam doesn't reflect full performance and expression skills and it is not suitable for every course.

Recommendations

Depending on the current study findings, the followings are recommended:

1. Conducting a regular meeting with the students to provide a clear explanation and answer their questions related to the nature of electronic exam from the beginning of the semester.
2. Providing psychological support before and during conduction electronic exam to alleviate student's anxiety.
3. Explain to the students the availability of technical support and other alternatives that will be taken in case of (power cuts and server failure) to enhance their understanding and eliminate their fears.
4. Assessment of students' feedback regarding the E- exam is very crucial to identify any barriers and address these barriers in the next exams.
5. Providing training courses to the students to enhance their computer skills regarding electronic exams.

Further Research

6. Assess the effect of applying training courses for faculty members to improve their skills in establishment of E-Exam and introducing different format of questions.

Acknowledgment

Researchers would like to thank the 6th level maternity nursing students (Second semester, 2022-2023) for their cooperation during the research process.

Conflict of Interests

The researchers declared no potential conflicts of interest.

Funding

This research did not receive any specific grant from funding agencies to conduct the current research.

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