

Effect of Moodle Based Learning on Maternity Nursing Students' Knowledge and Skills Regarding Fundal Assessment During Puerperium

Naglaa Zaki Hassan Roma¹, Neama Saad Mahmoud², Yasmeen Mohamed Shehata³

^{1,2} Obstetric & Gynecological Nursing, Faculty of Nursing, Alexandria University

³ Nursing Education, Faculty of Nursing, Alexandria University

Abstract:

Background: Most postpartum complications are considered preventable if postpartum observation and examination is conducted effectively. Around 216 women died worldwide from 100,000 women due to postpartum complications. Thus, **Aim** of this research was to investigate effect of Moodle based learning on maternity nursing students' knowledge and skills regarding fundal assessment during puerperium. A Quasi- experimental research design was used. A simple random sample of 80 maternity nursing students was randomly divided into two equal group, namely; Moodle group and traditional group. The study was conducted at Obstetric and Gynecological Nursing clinical training laboratory and information technology laboratory at the Faculty of Nursing, Alexandria University and El-Shatby Maternity University Hospital. **Tools:** three tools were used: (1) Maternity nursing students' knowledge regarding fundal assessment during puerperium questionnaire, (2) Maternity nursing students' skills regarding fundal assessment during puerperium observational checklist and (3) Maternity nursing students' satisfaction about using Moodle based learning in performing fundal assessment during puerperium. **Results:** revealed a statistically significant difference between the study subjects regarding Moodle group in relation to their knowledge and skills immediately, two weeks and two months after teaching sessions. The study concluded that students using Moodle based learning had better knowledge and skills retention than those of the traditional group at all three time periods. It was recommended that replication of the same study in different Egyptian faculties of nursing to introduce the concept of Moodle based learning and explore its importance for undergraduate and postgraduate nursing students.

Keywords: Moodle based learning, maternity nursing students, knowledge, skills, fundal assessment and puerperium.

Introduction

The postpartum, postnatal or puerperium is one of the most important events that constitute a powerful experience in women's lives and lives of their families. It is also a period of disequilibrium that involves profound endocrine and general somatic as well as

psychological changes. This disequilibrium necessitates adequate continuous health supervision. Negligence of this crucial period may have negative consequences and ultimately add to maternal morbidity and mortality (Lowdermilk, Perry & Cashion, 2016).

Maternal mortality rate during puerperium is defined as the annual number of women deaths per 100,000 live births from any cause related to or aggravated by postpartum complications. Most postpartum complications are considered preventable if postpartum observation and examination is started effectively. Around 216 women died worldwide from 100,000 women due to postpartum complications. In Egypt are 37 maternal deaths per 100,000 deaths (**World Health Organization [WHO], 2017a**). Thus reduction of maternal deaths is one of the major objectives of several recent international strategies (**[WHO], 2019**).

Puerperium is the period following childbirth. Its duration is understandably inexact, but is considered to be between 4 and 6 weeks. In which the reproductive organs gradually return approximately to their non pregnant state which is known as “**involution**”. Particularly uterine involution comprises three processes are (1) muscle fibers contraction, (2) catabolism (the process of converting cells into simpler compounds), and (3) uterine epithelium regeneration. Involution begins immediately after delivery of the placenta, when uterine muscle fibers contract firmly around maternal blood vessels at the area where the placenta was attached. This contraction controls bleeding from the area left opened when the placenta separated. The uterus decreases in size as muscle fibers, which have been stretched for many months, contract and gradually regain their former contour and size (**Dutta's, 2015**).

The maternity nurses should assess the uterus for its weight, size and consistency through fundal assessment

and examination during puerperium. **Weight of uterus**, at full term the uterus weighs about 1000 g. so, immediately after birth, the uterus is still the same. By the end of the first week, it weighs 500 g, then by 2nd week 350 g. As the involution is complete (6th week), it weighs approximately 50 g, Similar to its pre-pregnancy weight (**Cunningham, 2014**). Moreover, **Size of the uterus**, the fundus descends by approximately 1 cm, or one finger breadth, per day. At the end of 1st week, the fundus is midway between umbilicus and symphysis pubis. Eventually by the end of 12th days postpartum, the fundus is just behind the symphysis pubis, and thereafter, it becomes a pelvic organ that cannot be palpated abdominally (**Stergios & Sir, 2016**). Furthermore, **Uterine consistency**, immediately following placental expulsion, the uterine fundus can be felt at or below the level of the umbilicus in the med line (central), globular, well contracted and felt as a hard or firm mass. Postnatal care is one of the most important maternal health care goals through fundal assessment and examination during puerperium for early detection of any complication as postpartum hemorrhage. The majority of deaths due to post-partum hemorrhage can be avoidable through the provision of timely and effective care (**Pillitteri, 2010**).

Obstetrics nursing is high hazard medical specialty and required nursing students to be proficient in many tasks, but opportunities to enhance proficiency are limited by many factors such as shortage of clinical faculty, lack access to clinical sites, decreased numbers of clinical areas available at specific dates and times and increase students' enrollment. Thus, these challenges affect students' preparation to be a competent and skillful nurse. As well as traditional teaching methods allow for knowledge

and skill acquisition, but do not always allow for these skills to adequately be applied in realistic environments. These factors place pressure on obstetrics nursing program opportunity to develop a curriculum that maximizes faculty instruction practice time. Therefore, clinical nurse instructors have curial role to prepare expert and competent graduate nurses for today's health settings, through incorporate innovative teaching strategies in clinical nursing education such as E-learning. ([WHO], 2017b).

E-learning is an innovative methodology for delivering well-designed, learner-centered, interactive, and facilitated learning environment. It is enable students to be independent, have a self-directed learning, self-discipline, incorporation of critical thinking and communication strategies in e-learning positively impacts on student satisfaction in a web-based course (Beeckman, Schoonhoven, Boucqué, Van Maele & Defloor, 2008; Wilkinson, While & Roberts, 2009). There are different sources for e learning approaches such as: video-conferencing, virtual classrooms, blended learning, web0.3, mobile learning and Moodle usage (Bloomfield, Roberts & While, 2010; "Sources of e learning in Alexandria University," 2020).

Moodle (Modular Object-Oriented Dynamic Learning Environment) is basically an Open Source e-learning platform. It is one of e-learning approaches, which found to be more effective than face-to-face instruction in terms of student achievement and positive attitudes ("Sources of e learning in Alexandria University," 2020).

The Moodle has several features that make its use applicable in education and training. It can facilitate self-directed learning and enhances critical thinking

through learning experiences and reflective activity which is often a challenging goal for most teachers in undergraduate programs. Moodle provides several opportunities for the clinical nurse instructors to transform from being 'the source of knowledge' to being a facilitator and a role model in the process of acquiring knowledge and skills through creating online courses (Osman & Ahmed, 2003).

Electronic Learning at Alexandria University seeks to achieve fast communication between student and professor and to provide more learning opportunities for more students to learn in responding to present day demands. Electronic Learning Center of Alexandria University was established in 2005 as one of the projects of the Development Projects Management Unit in the university. This project aims at producing number of electronic courses with electronic learning centers at Egyptian universities, besides to dissemination of electronic learning culture in governmental and special learning institutions. In addition, teaching staff members and students are being trained on different sources for e-learning approaches for interaction via network during studying electronic courses. Thus, the clinical nurse instructors are increasingly using computer assisted learning technology to enhance delivery of information and integrate blended learning into teaching-learning processes. This reduces instruction time, enhances effectiveness and mastery of learning, improves retention and increases student motivation, satisfaction and enjoyment in learning (Moodle Rooms, 2012; Tomás et al., 2016). Therefore, this paper intended to assess the effectiveness of using Moodle based learning on knowledge retention and clinical skills of

maternal fundal assessment among nursing students.

Aim of the study

This study aims to:

Investigate the effect of Moodle based learning on maternity nursing students' knowledge and skills regarding fundal assessment during puerperium.

Research hypotheses

1. Maternity nursing students who receive Moodle based learning regarding fundal assessment during puerperium demonstrate higher skills level than those who do not receive it.

2. Maternity nursing students who receive Moodle based learning regarding fundal assessment during puerperium exhibit higher knowledge level than those who do not receive it.

3. Maternity nursing students who receive Moodle based learning regarding fundal assessment during puerperium exhibit more skills and knowledge retaining than those who receive traditional clinical training.

Operational definition Moodle Based Learning: In this study MBL refers is one of e-learning approaches that facilitate use of computer as a learning method in obstetric and gynecological nursing. It enhances acquiring knowledge and skills through creating online courses.

Materials and Method

Materials

Research design:

A quasi experimental research design was used in this study.

Setting:

The study was conducted at two areas as the following:

1. Obstetric and Gynecological Nursing clinical training laboratory and information technology laboratory at Faculty of Nursing, Alexandria University which was used to train students on fundal assessment during puerperium.

2. El-Shatby Maternity University Hospital which is affiliated to Alexandria University. The postpartum department was the traditional clinical training setting which was used to train students on fundal assessment during puerperium.

Subjects:

Eighty students enrolled in the obstetric and gynecological nursing course represented the study sample. This was in the first semester of the academic year 2019-2020. The Epi info program was used to estimate the sample size based on 10% acceptable error, 95% confidence coefficient, 50% expected frequency and a population size of 180. The program revealed that the minimum sample size is 79.

Tools:

Three tools were used to collect the necessary data in the current study:

Tool I: Maternity Nursing Students' Knowledge Regarding Fundal Assessment during Puerperium Questionnaire.

This tool was developed by the researchers after extensive review of recent, current & relevant literatures

(Mohammad & Khaleel, 2019). It included two parts:

Part I: This part included data about maternity nursing students' socio-demographic and professional profile such as: age, sex, residence, academic degree and last GPA (grade point average).

Part II: Maternity nursing students' knowledge regarding fundal assessment during puerperium: It consisted of 6 main domains of knowledge about the fundal assessment during puerperium as follows: General knowledge as definitions of involution, sub-involution and hyper-involution (N=3), weight of the uterus (N=4), size of the uterus (N=3), Consistency of the uterus (N=1), the involution process (N=2) and factors affecting involution process (N=8).

- Maternity nursing students' response was evaluated based on three points Likert Scale in which: incorrect answers = 1, correct but incomplete answers = 2 and correct and complete answers = 3.

The total score was ranged from 25-75.

Maternity nursing students' knowledge was ranked as follows:

- Poor for the total score < 41.
- Fair for the total score 41 - 57.
- Good for the total score ≥ 58.

Tool II- Maternity Nursing Students' Skills Regarding Fundal Assessment during Puerperium Observational Checklist:

This tool was developed by the researchers after extensive review of recent, current & relevant literatures ([WHO], 2014; Yaekob, Shimelis, Henok & Abota, 2015) to appraise the maternity

nursing students' skills regarding the fundal assessment during puerperium in a form of checklist. It covered 7 domains of the fundal assessment during puerperium as follows: preparation (N=5), palpate uterus position (N=1), palpate uterus consistency (N=1), assess of puerperium for REEDA scale: (R) redness, (E) edema, (E) echomosis, (D) discharge and (A) approximation (N=1), skills regarding management of atonic uterus (N=4), reassessment of uterus and puerperium (N=1) and post care (N=5).

- Maternity nursing students' performance was evaluated based on three points Likert Scale in which: Not done = 1, incompletely done = 2 and completely done = 3.

- The total scores for skills items ranged from 18-54, the level of maternity nursing students' skills was categorized as follows:

- Poor for the total score < 30.
- Fair for the total score 30 - 42.
- Good for the total score ≥ 43.

Tool III- Maternity Nursing Students Satisfaction about Using of Moodle based Learning Strategy in Performing Fundal Assessment during Puerperium:

This tool was adapted from (Omer, 2016) to measure the maternity nursing student's satisfaction with the Moodle based Learning. It contained 15 statements. Each one was scored on a three-points Likert scale ranging from 1-3.

▪ Highly satisfied (3), moderately satisfied (2) and low satisfied (1).

For each subject the total scores ranged from 15- 45. Accordingly, each

subject satisfaction level was categorized as follow:

- Low satisfaction level < 25.
- Moderate satisfaction level 25- 35.
- Highly satisfaction level \geq 36.

METHOD

The study was conducted according to the following steps:

1. Formal consent from The Research Ethics' Committee of Alexandria Faculty of Nursing was obtained before conducting the research.

2. Written permissions to conduct the study were obtained from the head of the Obstetric & Gynecologic Nursing Department and the medical director of El-Shatby Maternity University Hospital after explaining the purpose of the study.

3. The research team attended serial workshops about using Moodle based learning by expert person.

4. Tool (I &II) were developed by the researchers after extensive review of recent, current & relevant literatures ([WHO], 2014; Yaekob et al., 2015; Mohammad & Khaleel, 2019).

5. Tools III was adapted by the researcher from (Omer, 2016).

6. All tools were submitted to three experts in the related field to assess its content validity then the necessary modifications were done. The content validity index was=0.84 and the acceptable level 0.8.

7. The reliability of tools (I, II &III) was accomplished to measure the internal consistency of their items by using test & retest technique. Reliability coefficient

for knowledge scale = 0.830. Reliability coefficient for practices scale = 0.860 while reliability coefficient for satisfaction scale =0.897.

8. Eighty students from student's list were randomly selected. Then, students were randomly assigned to two equal groups as follows:

- **Moodle group:** which contained 40 students who received their training about fundal assessment during puerperium using Moodle based learning.

- **Traditional group:** which contained 40 students who received their training about fundal assessment during puerperium through traditional methods on static simulator model and actual postpartum women in the hospital setting.

9. A pilot study was done on 8 maternity nursing students (4 students were trained using Moodle based learning and 4 were trained on actual postpartum women) to test the clarity, feasibility & applicability of the tools and the necessary modifications were done accordingly. Pilot study participants were excluded from the study.

10. The data were collected at the first semester of the academic year 2019-2020 over a period of four months starting at the 10th October 2019 and ending at 25th January 2020.

11. The program was developed through the following phases:

Phase (1): Preparation:

During this phase, the researchers prepared the needed content depending on the pretest results:

1. Students and website preparation:

a. A list of student identifications was imported to the database to confirm students creating user accounts.

b. The home page of the website included a welcome message, contact information, including a phone number and a user account form.

c. Students could access the online course after their ID and password were verified.

d. The website included the online knowledge pre-test and answers were recorded automatically. While, their skills pre-test was done in obstetric & gynecologic nursing laboratory.

2. Theoretical part: regarding fundal assessment converted to Power Point presentation, static pictures, and pre-recorded videos, were uploaded to the website; this formed the basis of web-based learning procedures.

Phase (2): Implementation phase:

- Moodle group:

a. The students were informed in detail about the registration process and use of the website. The website was activated in November 2019 and kept open for 2 weeks.

b. After registering, the students access the course through internet at any time within the 2 weeks period. At the end of the 2 weeks the system was automatically and temporarily closed.

- Traditional group: were studying using traditional method of

teaching. After the web-based education was completed the students in traditional group were practice the fundal assessment by using traditional method of teaching: instructor demonstration of fundal assessment procedure in obstetric & gynecologic nursing laboratory on static simulator model and actual postpartum women in the hospital setting.

- Phase (3): Debriefing:

Closely, following the Moodle based training; the researchers provided a debriefing as an intuitive activity. This lasted about 10-20 minutes; it included constructive feedback, correction, and clarification about the fundal assessment.

Phase (4): Evaluation:

Knowledge and skills related to fundal assessment procedure were evaluated three times for all students in both groups, immediately following the teaching session, after two weeks and two months later. The difference between both pre-test and post-test among both groups was calculated to detect the effect of the intervention.

Ethical considerations:

For each recruited subject the following issues were considered: securing the subject's informed written consent, keeping her privacy and right to withdraw at any time as well as assuring confidentiality of her data.

Statistical analysis: Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using mean, standard deviation.

Significance of the obtained results was judged at the 5% level. The used tests were Chi-square test, Fisher's Exact or Monte Carlo correction, Friedman test and Pearson coefficient test.

Results

Table (1) indicates absence of any statistically significant differences between the study subjects in relation to their age, sex, original residence, previous academic achievement and last GPA. Specifically, the vast majority of the Moodle and traditional group (87.5% & 92.5%) were 20 to less than 22 years old, had secondary certificate and near to three quarter (72.5 & 67.5 %) of them were male respectively. While the rest of both groups aged between 22 to 26 years old, had technical nursing institute degrees, and were female respectively. In relation to original residence, the table also presents the majority of the students (85% & 72.5%) in the Moodle & traditional group were urban dwellers, while 15% & 27.5% of them were rural dwellers. Moreover, last GPA reveals that half and more (52.5 & 42.5%) of the Moodle and traditional group obtained a grade of B- and one quarter 25% of them obtained a grade of B, compared to only 15% and (2.5 & 10%) of them obtained a grade of C+ and B+ respectively.

Table (2) represents that both Moodle and traditional group had improvement in their knowledge regarding **fundal assessment during puerperium** after providing teaching session. Where, students of Moodle group retained more skill than those of traditional group all over the three period of the study. A Statistically significant difference was found between the two groups regarding to Moodle group immediate, after two weeks and after two months later $P = (0.007, 0.001 \text{ \& } 0.001)$

respectively. This reveals that long retention of knowledge among students of Moodle training program was better than that in the traditional group.

Table (3) shows the number and percent distribution of the Moodle and traditional groups according to their total score of knowledge regarding fundal assessment during puerperium. In relation to **Moodle group**, before providing teaching session, most (90 %) of students had poor total scores of knowledge and only 10% of them had fair total score of knowledge. After providing teaching session, students showed improvement all over the three period of the study where 92.5%, 87.5% & 80% respectively exhibit good total scores. Statistically significant difference was found before intervention and immediately after ($P= 0.001$). On the others hand, there were no statistically significant differences between immediately after and after two weeks ($P = 0.795$), among the Moodle group. In addition, there were no statistically significant differences between immediately after and after two months ($P = 0.488$), among the Moodle group. The same table reveals that, the vast majority (95%) of **traditional group** had poor total knowledge scores and only 5% of them had fair total score of knowledge. Immediately after the intervention, they presented improvement in their knowledge where about more than two third (65%) achieving a good total practice score. Two weeks after intervention, a clear decrease was observed in their total knowledge score. Where 50% of them had good total score of knowledge. A further sharp decline in their knowledge was observed after two months of providing teaching session where 37.5% of them had good total score. Statistically significant difference was found before intervention and immediately after ($P= 0.001$). On the

others hand, there were no statistically significant differences between immediately after and after two weeks ($P = 0.363$), among the traditional group. In addition, there were no statistically significant differences between immediately after and after two months ($P = 0.109$), among the traditional group.

Table (4) illustrates that both Moodle group and traditional groups had improvement in their skills regarding **fundal assessment during puerperium** after providing teaching session. Where, students of Moodle group retained high skill score than those of traditional group all over the three period of the study. A Statistically significant difference was found between the two groups immediate, after two weeks and after two months later $P = (0.034, 0.006 \& 0.022)$ respectively. This denotes that long retention of skill among students of Moodle based learning was better than that in the traditional group.

Table (5) represents the number and percent distribution of the Moodle and traditional groups according to their total score of skills regarding fundal assessment during puerperium. In relation to **Moodle group**, before providing teaching session, most (90 %) of students had poor total scores of skills and only 10% of them had fair total score of skills. After providing teaching session, students showed improvement all over the three period of the study where 92.5%, 87.5% & 72.5% respectively exhibit good total scores. Statistically significant difference was found before intervention and immediately after ($P= 0.001$). On the others hand, there were no statistically significant differences between immediately after and after two weeks ($P = 0.795$), among the Moodle group. In addition, there were no statistically significant differences between

immediately after and after two months ($P = 0.279$), among the Moodle group. The same table reveals that, the vast majority (95%) of **traditional group** had total scores of skills and only 5% of them had fair total score of skills prior to the traditional intervention. Immediately after the intervention, they presented improvement in their skills where about the three quarter (75%) achieving a good total skills score. Two weeks after intervention, a clear decrease was observed in their total skills score. Where 57.5% of them had good total score of skills. A further decrease in their skills were observed after two months of providing teaching session where 55% of them had good total score. A statistically significant differences were evident across the three time periods with an initial increase immediately after teaching ($p= 0.001$), followed by significant declines after two weeks and two months ($p = 0.260 \& 0.091$) respectively.

Considering to table (6) no significant correlation was found between students' knowledge and their skills regarding fundal assessment during puerperium either immediately after, after two weeks, two months later following providing teaching session. This indicates that students' knowledge had no effect on their skills regarding fundal assessment during puerperium for both groups.

Table (7): indicates the percentage distribution of Moodle group according to their level of satisfaction of Moodle strategy. It was obvious that the majority (85%) of the Moodle group got high satisfaction level toward Moodle strategy, while only 7.5 % of them obtained low and moderate satisfaction level respectively.

Table (8): Demonstrate the relationship between level of satisfaction

and barriers level of Moodle strategy among studied group. There was found significant negative correlation between level of satisfaction and barriers level of

Moodle strategy ($r = 0.443$, $p = 0.004$). It that mean when the barriers level decreased the satisfaction will be improved.

Table (1): Number and percent distribution of the study subjects according to their socio-demographic characteristics.

| Socio-Demographic data | Moodle group (n=40) | | Traditional group (n=40) | | 2(P) |
|-------------------------------|---------------------|------|--------------------------|------|------------------------------------|
| | No | % | No | % | |
| Age (years): | | | | | |
| • 20- | 35 | 87.5 | 37 | 92.5 | 1.186 MC _p =(0.714) |
| • 22- | 4 | 10.0 | 3 | 7.5 | |
| • 24-26 | 1 | 2.5 | 0 | 0.0 | |
| Sex | | | | | |
| • Male | 29 | 72.5 | 27 | 67.5 | 0.238(0.626) |
| • Female | 11 | 27.5 | 13 | 32.5 | |
| Original residence: | | | | | |
| • Urban | 34 | 85.0 | 29 | 72.5 | 1.867(0.172) |
| • Rural | 6 | 15.0 | 11 | 27.5 | |
| Academic degree: | | | | | |
| • Secondary | 35 | 87.5 | 37 | 92.5 | 0.556 FE _p = (0.712) |
| • Technical nursing institute | 5 | 12.5 | 3 | 7.5 | |
| Last GPA | | | | | |
| • A | 1 | 2.5 | 1 | 2.5 | 2.789 MC _p =(0.807) |
| • A- | 1 | 2.5 | 2 | 5.0 | |
| • B+ | 1 | 2.5 | 4 | 10.0 | |
| • B | 10 | 25.0 | 10 | 25.0 | |
| • B- | 21 | 52.5 | 17 | 42.5 | |
| • C+ | 6 | 15.0 | 6 | 15.0 | |

² (P): Chi-Square Test & P for ² Test

FET (P): Fisher Exact Test & P for FET-Test

*: Significant at $P \leq 0.05$

Table (2): Comparison of students' knowledge levels of the studied students regarding fundal assessment during puerperium before, and after the application of the program

| Total score of knowledge | Before | | Immediate | | After two weeks | | After two months | | | | | | | | | |
|--------------------------|--------------------------------|------|-------------------|------|---------------------------------|------|-------------------|------|----------------------------------|------|----|------|----------------------------------|------|----|------|
| | Moodle group | | Traditional group | | Moodle group | | Traditional group | | | | | | | | | |
| | No | % | No | % | No | % | No | % | | | | | | | | |
| Poor | 36 | 90.0 | 38 | 95.0 | 0 | 0.0 | 3 | 7.5 | 0 | 0.0 | 6 | 15.0 | 0 | 0.0 | 7 | 17.5 |
| Fair | 4 | 10.0 | 2 | 5.0 | 3 | 7.5 | 11 | 27.5 | 5 | 12.5 | 14 | 35.0 | 8 | 20.0 | 18 | 45.0 |
| Good | 0 | 0.0 | 0 | 0.0 | 37 | 92.5 | 26 | 65.0 | 35 | 87.5 | 20 | 50.0 | 32 | 80.0 | 15 | 37.5 |
| (p) | 0.721 (FE _p =0.675) | | | | 9.033*(MC _p =0.007*) | | | | 14.365*(MC _p <0.001*) | | | | 17.274*(MC _p <0.001*) | | | |

χ^2 : Chi square test MC: Monte Carlo FE: Fisher Exact

p: Significance between study subjects in each period

*: Statistically significant at $p \leq 0.05$

Table (3): Comparison of students' knowledge levels of the studied students regarding fundal assessment during puerperium before, and after the application of the program.

| Total score of knowledge | Moodle group | | | | | | | | Traditional group | | | | | | | |
|--------------------------|-------------------|------|-----------|------|---------------|------|----------------|------|-------------------|------|-----------|------|---------------|------|----------------|------|
| | Before | | Immediate | | After 2 weeks | | After 2 months | | Before | | Immediate | | After 2 weeks | | After 2 months | |
| | No | % | No | % | No | % | No | % | No | % | No | % | No | % | No | % |
| Poor | 36 | 90.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 38 | 95.0 | 3 | 7.5 | 6 | 15.0 | 7 | 17.5 |
| Fair | 4 | 10.0 | 3 | 7.5 | 5 | 12.5 | 8 | 20.0 | 2 | 5.0 | 11 | 27.5 | 14 | 35.0 | 18 | 45.0 |
| Good | 0 | 0.0 | 37 | 92.5 | 35 | 87.5 | 32 | 80.0 | 0 | 0.0 | 26 | 65.0 | 20 | 50.0 | 15 | 37.5 |
| Fr (p) | 100.415*(<0.001*) | | | | | | | | 92.510*(<0.001*) | | | | | | | |
| p ₁ | <0.001* | | | | | | | | <0.001* | | | | | | | |
| p ₂ | 0.795 | | | | | | | | 0.363 | | | | | | | |
| p ₃ | 0.488 | | | | | | | | 0.109 | | | | | | | |

Fr: Friedman test, Sig. bet. periods were done using Post Hoc Test (Dunn's)

P1: Significance between before and immediately after.

P2: Significance between immediately after and after two weeks.

P3: Significance between immediately after and after two months.

*: Statistically significant at $p \leq 0.05$

Table (4): Comparison of students' skill levels of the studied students regarding fundal assessment during puerperium before, and after the application of the program.

| Total score of skills | Before | | Immediate | | | | After two weeks | | | | After two months | | | | | |
|-----------------------|--------------------------------|------|-------------------|------|----------------|------|-------------------|------|---------------------------------|------|-------------------|------|---------------------------------|------|-------------------|------|
| | Moodle group | | Traditional group | | Moodle group | | Traditional group | | Moodle group | | Traditional group | | Moodle group | | Traditional group | |
| | No | % | No | % | No | % | No | % | No | % | No | % | No | % | No | % |
| Poor | 36 | 90.0 | 38 | 95.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 | 7.5 | 0 | 0.0 | 2 | 5.0 |
| Fair | 4 | 10.0 | 2 | 5.0 | 3 | 7.5 | 10 | 25.0 | 5 | 12.5 | 14 | 35.0 | 11 | 27.5 | 20 | 50.0 |
| Good | 0 | 0.0 | 0 | 0.0 | 37 | 92.5 | 30 | 75.0 | 35 | 87.5 | 23 | 57.5 | 29 | 72.5 | 18 | 45.0 |
| (p) | 0.721 (MC _p =0.675) | | | | 4.501*(0.034*) | | | | 9.290*(MC _p =0.006*) | | | | 6.756*(MC _p =0.022*) | | | |

χ^2 : Chi square test MC: Monte Carlo

p: Significance between study subjects in each period

*: Statistically significant at $p \leq 0.05$

Table (5): Comparison of students' practice levels of the studied students regarding fundal assessment during puerperium before, and after the application of the program.

| Total score of Skills | Moodle group | | | | | | | | Traditional group | | | | | | | |
|-----------------------|------------------|------|-----------|------|---------------|------|----------------|------|-------------------|------|-----------|------|---------------|------|----------------|------|
| | Before | | Immediate | | After 2 weeks | | After 2 months | | Before | | Immediate | | After 2 weeks | | After 2 months | |
| | No | % | No | % | No | % | No | % | No | % | No | % | No | % | No | % |
| Poor | 36 | 90.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 38 | 95.0 | 0 | 0.0 | 3 | 7.5 | 2 | 5.0 |
| Fair | 4 | 10.0 | 3 | 7.5 | 5 | 12.5 | 11 | 27.5 | 2 | 5.0 | 10 | 25.0 | 14 | 35.0 | 16 | 40.0 |
| Good | 0 | 0.0 | 37 | 92.5 | 35 | 87.5 | 29 | 72.5 | 0 | 0.0 | 30 | 75.0 | 23 | 57.5 | 22 | 55.0 |
| Fr (p) | 98.406*(<0.001*) | | | | | | | | 93.990*(<0.001*) | | | | | | | |
| p ₁ | <0.001* | | | | | | | | <0.001* | | | | | | | |
| p ₂ | 0.795 | | | | | | | | 0.260 | | | | | | | |
| p ₃ | 0.279 | | | | | | | | 0.091 | | | | | | | |

χ^2 : Chi square test MC: Monte Carlo *: Statistically significant at $p \leq 0.05$

Fr: Friedman test, Sig. bet. periods were done using Post Hoc Test (Dunn's)

P1: Significance between before and immediately after.

P2: Significance between immediately after and after two weeks.

P3: Significance between immediately after and after two months.

Table (6): The relationship between the studied students' knowledge and skills across the study phases:

| Items | Pearson's r Correlation Coefficient | Significance |
|---|-------------------------------------|--------------|
| Preprogram knowledge – Preprogram skills | 1.000* | <0.001* |
| Post 1 program knowledge- Post 1 program skills | 1.000* | <0.001* |
| Post 2 program knowledge- Post 2 program skills | 1.000* | <0.001* |
| Post 3 program knowledge- Post 3 program skills | 0.812* | <0.001* |

* Statistically significant at $p \leq 0.05$

Table (7): distribution of the studied cases according to level of satisfaction in Moodle group (n=40)

| Level of satisfaction | No. | % |
|-----------------------------|-----|------|
| Low satisfaction level | 3 | 7.5 |
| Moderate satisfaction level | 3 | 7.5 |
| High satisfaction level | 34 | 85.0 |

Table (8): relationship between the studied students' satisfaction level and barriers of Moodle strategy

| Satisfaction level | Low | | Moderate | | High | |
|-----------------------------|-----|-------|-----------------|------|------|------|
| | No | % | No | % | No | % |
| Low satisfaction level | 0 | 0.0 | 0 | 0.0 | 3 | 21.4 |
| Moderate satisfaction level | 0 | 0.0 | 1 | 12.5 | 2 | 14.3 |
| High satisfaction level | 18 | 100.0 | 7 | 87.5 | 9 | 64.3 |
| (^{MC} p) | | | 7.839*(0.026*) | | | |
| r _s (p) | | | -0.443*(0.004*) | | | |

 χ^2 : Chi square test

MC: Monte Carlo

r_s: Spearman coefficient*: Statistically significant at $p \leq 0.05$

Discussion

The growing popularity of the internet and the rapid advances in web-based technologies has extended the pedagogical boundaries of teaching and learning, particularly in higher education; therefore effective usage of Moodle as a Learning Management System is essential to fully benefit from the application of e-learning in nursing education (Harerimana et al., 2016). The present study was emphasized the usage of Moodle based learning in the clinical training of obstetric nursing students about the fundal assessment procedure in order to overcome the challenges of applying traditional training settings and

the obstacles that facing the students in their training experiences. The results of the current study exhibited that students who had received training program about the fundal assessment procedure using the Moodle based learning had more knowledge retention than those who received the traditional clinical training in all over the three period of the study. A statistically significant difference was found between the two groups immediate, after two weeks and after two months later. This may be due to the Moodle based using different multimedia modalities, strengthening students' interest and motivation which enhanced the students' concentration and engagement in the learning process. Additionally, Moodle was perceived by

obstetric nursing students as convenient, easy, cheap, manageable and portable strategy that could help them improve their knowledge and enhances critical thinking through learning experiences and reflective activity.

This finding was in agreement with the study of **Harerimana and Mtshali (2018)**, They had conducted a study about **"Implementing E-Learning in Resource-Constrained Nursing Education Institutions in Rwanda"**. They conducted an exploratory qualitative method to present the intervening conditions that influence the implementation of e-learning in nursing education institutions. Their results demonstrated that it is essential to improve the digital literacy of the users and to enhance the utilization of Moodle as a Learning Management System. Furthermore, the current result is relatively similar to a study of **Minolin (2013)**, who They had conducted a study entitled **"A comparison of two instructional methods to teach obstetrical palpation for antenatal mothers among B.Sc II year students"**. Their results indicated that knowledge on obstetrical palpation among students in web-based group is higher than the traditional group students.

On the other hand, **Lu, Lin and Li (2009)** carried out a study titled **"Effects of a Web-Based Course on Nursing Skills and Knowledge Learning"**. their results showed that knowledge level among students in the Web-based group was significantly lower than that of students in the traditional group. Also, **Eaton-Spiva and Day (2011)** conducted a study about **"Effectiveness of a computerized educational module on nurses' knowledge and confidence level related to diabetes"**. they reported that nurses had a slight improvement in

knowledge, skill, and self -confidence related to diabetes after the computer-based learning intervention, however, there was no statistically significant differences between both groups.

The results of the present study concluded that students who had received a training program about the fundal assessment procedure using the Moodle based learning had more skill retention than those received the traditional clinical training all over the three period of the study, with a statistically significant difference was found between the two groups regarding Moodle group immediate, after two weeks and after two months later. This may be due to availability of multiple training chances that provided to students using the Moodle based learning for them all the time, which is difficult to be found in the hospital settings.

This result is consistent with the findings of **Yoshino et al. (2018)** they had conducted a study titled **" Outcome Evaluation of Web Based Learning and Continuing Education Program for Maternal and Child Health Nursing and Other Professionals in Mongolia"**. They found that all of their groups of students had gained significantly higher performance skills and they put great emphasize on providing a feedback mechanism after each seminar to make sure the knowledge and skills were understood correctly. Moreover, this result in the light with **Ali and John (2019)** who carried out a study about **"Examining the Efficacy of Online Self-Paced Interactive Video-Recordings in Nursing Skill Competency Learning: Seeking Preliminary Evidence Through an Action Research"**. They concluded that Online video learning usage as a supplement in nursing instruction is well supported and offers a promising

alternative in teaching clinical skills compared with other traditional teaching strategies. Moreover, Vaona et al. (2018) they had conducted a systemic review about "E-learning for health professionals". They reported that e-learning offers great benefits but, equity should be considered carefully such as: poor access, language barriers, and lack of computer and internet literacy could limit or prevent the participation of some health professionals, especially in low and middle-income countries. These limitations might prevent e-learning from becoming the norm.

Regarding to the total score of knowledge and practice, the current study shows that students who had clinical training using the Moodle based learning shows higher scores of knowledge and skills rather than those received the traditional clinical training. This is due to now nursing students live in the digital economy all the time, where advantages of computer-based learning satisfy their learning curiosity, Moodle creates a rich environment for active students' learning, which leads to increasing the knowledge and skills retention as well as competency among the Moodle group.

The current result shows that the majority (85%) of the Moodle group had high satisfaction level toward Moodle strategy. This in in line with Nagy (2018) they had investigated "The evaluation of Online Video Usage and Learning Satisfaction: An Extension of the Technology Acceptance Model " to examine the determining factors of students' video usage and their learning satisfaction related to the supplementary application of educational videos, accessible in a Moodle environment. He found that high level of satisfaction

regarding the usage and application of educational videos in a Moodle strategy. Finally, in the present study was found significant negative correlation between level of satisfaction and barriers level of Moodle strategy ($r = 0.443$, $p = 0.004$). This is due to when the E-learning materials were available for the student all the time the satisfaction will be improved for them.

Conclusion

Based on the results of the current study, it can be concluded that, students who received the clinical training about fundal assessment procedure during puerperium using Moodle based learning exhibit higher scores of knowledge and skills' retention than those who received the traditional clinical training with a statistically significant difference along the three times of measurements over a period of two months after the implementation of the training program. Therefore, the research hypotheses are accepted.

Recommendations

Replication of the same study in different Egyptian faculties of nursing to introduce the concept of Moodle based learning and explore its importance for undergraduate and postgraduate nursing students.

Conflict of interest

There were no conflicts of interest.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article

References

- Ali, N.S., & John, B. (2019).** Examining the Efficacy of Online Self-Paced Interactive Video-Recordings in Nursing Skill Competency Learning: Seeking Preliminary Evidence Through an Action Research. *Medical Science Educator*, 29(2), 463-473.
- Beeckman, D., Schoonhoven, L., Boucqué, H., Van Maele, G., & Defloor, T. (2008).** Pressure ulcers: e-learning to improve classification by nurses and nursing students. *Journal of clinical nursing*, 17(13), 1697-1707.
- Bloomfield, J., Roberts, J., & While, A. (2010).** The effect of computer-assisted learning versus conventional teaching methods on the acquisition and retention of handwashing theory and skills in pre-qualification nursing students: a randomised controlled trial. *International journal of nursing studies*, 47(3), 287-294.
- Cunningham, F. (2014).** *Wilimms in Obstetrics (23rd ed.)*. New York: Walters Kluwer Co.
- Doaa, M., Kamilia, R., Ahmed, R., & Randa, M. (2018).** Mother's Personal Care during Post Partum Period. *Egyptian Journal of Health Care*, 9(2), 48-60.
- Dutta's, D. (2015).** *DC Dutta's Textbook of Obstetrics: Including Perinatology and Contraception*. London: Jaypee Brothers Medical Pub.
- Eaton-Spiva, L., & Day, A. (2011).** Effectiveness of a computerized educational module on nurses' knowledge and confidence level related to diabetes. *Journal for nurses in staff development*, 27(6), 285-289.
- Harerimana, A., Mtshali, N.G., Ewing, H., Maniriho, F., Kyamusoke, E., Mukankaka, A., & Mugarura, J. (2016).** E-learning in nursing education in Rwanda: Benefits and challenges. An exploration of participants' perceptives. *IOSR J Nurs and Health Sc*, 5(3), 64-92.
- Harerimana, A., & Mtshali, N.G. (2018).** Implementing e-learning in resource-constrained nursing education institutions in Rwanda. *Journal of Nursing and Health Sciences*, 4, 1-14.
- Lu, D.F., Lin, Z.C., & Li, Y.J. (2009).** Effects of a Web-based course on nursing skills and knowledge learning. *The Journal of nursing education*, 48(2), 70-77.
- Lowdermilk, D., Perry, S., Cachion, K. (2016).** *Maternity and women healthcare (11th ed)*. St. Louis: Elsevier Health Sciences. 301-3.
- Minolin, M. (2013).** A comparison of two instructional methods to teach obstetrical palpation for antenatal mothers among B.Sc II year students. *IOSR Journal of Research and Method in Education*, 3(6), 41-44.
- Mohammad, H.N., & Khaleel, M.A. (2019).** Assessment of Nurse Midwives Knowledge Regarding Nursing Care of Post-partum Hemorrhage at Al-Najaf AL-Ashraf City Hospitals. *Indian Journal of Public Health Research & Development*, 10(10), 2953-2956.
- Moodle rooms. (2012).** About Moodle. Retrieved from <http://www.moodlerooms.com/resources/moodle-resources/>. Retrieved on 22-1-2020
- Nagy, J. (2018).** Evaluation of Online Video Usage and Learning Satisfaction: An Extension of the Technology Acceptance Model. *The International Review of Research in Open and Distributed Learning*, 19(1), 1-26.
- Omer, T. (2016).** Nursing Students' Perceptions of Satisfaction and Self-Confidence with Clinical Simulation Experience. *Journal of Education and Practice*, 7(5), 131-138.

- Osman, M., & Ahmed, H. (2003).** Web-assisted instruction: Its potentials and impact on students' learning and attitudes. Paper presented at the Conference of the Center for Educational Technology (ETEX 2003). Oman: Sultan Qaboos University.
- Pillitteri, A. (2010).** Maternal & child health nursing: care of the childbearing & childrearing family (6th ed.). New York: Lippincott Williams & Wilkins.
- Sources of e learning in Alexandria University. (2020).** Retrieved from <http://www.alec.alexu.edu.eg/arservices.html>. Retrieved on 20-2-2020
- Stergios, K., & Sir, S. (2016).** Obstetrics and Gynecology Emergencies (2nd ed.). St. Louis: Elsevier Health Sciences.
- Tomás, C.C., Oliveira, E., Sousa, D., Uba-Chupel, M., Furtado, G., Rocha, C., . . . & Rama, L. (2016).** Proceedings of the 3rd IPEiria's International Health Congress : Leiria, Portugal. 6-7 May 2016. BMC health services research, 16 Suppl 3(Suppl 3), 200.
- Vaona, A., Banzi, R., Kwag, K.H., Rigon, G., Cereda, D., Pecoraro, V., . . . & Moja, L. (2018).** E-learning for health professionals. The Cochrane database of systematic reviews, 1(1), Cd011736.
- Wilkinson, A., While, A.E., & Roberts, J. (2009).** Measurement of information and communication technology experience and attitudes to e-learning of students in the healthcare professions: integrative review. Journal of advanced nursing, 65(4), 755-772.
- World Health Organization [WHO]. (2014).** Hospital care for mothers and newborn babies: quality assessment and improvement too (2nd ed.). Geneva, Switzerland: WHO.
- World Health Organization [WHO]. (2017a).** Trends in maternal mortality: 2000-2017: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division: executive summary (No. WHO/RHR/15.23). Geneva, Switzerland: World Health Organization.
- World Health Organization [WHO]. (2017b).** Managing complications in pregnancy and childbirth: a guide for midwives and doctors (2nd ed.). Geneva, Switzerland: WHO.
- World Health Organization [WHO]. (2019).** Transforming our world: the 2030 agenda for sustainable development. Geneva, Switzerland: WHO.
- Yaekob, R., Shimelis, T., Henok, A., & Abota, T. (2015).** Assessment Of Knowledge, Attitude, And Practice Of Midwives On Active Management Of Third Stage Of Labour At Selected Health Centers Of Addis Ababa, Ethiopia, 2014. Journal of Biology, Agriculture and Health care, 5(11), 232-240.
- Yoshino, Y., Willott, C., Gendenjamtz, E., Surenkhorloo, A., Islam, M., Sakashita, R., & Author, C. (2018).** Outcome Evaluation of Web Based Learning and Continuing Education Program for Maternal and Child Health Nursing and Other Professionals in Mongolia. Central Asian Journal of Medical Sciences, 4(4), 253-263.