

Impact of A designed Eye Care Protocol on Nurses Knowledge, Practices and on Eye Health Status of Unconscious Mechanically Ventilated Patients at North Palestine Hospitals.

*¹Imad Hussein Deeb Fashafsheh, ²WardaYousef Mohamed Morsy, ³Manal Sayed Ismaeel and ⁴Aidah Abu Elsoud Alkaiasi

1. Lecturer of Medical Surgical Nursing, Vice Dean-Faculty of Allied Medical Sciences, Arab American University Jenin- Palestine.
2. Professors of Critical Care and Emergency Nursing, Dean of the Faculty of Nursing - Cairo University
3. Professor of Critical Care and Emergency Nursing, Vice Dean of Education and Students Affairs.-Cairo University.
4. Assistant Professor in Anaesthesiology, An-Najah National University-Faculty of Medicine and Health Sciences-Nursing & Midwifery Department- Nablus-Palestine.
Email of the corresponding author: fashafsheh2001@yhao.com

Abstract

Patients in intensive care units are at high risk for eye problems due to the loss of normal physiologic defense mechanisms of the eyes in addition to the drawback effect of the mechanical ventilation & the use of sedations which leads to decrease tear production and increase evaporation due to eye lid opening. **Aim:** to examine the impact of a designed eye care protocol on nurses' knowledge, practices and on eye health status of unconscious mechanically ventilated patients at, Jenin, Tulkarm and Nablus Hospitals-North Palestine. **Quasi-experimental design** was used. **The study sample:** consists of 35 nurses (16 male and 19 female), age mean \pm SD 30.97 ± 7.90 , working in the ICU departments in three main governmental hospitals and 70 patients (45 male and 25 female), age mean \pm SD 57.02 ± 20.14 who fulfilled the inclusion criteria to be part of this research sample.. **Tools and Data collection:** data were obtained through three tools; Pre/Post knowledge questionnaire assessment schedule, eye care practices observational checklist, and eye health status assessment sheet. The educational, instructional, and demonstrational programs were designed according to nurse's educational needs; an illustrated booklet was also utilized. **Results:** There were statistical significant differences in the total knowledge scores regarding eye care of unconscious mechanically ventilated patients when pre-test Mean (SD) $1.553 \pm (0.210)$ is compared with post-test $1.6467 \pm (0.155)$ ($p < 0.05$) and when pre-test is compared with 2 month follow $1.644 \pm (0.143)$ ($p < 0.05$). There were high statistical significant differences in the total and subtotal practice scores regarding eye care of unconscious mechanically ventilated patients when pre-test Mean (SD) $1.3419 \pm (0.24579)$ is compared with post-test $2.3829 \pm (0.11472)$ ($P < 0.01$) and when pre-test is compared with 2 months follow $2.0819 \pm (0.18210)$ $p < 0.01$ and when post-test $2.3829 \pm (0.11472)$ is compared with 2 months follow $2.0819 \pm (0.18210)$ ($p < 0.01$) following protocol application. The results revealed that the percentage of no exposure of the eye lid was significantly higher in the post-test 54.3% when is compared with pre-test 22.9% after protocol application ($p < 0.05$) The results showed that 17.1% of patient had absence conjunctival odema in pre-protocol application when is compared with post-application, 31.4% of patient had absence conjunctival odema ($p < 0.05$). For conjunctival injection, the percent in pre- test was 37.1% and in post-test was 54.3%, the difference is significant ($p < 0.05$). Research hypotheses were supported in which nurse's knowledge, practices, and eye health state showed sustainable improvement. **Conclusion:** Palestinian critical care nurses were lacking some knowledge and practices regarding eye care. The educational handout, demonstrations and the designed protocol showed a positive impact in improving nurse's knowledge and practices and in lowering the percentage of eye health complications. **Recommendations:** the study recommended establishing a written updated protocol for eyes assessment and care with continuous education & appraisal to ensure enough knowledge, and complete safe practices, which certainly leads to minimizing the incidence of eye complications. **Key words:** Designed Eye Care Protocol, Nurses Knowledge, Nurses Practices, Eye Care. Eye Health Status, Unconscious Mechanically Ventilated Patients.

1. Introduction

Nurses and doctors in the intensive care units (ICU) usually concentrate on life threatening issues which are emergency in most situations that lead to little concern of the less emergency issues like eye problems even it is serious problem (Rosenberg & Eisen,2008).

Australian Nursing Federation (2008) in the Best Practice Information Sheet assures that eye care forms part of the care provided to all patients in acute care environments with impaired or compromised protective

mechanisms. The unconscious, sedated or paralyzed patients represent high risk group who are dependent on eye care to maintain the integrity of the ocular surface.

The incidence of eye disorders in the intensive care population is difficult to quantify due to poor documentations when compared to the nursing care required to stabilize vital body systems. Eye care is often seen as a relatively minor problem. Patients in (ICU), especially ventilated patients, are at considerable risk of developing eye problems. Sedation and muscle relaxants also lead to impairment of blink reflexes and loss of eyelid muscle tone, while fluid imbalance and positive pressure ventilation may lead to chemosis (McHugh, Alexander, Kalhoro & Ionides, 2008).

Eyelid closure is an active process involving contraction and relaxation of eyelid muscles. This active contraction and relaxation is lost when the patients in the ICU are heavily sedated and relaxed, blinking reflex is also lost. Incomplete lid closure leads to drying of the mucosal surface and desiccation of the corneal epithelial tissues, which lead to ulceration. Lesions can range from punctate epithelial erosions involving the exposed inferior third of the cornea to more extensive erosion termed macroepithelial defect. Destruction of the epithelial surface increases the risk of bacterial infection (Mela, Drintzias, Christofidou, Filo, Anastassiou & Gartaganis, 2010).

Incomplete lid closure and use of muscle relaxants are the most important predictive factors for developing exposure keratopathy, in addition to the loss of other natural protective mechanisms like blinking (Sivasankar, Jasper, Simon, Jacob, John & Raju, 2006).

An intact corneal epithelium is an important barrier to prevent corneal infections and to help maintaining a smooth surface that allows clear vision. Any condition leads to dryness of the cornea compromises. The corneal epithelium can lead to exposure keratitis, corneal abrasion, and corneal ulcer with possible visual loss. The lids offer physical protection and the tear flow helps in flushing out the microorganisms. Complete closure of the eyelid may be affected by turning the patient, elevating the head of the bed, decreased tear production and a decrease in venous return with increased pre orbital edema due to rises in intra thoracic pressure associated with positive pressure ventilation. Incomplete lid closure without doubt leads to corneal epithelial drying and exposure keratopathy (The Joanna Briggs Institute, 2002, Lenart; & Garrity, Suresh, Mercieca, Morton, & Tullo Parkin & Cook, 2000; & Sheila & Forrest, 1999).

A healthy ocular surface is vital in preventing infection. Tear film is bactericidal that lubricates the ocular surface and the oily layer of the tear film. The lid closure prevents evaporation during blinking and sleeping. Microorganisms are normally able to adhere to a damaged corneal epithelium. Healthy epithelium is vital to prevent the deterioration of the ocular surface of patients in ICU, and to avoid the development of ocular disease. Medical and nursing staff is naturally preoccupied with stabilization of the cardiovascular and respiratory systems (Parkin & Cook, 2000).

Dry eye is defined as "Dry eye is a disorder of the tear film due to tear deficiency or excessive tear evaporation, which causes damage to the inter palpebral ocular surface and is associated with symptoms of ocular discomfort." (Lemp, 2008).

Unconscious, sedated or mechanically ventilated adult patients are particularly at risk of exposure keratitis and bacterial infection. Positive intrathoracic pressure results from mechanical ventilation. The increase tissue water associated with critical illness contributes to the development of conjunctival edema or chemosis. Conjunctival edema is caused by incomplete eyelid closure which is secondary to heavy sedation and/or muscle relaxation that increases the area of the conjunctiva and cornea exposed and thus increases the risk of epithelial damage (Prince of Wales Intensive Care–Clinical Practice Guidelines, 2004).

ICU patients are rarely admitted to ocular pathologies, but most ICU patients need nurse's assistant to maintain normal and patho physiological hygiene of their eyes. Patients should not suffer unnecessary complications from absence of standardized care. Eye care in ICUs often suffers from the vagaries of ritual, priorities and knowledge, and receives scant attention in the nursing literature, so that ICU nurses have little evidence beyond the lack of eye care standards to guide practice (Woodrow, 2000).

2. Significance of the study:

Little is known about eye care of ventilated unconscious or sedated patients in West bank– Palestine. No previous studies about the incidence of the complications, protocols or standards of eye care. Nothing in the policy and procedure manuals in the hospitals as a part of nursing care. There are no documents about any complications happen or management and treatment. This study is very important to fill this gap, especially; this problem is increasing continuously due to the increase use of mechanical ventilation for patients as an important part of the treatment; increase in the size of critical care units as a response to the increasing of Palestinian population.

From the researcher experience and some estimate of five registered ICU nurses, around 40 percent of unconscious mechanically ventilated ICUs patients have developed eye problems especially after 48 hours of being ventilated and sedated. Examples of complications seen are dryness, redness of the conjunctiva (inflammation), odema and discharge, etc.

From the previous issues, the researcher found that it is important to work on exploring and applying protocols for assessment, diagnosis, planning, implementation, and evaluation of eye care for patients with high risks of eye problems trying to decrease the incidence first and to improve the level of nurse knowledge and practices which will improve eye health status.

The results of this study will be disseminated to the decision makers in Palestinian Ministry of Health (MOH) and also to the private sector to be adopted in the protocols and policy procedure manuals and to be a priority to improve the quality of patient care provided to this group of patients.

3. Aim of the study:

The aim of this study was to examine the impact of a designed eye care protocol on nurses' knowledge, practices and on eye health status of unconscious mechanically ventilated patients at, Jenin, Tulkarm and Nablus Hospitals- Palestine. The aim could be achieved through:

- Assessment of the incidence of the complications, nurse's knowledge of eye care and nurse's practices
- Development of the educational material for nurses in the light of educational needs and the current eye health problems sound.
- Dissemination of the educational material and applying demonstrations sessions for refreshment and evaluation of nurse's knowledge and practices.
- Applying and following up the application of the eye health care protocol in ICUs departments.
- Evaluation of the patient's eyes health status after 48 hours of application of the protocol.

4. Research hypotheses:

To fulfill the aim of this study the following research hypotheses were formulated:

H1: The post mean knowledge scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean knowledge scores.

H2: The post mean practices scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean practice scores.

H3: The percentage of eye health problems will be less among patients who are cared by nurses exposed to the designed eye care protocol than those who do not.

5. Theoretical framework

Nursing process is taken as a framework in the current study, since the researcher started with assessment of nurse's knowledge, practices & patient's eyes health status to determine the actual needs of nurses as well as eye health status of the mechanically ventilated unconscious or paralyzed patients. In the light of these data planning and implementation of the designed protocol and the educational instructional handout were accomplished, and evaluation was carried out to check the effectiveness of the protocol. It was convenient to adopt nursing process in the current study as a theoretical framework.

6. Subject and Methods

6.1 Study design: Quasi-experimental design was utilized in this study to examine the impact of a designed eye care protocol on nurses' knowledge, practices and on eye health status of unconscious mechanically ventilated patients at, Jenin, Tulkarm and Nablus Hospitals- Palestine pre and post. **Sample:** A convenient sample consists of 35 male and female nurses in the ICU of the mentioned hospitals with at least one year of experience in the ICU and 70 unconscious mechanically ventilated patients admitted to the ICU for at least 48 hours or longer.

6.2 Settings: This study was conducted in three of the main Ministry of Health (MOH) hospitals in the north of west bank-Palestine (Jenin hospital, Nablus Hospitals and Tulkarm Hospital). West Bank was divided into three main governorates north, middle and south; the north includes four general hospitals with four intensive care units with a capacity of 24 beds (4 beds in Jenin, 4 beds in Tulkarm, 16 beds in Nablus –Rafedia and Alwatani).

6.3 Subjects: All nurses are working in three ICUs with at least one year experience and 70 adult unconscious mechanically ventilated patients who are admitted to that department without eye problems on admission; 35 patients assessed before protocol application from November 2011 to February 2012 and 35 patients post protocol application from July 2012 to November 2012.

6.4 Tools and Data Collection: Three tools were developed by the researcher and reviewed by the panel of nine ICU nurses and medical experts, and ophthalmologists. The three tools were piloted on (4) nurses and (7) patients. These tools are:

- 1- Pre/Post – test knowledge questionnaire: to assess nurses' knowledge about eye care, in addition to their socio demographic data.

Scoring system: Each question was scored as follows:

Zero = no/ incorrect answer, 1= correct answer.

Those who obtain less than 80% were considered as having unsatisfactory knowledge. Above 80% considered as having satisfactory knowledge.

2- Pre/Post- test eye care practices observational checklist: to assess nurses' practices in relation to the eye care of the unconscious mechanically ventilated patients.

Scoring system: each item was scored as follows:

Zero = not done, 1= done incorrect, 2= done incomplete, 3= done correctly and completely.

Those who obtained less than 80% were considered as having unsatisfactory practices. Above 80% were considered as having satisfactory practices

3- Pre/Post- test eye health status assessment sheet that covers information on Socio demographic and medical condition of the patients under the study, in addition to eye health status assessment data.

Scoring system:

For eye lid position: graded from 0=No exposure, 1= Only conjunctival exposure, 2= Lower 1/4th of the cornea exposed, 3= Lower 1/2 of the cornea exposed, 4= 3/4th of the cornea exposed, 5= Cornea fully exposed.

For conjunctival odema: 0= Absent, 1= Conjunctival Injection, 2= Conjunctival odema without dellen formation, 3= Conjunctival odema with dellen formation.

For corneal changes: 0= No changes, 1= Punctate epithelial erosions involving the inferior third of the cornea, 2= Punctate epithelial erosions involving more than the inferior third of the cornea, 3= Macroepithelial defects, 4= Stromal whitening in the presence of epithelial defect, 5= Stromal scar, 6= Microbial keratitis

6.5 Procedure: The study was conducted on five phases; tools development phase, assessment phase, designing and constructing the eye care protocol based on the assessment data, implementation phase, and evaluation phase. (I)Tools development: during this phase the study tools were developed to assess the current ICU nurses knowledge and practices related to the eye care of mechanically ventilated unconscious or sedated patients in addition to the eye health status assessment sheet which will be utilized to assess the current eye health status of mechanically ventilated unconscious or sedated patients admitted to ICUs (II) Assessment phase were conducted to collect data base about eye health status of the patients in two- month observation. Nurse's knowledge and practices related to eye care were assessed utilizing tools 1&2. (III) Designing phase: based on the assessed data of eye care and nurses, knowledge and practices; eye care protocol was developed. (IV) Implementation phase: through this phase the required theoretical and practical sessions for nurses were conducted in the three ICUs areas to facilitate the attendance of the nurses after explanation of the nature and purpose of the study. Written consent was obtain from the nurses and the guardians of the patients.

For the theoretical part, nurses were divided into small groups (from 2 to 5 each group. Four teaching sessions conducted in the work areas, each section 40 minutes; instructions were provided with illustrated simple handout about eye anatomy and physiology and complications of ventilators on eye health status, infection control standards and eye care protocol. Then within 10 days immediate post test was conducted. After two months during the application of eye care protocol another test done to evaluate knowledge and practices.

For the practical part, nurses are divided into small groups (from 2 to 3 each), demonstration and re demonstration were carried out, in addition to audiovisual aids. Four practical sessions were conducted, each section 30 minutes then within 10 days immediate post practice test performed. After two months during the application of eye care protocol another test was performed to evaluate practice.

An open channel of communication was established between the researcher and nurses through mobile and personal meetings in the departments for any questions, missed information, and reinforcement of knowledge and practices all through the study period.

Patients under the study were exposed to the routine care in addition to the designed eye care protocol, and then eye health status assessment was carried out by the investigator utilizing eye health assessment sheet for two months started from the conduction of the immediate post knowledge and practices tests for the nurses.

6.6 Validity& reliability of the tools: Content validity was done to identify the degree to which the used tools measure what it was supposed to measure which are checked by distributing the tools to nine critical care nursing, medical experts, and ophthalmologists from san john hospital Jerusalem and ophthalmic center in Nablus. Most of the items in the three tools has consensus from the group of experts and very little change suggested in distribution of the knowledge questionnaire questions or the domains of the questionnaire and clarifying some statements in the check list of practices, all the notes taken in consideration and changes done by the researcher.

Cronbach's coefficient alpha was used to test reliability (The normal range value of this test range between 0.0 and+ 1.0), and higher values reflects a higher degree of internal consistency (George& Mallery,

2003). The Cronbach's coefficient alpha was 0.854. This value is considered high which indicates high reliability of the questionnaire. To measure the correlation coefficient between odd and even responses of questions related to knowledge included in the pre-immediate – post-test; split half method was used to measure this correlation. The Spearman-Brown Correlation Coefficient for the pre-posttests was 0.862, and for check list tool pre-test, 2 months follow up and post-test Cronbach's coefficient alpha was 0.896. Spearman-Brown Correlation Coefficient for the pre-posttests was .910. These values are considered high which indicates reasonable reliability of the questionnaire and check list practices.

6.7 Eye care protocol: Unconscious or sedated patients on ventilators are highly at risks for eye health problems; these problems can be reduced or even totally prevented if nurses follow a protocol for assessment and management. Here is a suggested protocol that I hope our colleges in ICU will follow trying to evaluate its effect at the end of the period of hospitalization of such patients.

1. In unconscious, heavily sedated, and muscle relaxed patients the eyes should be shiftily inspected with a pen light to check whether there is a conjunctival or corneal exposure due to the level of eye lid closure.
2. On assessment infection control, measures must be followed (hand washing, gloves).
3. Oral hygiene and suctioning of the ETT must be done from one side and away from the eyes of the patient, and eyes must be covered.
4. Eye swaps from the conjunctiva must be taken for culture and sensitivity if there are any signs of infection.
5. On assessment the nurses should determine if?
 - a- There is periorbital odema.
 - b- Conjunctival odema.
 - c- Subconjunctival haemorrhage.
 - d- Eyelid completely closed or not.
 - e- Tear production.
 - f- Signs of infection or inflammation.
6. Intervention according to findings and prevention has the priority:

Eye care protocol is designed by the researcher taking in consideration three levels of care depending on assessments regularly: a- General eye hygiene and cleaning with normal saline .09% and horizontal covering with tape Q12 h. b- Patients who cannot achieve complete eye closure independently, cleaning with normal saline 0.09% regularly and lubrication of chloramphenicol antibiotic ointment as prophylactic and tape the lid horizontally Q8h. c- Patients who cannot achieve complete eye closure independently, cleaning with normal saline 0.09% regularly and lubricate with chloramphenicol antibiotic ointment as treatment or as prescribed after swap culture is taken if signs of infection presented and tape the lid horizontally Q8h. At this phase knowledge and check list practices collected completely.

6.8 Ethical consideration: Human subject approval received from the board of the college of nursing at Cairo University as well as ministry of health in west bank-Palestine. Written permission (informed consent) of participation obtained from each participant or guardian at the first session. The Declaration of Helsinki as a statement of ethical principles for medical research involving human subjects was applied:

- Written permission (informed consent) of participation was obtained from each participant at the first session.
- The researcher explain to the participants or guardians that no risk or hazards related to the study.
- Each participate or guardian was informed that his participation in the study was voluntary and he/ she can withdraw when she/he wanted.

7. Results: Results are presented in two main sections, Section (I) represents socio demographic& medical data of the studied sample and Section (II) delineates answers for the hypothesis testing for being supported or not.

Section (I): Demographics of nurses are presented in (Table1) and demographics of patients are presented in (Table 2).

Table (1): Distribution of the studied sample (nurses) in relation to their gender, age, marital status, residence, professional status, education and experience (n=35)

Socio-demographic characteristics of Nurses		No	%
Gender	Male	19	54.3
	Female	16	45.7
Age in years	19-23	3	8.6
	24-28	13	37.1
	29-34	10	28.6
	35- 39	3	8.6
	≥ 40	6	17.2
Mean ± SD 30.97 ± 7.90			
Marital status	Married	27	77.1
	Single	8	22.9
Residence	Nablus	17	48.6
	Jenin	11	31.4
	Tulkarm	7	20.0
Professional status	Practical Nurse	8	22.9
	Staff nurse	27	77.1
Education	Diploma 2y	8	22.9
	Diploma 3y	3	8.6
	BA 4 y	16	45.7
	Master 6 y	8	22.9
Years of experience	1year	2	5.7
	2 years	5	14.3
	3 years	3	8.6
	4 years	5	14.3
	more than 4 y	20	57.1
Mean ± SD 4.028 ± 1.33			

As shown in table (1) the majority of the studied subjects (77.1%) were married as well as more than half of them (54.3%) were male. In relation to residence, the highest percentage (48.6%) were from Nablus and in relation to professional status, education and experience, the highest percentage(77.1%) were, staff nurses, 45.7% (BA 4) y and 57.1%) more than 4 y), respectively.

Table (2): Distribution of the studied sample (patients) Pre and Post protocol application in relation to their age, gender and medical diagnosis (n=35) were included in the pretest and another (n=35) were included in the post test.

Socio-demographic characteristics of Patient						
Pre-test				Post-test		
		No	%	No	%	
Gender	Male	21	60	24	68.6	
	Female	14	40	11	31.4	
Age in years	13-24	4	11.4	6	17.1	
	25-29	3	8.6	2	5.7	
	40-49	4	11.4	4	11.4	
	50-59	7	20	2	5.7	
	60-69	5	14.3	10	28.6	
	70-79	9	25.7	7	20	
	80-89	3	8.6	4	11.4	
Mean ± SD 57.02 ± 20.14				Mean ± SD 55.91 ± 22.62		
Medical Diagnosis	Neuro	6	17.1	7	20	
	Cardiac	8	22.9	12	34.3	
	Respiratory	14	40	10	28.6	
	Trauma	4	11.4	4	11.4	
	Renal	2	5.7			
	Poisoning	1	2.9	2	5.7	

Table (2) reveals that the (60%) in pre-test and (68.6%) in post-test of the studied sample were males. In relation to age, the highest percentage (25.7%) was with age between 70 to 79 years old in pre-test and (28.6%) with age between 60 to 69 years old. According to medical diagnosis, we can see that respiratory patients represented the highest percentage (40%) in pre-test, and cardiac patients (34.3%) in post-test.

Section (II) delineates answers for the hypothesis testing

Hypothesis 1: The post mean knowledge scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean knowledge scores.

Table (3) Mean scores of total and subtotal knowledge of ICU nurses regarding eyes of ventilated unconscious patients pre-test, post-test & 2 months follow up (n=35)

Items	Pre-test Mean ± SD	Post- test Mean ± SD	2 months follow Mean ± SD	F Test	P value
Anatomy & physiology	1.523 ± (0.3341)	1.6418 ± (0.1678)	1.5890 ± (0.1739)	2.183	0.118
Mechanical ventilation complications	1.5020±(0.2333)	1.6327± 0.23826)	1.6408±(0.2578)	3.583	*0.031
Medications	1.5238±(0.37299)	1.6286±(0.35948)	1.6571±(0.3077)	1.425	0.245
Infection	1.6653±(0.3078)	1.6776±(0.26007)	1.6898±(0.29702)	0.063	0.939
Total knowledge	1.553±(0.210)	1.6467± (0.155)	1.644±(0.143)	3.184	*0.046

*P < 0.05 significant value

The above table reveals that the mean and standard deviation in all subtotal knowledge items were the highest in post-test followed by the mean and standard deviation of 2months follow up. We can see that in post-test there is statistical significance in the mean scores of total knowledge and mechanical ventilation complications but for the remaining subtotals (Anatomy& physiology, Medication, Infection) there were not statistically significant.

Table (4) Scheffe post-test matrix to identify the directions of differences of knowledge scores between pre-test, post-test and 2moths follow up.

Dependent variable	Application I	Application J	Mean differences (I-J)	t-test	P value
Total scores of Knowledge	Pre-test	Post- test	0.095	2.144	*0.039
	Pre-test	2 months follow	0.0800	1.959	0.058
	Post- test	2 months follow	0.152	0.595	0.556

*P < 0.05 significant value

**p < 0.01 highly significant

Table(4) shows statistical significance difference in the total knowledge scores between pre-test and post-test $P=0.039$ which is less than 0.05.

From previous tables (3, 4) we can conclude that there were statistical significant difference in the total knowledge scores regarding eye care of unconscious mechanically ventilated patients between pre-test, post-test, and 2 months following protocol application. So the researcher reject the null hypothesis assumed "There is no statistical significant difference at ($P \leq 0.05\%$) in nurses' knowledge regarding eye care of unconscious mechanically ventilated patients between pre, post, and 2 months following protocol application. In the light of this, the first hypothesis which stated that "The post mean knowledge scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean knowledge scores" is accepted and null hypothesis rejected.

Hypothesis 2: The post mean practices scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean practice scores.

Table (5): Mean scores of the total and subtotal practices of ICU nurses regarding eyes care of ventilated unconscious patients pre-test, post-test and 2 months follow up (n=35)

Item	Pre-test	Post-test	2 months follow	F test	P value
	Mean \pm SD	Mean \pm SD	Mean \pm SD		
Assessment	1.3306 \pm (0.36957)	2.5306 \pm (0.26742)	2.1837 \pm (0.42797)	102.341	**0.000
Infection Control	1.4396 \pm (0.33352)	2.3385 \pm (0.17817)	2.0879 \pm (0.25179)	104.378	**0.000
Prevention & Management Actions	1.2229 \pm (0.32907)	2.3371 \pm (0.19416)	2.0029 \pm (0.24910)	165.027	**0.000
Total scores	1.3419 \pm (0.24579)	2.3829 \pm (0.11472)	2.0819 \pm (0.18210)	282.29	**0.000

**p < 0.01 highly significant

The above table reveals that the mean and standard deviation in all subtotal practice items were the highest in post-test followed by the mean and standard deviation of 2months follow up. It shows high statistical significance in the mean scores of total and subtotal practice regarding eye care of ventilated unconscious patients in the critical care department among pre-test, post-test and 2 months follow up .

Table (6) Scheffe post-test matrix to identify the directions of differences of total practice scores between pre-test, post-test and 2 months follow (n=35)

Dependent variable	Application I	Application J	Mean differences (I-J)	t-test	P value
Total scores of practice	Pre-test	Post-test	1.04095	26.035	**0.000
	Pre-test	2 months follow	0.74000	19.136	**0.000
	Post-test	2 months follow	0.30095	11.396	**0.000

*P <0.05 significant value

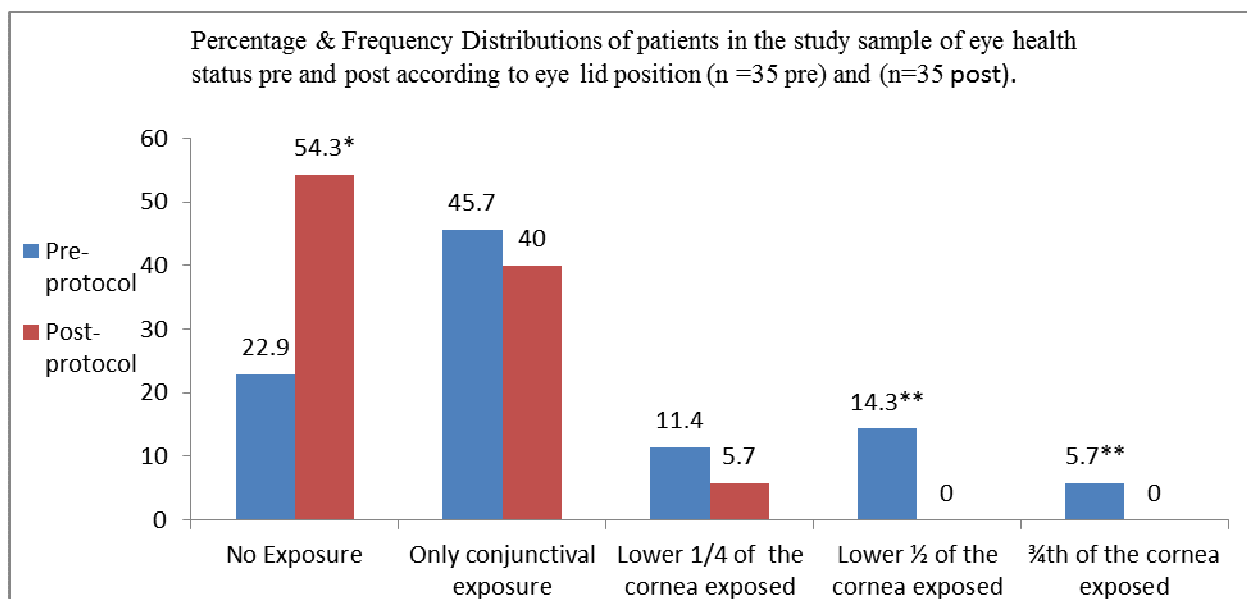
**p < 0.01 highly significant

Table (6) showed highly statistical significant difference in total practice scores between pre, post, and 2 months follow up of protocol application.

From previous tables (5 & 6) we can conclude that there were high statistical significant difference in the total and subtotal practice scores regarding eye care of unconscious mechanically ventilated patients between pre, post, and 2 months following protocol application. In relation to that, the researcher reject the null hypothesis assumed " There is no statistical significant difference at ($P \leq 0.05\%$) in nurses practice regarding eye care of unconscious mechanically ventilated patients between pre, post, and 2 months following protocol application. In the light of this, the second hypothesis which stated that " The post mean practices scores of critical care nurses who are exposed to the designed protocol for eye care will be higher than their prior mean practice scores" is accepted and null hypothesis is rejected.

Hypothesis 3: The percentage of eye health problems will be less among patients who are cared by nurses exposed to the designed eye care protocol than those who do not.

Figure (I) Percentage Distributions of patients in the study sample of eye health status pre and post according to eye lid position (n =35 pre and post).



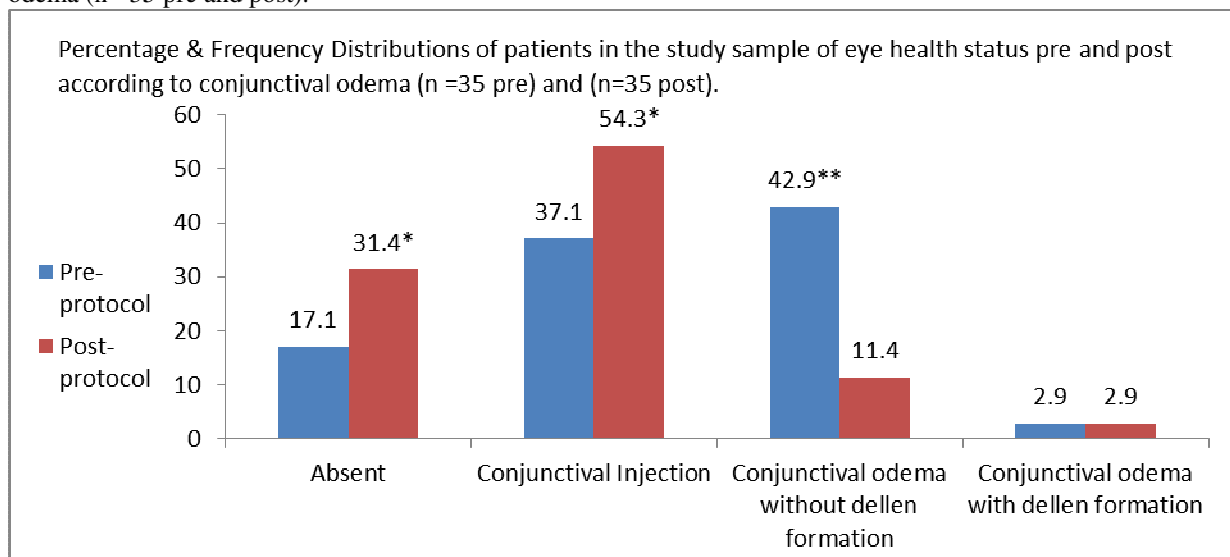
* The result is significant at $p < 0.05$ for the post-test

** The result is significant at $p < 0.05$ for the pre-test

Figure (I) revealed that the percentage of no exposure of the eye lid was 22.9% in pre- protocol application while in the post was 54.3%, conjunctival exposure was 45.7% in pre-protocol application while in the post was 40% and for lower 1/4 of the cornea exposed in pre was 11.4% while in post protocol application was 5.7%. For the lower 1/2 of the cornea exposed and 3/4th of the cornea exposed in pre-protocol application the percentages were 14.3% and 5.7 respectively but there no exposed in post- protocol application.

Figure (II) Percentage of patients in the study sample of eye health status pre and post according to conjunctival odema (n =35 pre and post).

Figure (II) Percentage of patients in the study sample of eye health status pre and post according to conjunctival odema (n =35 pre and post).

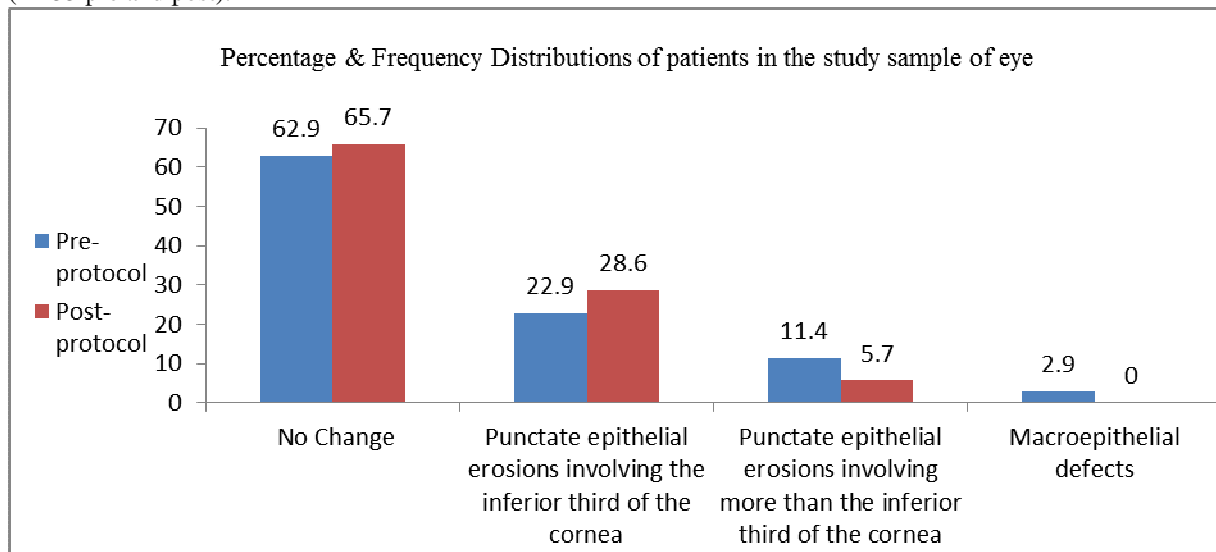


* The result is significant at $p < 0.05$ for the post-test

** The result is significant at $p < 0.05$ for the pre-test

Figure (II) showed that 17.1% of patient had absence conjunctival odema in pre-protocol application but in post-application had 31.4%, for conjunctival injection, the percent in pre was 37.1% and in post was 54.3%, we can see that conjunctival odema without dellen formation in pre-test was 42.9% compared with 11.4% in post-test, and 2.9% had conjunctival odema with dellen formation for both pre and post-protocol application.

Figure (III) Percentage Distributions of patients in the study sample of eye health according to Corneal Changes (n =35 pre and post).



We can see from the above Figure that 62.9% of eyes had no change in pre-test comparing with 65.7% in post -protocol, for punctate epithelial erosions involving the inferior third of the cornea in pre-test there were 22.9% and in post-test were 28.6 % , punctate epithelial erosions involving more than the inferior third of the cornea had 11.4% in pre-test but in post-test had 5.7%, in pre-test there were 2.9% with macroepithelial defects but in post-test no eyes had macroepithelial defects.

From previous figures (I, I& III) we can conclude that there was high statistical significant difference in post- protocol application. In the light of this, the third hypothesis which stated that “The percentage of eye health problems will be less among patients who are cared by nurses exposed to the designed eye care protocol than those who do not” was accepted and null hypothesis is rejected.

8. Discussion

In the current study, the low level of knowledge of ICU nurses regarding eye care of unconscious ventilated patients is mostly because eye care is not lifesaving issue for all health team and not merely nurses who were amazed to study this issue and ICU doctors as well . For nurses they concentrate on the policy and procedures of the hospitals; there were no policies at all which affect nurse’s attention to this problem. Another factor raised by nurses was the work load that did not give them time to attend continuous educational workshops or lectures. On the other hand, there are no policies in the MOH that encourage nurses’ continuous education like free educational hours or even days and lack of internet access facilities in the department or setting rooms that can facilitate and encourage nurses for update refresh their knowledge.

The study clearly indicates the presence of gap between updated literature based on evidence knowledge and nurse’s knowledge about eye care of unconscious ventilated patients. For this the designed protocol supported by the scientific handout and demonstrational sessions was important to improve nurse’s knowledge.

This result was consistent with a survey done by Fulbrook, Albarran, Baktoft & Sidebottom (2011). The overall mean knowledge score of the study was 66%.

The current study showed good improving after protocol application in relation to infection and mechanical ventilation complications. In relation to mechanical ventilation complications, the incidence of epithelial damage to the outer eye amongst intensive care patients has been reported to be between 20% and 40% and up to 60% of intubated and mechanically ventilated patients who were sedated and / or muscle relaxed (Boyle, 2004).

Regarding nursing practices, it was seen that nurse’s practices scores were inadequate in total and subtotal. Mean and standard deviation for total practices pre-protocol application reveal that there was significant improvement in nurses practices in post and 2 months follow up. Similar results were seen in the study done by Koutzavekiaris et al. (2011).

ICU nurses practices related to eye care in are highly important to patient’s treatment regimen, patient safety, length of stay in the critical care unit, cost of treatment and quality of life post discharge, however, the

percentage weight (44.7%) for all subtotal domains in pre-protocol application of practice (Assessment of eye, Infection control and Prevention and management actions) considered very low and extremely unsatisfactory.

In relation to assessment: Assessment of a critical care patient's eyes should routinely be done by every shift. Most ocular problems in critical care patients arise from lagophthalmos, which generally increases in severity with increased sedation. It is important that eyelid position be carefully assessed. Excessive exposure can lead to breakdown of the corneal epithelium, known as keratopathy (Gregory, 2003).

In the current study, the satisfactory percentage in pre-protocol application was very low (44.4%), and after application there was significant improvement and it reaches in post- application and two months follow up (84.4%) and (72.8%), respectively.

Similarly in the study of Rutto et al. (2012) it was observed that teams of acute and emergency (A&E) nurses managing poisoned casualties sometimes fail to assess, make appropriate diagnosis, plan, intervene and evaluate accordingly.

Regarding infection control domain, high improvement in post –protocol application and slight decrease in the 2 months follow up.

On the same direction it was observed in the study done by Rutto, Mwaura, Chepchirchir& Odero (2012) nurses sometimes failed in recognizing distressed patients, taking appropriate patient history and performing evidence based intervention.

In the current study, nurses in the critical care units of ministry of health confirmed that there were no written protocols or guidelines regarding eye care of unconscious ventilated patients. This was also the case of the study of Azfar, Khan& Alzeer (2012) at Department of Critical Care, King Khalid University Hospital.

The current study reveals that there was an excellent improvement in eye lid closure which means excellent nurses adherence to the protocol and follow up assessment which reflected on the rate of conjunctival dryness and corneal abrasions in advance.

Regarding eye lid closure, it helps in preventing of microbial keratitis secondary to exposure keratopathy. This identifies the population with incomplete lid closure that will be vulnerable to exposure keratopathy (Kam, Hayes& Joshi, 2011). McHugh et al. (2008) found similar rates of incomplete eye closure by both the ophthalmologist and ICU doctors (20.8% and 22.9% of eyes, respectively).

In relation to conjunctival odema, conjunctival injection, conjunctival odema without dellen formation and conjunctival odema with dellen formation, the current study showed good improvements in the post-protocol application.

Similar results were seen in the study of Werli-Alvarenga, Ercole, Botoni, Oliveira& Chianca (2011). However opposite direction was seen in the study of Sivasankar et al. (2006).

Regarding corneal complications, the current study reveals that (62.9%) of eyes had no change in pre-protocol comparing with (65.7%) in post–protocol. For punctate epithelial erosions involving the inferior third of the cornea in pre-protocol was (22.9%) and in post-protocol was (28.6 %). Punctate epithelial erosions involving more than the inferior third of the cornea had (11.4%) in pre-protocol but post-protocol had (5.7%). In pre-protocol, there was (2.9%) with macroepithelial defects but in post-protocol no eyes had macroepithelial defects.

Werli-Alvarenga et al. 2011) of the 254 subjects 151 corneal injuries were identified; the overall incidence of this type of injury was (59.4%) for the period of study. The incidence of punctate type corneal injury was (55.1%) and of the corneal ulcer type (11.8%).

The algorithm used in the current study was successful in lowering the rates of surface disease; however, the fact that the algorithm was not followed in all patients or may be an evaluation error from the researcher may limit the generalizability of the results and did not give the researcher any scientific explanation of some findings. Interventions that the researcher tried to apply can be grouped in to four categories: eye hygiene, preventing dry eyes, ensuring eyelid closure, and standardize programs of eye care.

The current study had good improvement on eye health status in all domains related to eye complications (eye lid position, conjunctival and cornea), even the researcher was not the applicator, and he was evaluating findings of what the nurses have done. Like decrease in conjunctival odema and increase of conjunctival injection also increase in punctate epithelial erosions involving the inferior third of the cornea and decrease in punctate epithelial erosions involving more than the inferior third of the cornea.

Regarding gender of nurses, the number of male and female was nearly the same with slightly increase of male. This indicates that nursing profession in Palestine from early in 1960s started to be taught for both gender. According to the Palestinian Nursing and Midwifery Association, last statistics in 2012 were 11100 nurses (57%) in West Bank and (43%) in Gaza. In West Bank, (60 %) was female but in Gaza (40%), so in average male and female nurses in Palestine nearly the same percentage. In the current study there was no statistical

significant difference between male and female in the total knowledge and practice in all phases (pre-test, post-test and 2 months following).

Similar results shown by Yousefi, Nahidian, & Sabouhi (2012) the results showed that the two groups had no significant differences in terms of age, sex, work experience, and employment status.

Regarding age, the majority (23 out of 35) of the sample nurses' age was between 23 to 33 years old and the rest was 3 between 19 to 22 years old and 9 above 34 years old. For that the current study revealed no statistical significant correlation at ($P < 0.01$) between total knowledge and total practice scores and age of participants nurses in the pre-test, post- test and 2 months following protocol application.

This result goes with the results of Huang, Chuang & Chiang study (2009) reported no significant differences between the two groups about age.

Regarding Years of experience, there was (57.1%) of nurses who had more than 4 years of experience in ICUs. This explains why the current study revealed no statistical significant correlation at ($P < 0.01$) between total knowledge and practice scores and experience of participant's nurses in the pre-test, post-test and 2 months following protocol application.

Chan, et al. (2002) study results show that there were no significant relationships between the knowledge score and the sample's demographic data including years of experience. Similar result were seen in the study of Huang et al. (2009) there were no significant differences found between the two groups length of nursing experience.

In the opposite direction, Suchitra & Devi (2007) concluded that years of experience in the hospital significantly correlates with increased knowledge, attitudes, and practices among various categories of the staff, but unfortunately did not translated to good clinical practice.

Regarding educational level, the studied sample revealed that nearly half of the sample (16 out of 35) were BA holders which reflects stabilized level of knowledge and practice, so the current study shows there were no statistical significant differences between diploma 2 years, diploma 3 years, BA and master degrees holder nurses in total scores of knowledge regarding eye care in pre-test, post-test & 2 months following protocol application. But in practice there were statistical significant differences between diplomas 2 years, diploma 3 years, BA and master degrees holder nurses in total scores of practice regarding eye care in pre-test only.

Similar results were seen in the study of Huang et al. (2009) there were no significant differences found between the two groups due to level of education in knowledge.

In contrary, according to the study of Meherali, Parpio, Ali & Javed (2011) the knowledge among intensive care nurses is higher than those who have higher experience and holding a special degree in intensive care for the prevention of Ventilator Associated Pnuemonia (VAP).

In relation to marital status, the majority (27 out of 35) of the studied sample nurses were married; there were no statistical significant differences between single and married nurses in total scores of knowledge and practice regarding eye care in pre-test, post-test & 2 months following protocol application.

In the same direction, results were seen in Ceber, Turk & Ciceklioglu (2010). Participants in the two groups of the study had similar characteristics and did not differ significantly with respect to age groups, marital status, graduation and professions.

In relation to residence, we can see statistical significant differences between residence nurses in total scores of knowledge regarding eye care in post-protocol & in 2 months following application, but there were no statistical significant differences in pre-test. But in practice, no statistical significant differences were seen in pre-test, post-test, 2 months following protocol application.

Regarding professional status, 27 out of 35 of the studied sample nurses were staff nurses which means 3 or more years of education and the rest were practical nurses means 2 or less years of education according to Ministry of High Education and Ministry of Health in Palestine. The current study reveals that there were no statistical significant differences between staff and practical nurses in total scores of knowledge regarding eye care in pre-test, post-test & 2 months following protocol application.

The current study showed no statistical significant correlation between age, gender and medical diagnosis and eye lid position & conjunctival odema and corneal changes in pre- test and post protocol application at 0.01 significant level.

Similarly in the following three studies, there were no statistical significant differences between age, gender and medical diagnosis and eye health status. McHugh et al. (2008), Azfar, Khan & Alzeer (2013) and Gu'ler, Eser & Egrilmez (2011).

9. Conclusion: Nurse's knowledge and practices regarding eye care of unconscious ventilated patients in critical care departments were not enough. There were lacks of educational materials, policies and procedure or protocols about eye care of unconscious ventilated patients in the critical care units. The designed protocol with

the supportive educational handout had a positive effect on nurse's knowledge and practices and eye health status in ICU departments in North Palestine (MOH) Hospitals.

10. Recommendations: The researcher recommended establishing a written update protocol of eye care of unconscious ventilated patients in ICU departments to ensure enough knowledge, and safe practices; it's also recommended to implement the current study on (MOH) in Palestine.

The researcher recommended that nurses need continuous education and clinical training programs about eye assessment protocol and care of unconscious ventilated patients that can be supportive to nurses in critical care units, by placing strong emphasis on theoretical and skill development.

Collaboration between health care providers especially between nurses and doctors in ICU to enhance and raise the awareness of eye care of unconscious ventilated patients through updated knowledge and safe practices.

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