

Prevalence of Pressure Ulcers with the Study of the Impact of Pressure Ulcer Educational Program on Registered Nurses' Knowledge and Practice in Prince Miteb Bin Abdulaziz Hospital, Sakaka City, Saudi Arabia

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Abstract

Critically ill patients are at high risk for pressure ulcers. Prevalence differs based on settings but is 25% on the average. Cost of its treatment is two and a half times the cost of preventing them. Its development is an index of poor Nursing care. Nursing remains at the forefront of protecting and safeguarding the patient from pressure ulcers. Successful prevention of pressure ulcers requires that caregivers have adequate knowledge of this complication and preventive practice measures. This study describe the prevalence of pressure ulcers among inpatients of ICU and CCU departments, assess intensive care nurses' knowledge and practice about pressure ulcers management and the impact of an educational program on knowledge and practice. An experimental research design was adopted to conduct the study on (39) nurses working in Intensive Care Units of Prince Miteb Bin Abdulaziz Hospital, Sakaka City, Saudi Arabia. Two tools were used for data collection: Knowledge questionnaire sheet and observation checklist. Completion of the educational program resulted in improved levels of nurses' knowledge and practice regarding PU management. Findings of the present study suggest continued nursing education for the enrichment of nurses' knowledge and augmenting their practices about identification, prevention and management of pressure ulcer is effective in minimizing pressure ulcer for immobilized patients.

Keywords: key words, Nurses' Knowledge, Nurses' Practice, Pressure Ulcer Prevention, educational programs.

1. Introduction

The human body is designed to be in constant movement, even while we sleep. We constantly shift positions, always unconsciously readjusting ourselves in bed, at the computer station, watching TV or whatever active or inactive pursuit engages us (Jeannette 2015).

Total immobility, even for as little as 12 hours, can cause bedsores. Circulation is impeded when blood flow slows or stops in the compressed area between bone and the surface of a bed or wheelchair. When the tissue is deprived of oxygen and nutrients, the skin can die in as little as half a day, although the evidence may not be obvious for days or even weeks (Jeannette 2015). This external pressure must be greater than normal arterial capillary closure pressure of 32 mmHg to lead to inflow impairment and resultant local ischemia and tissue damage (DHHS 2011).

These sores not only cause pain and discomfort, but may lead to infections, like meningitis, cellulitis and endocarditis, according to Health Link BC. The shoulder blades, tailbone, elbows, heels and hips are the most common sites for bed sores because these areas contain little muscle and fat (WOCN 2010).

Pressure ulcers are a serious health issue for patients in all kinds of health care settings and even at home thus reduction of pressure ulcer prevalence in long-term care (LTC) is a Healthy People 2010 initiative. Approximately three million adults are affected in the United States (DHHS 2011).

A Canadian Association of Wound Care-supported study in 2004 indicated that the prevalence of pressure ulcers was 25% in acute care, 30% in non-acute care, 22% in mixed health-care settings, and 15% in community care (Woodbury &Houghton 2004). These figures translate into untold patient suffering, caregiver anguish, and extra work for health-care providers, and millions spent in health-care budget. Pressure ulcer incidence is associated with an increased morbidity and mortality-nearly 70% die within 6 months. Bed-ridden patients are prone to pressure ulcers (Jun et al. 2004).

The most common bed sore location were the sacrum (a triangular bone at the base of the spine); buttocks; Ears; Scapula; Shoulder; Elbow; Iliac Crest; Sacrum/Coccyx; Heel; and Toes . Pressure ulcers were graded from I to IV: grade I, non-blanch able erythema with intact skin surface; grade II, epithelial damage, abrasion or blister; grade III, damage to the full thickness of the skin without a deep cavity and grade IV, damage to the full thickness of the skin with a deep cavity (Fitzgerald 2010).

Prevention and management of a pressure ulcer therefore focuses on eliminating or reducing risk factors in

such patients which could be intrinsic or extrinsic factors (Jun et al. 2004).

Intrinsic risk factor of pressure sore include; (1) immobility as in patients with spinal cord injury, cerebrovascular accident, pain, fractures, post-surgical procedures, coma or sedation, arthropathies and progressive neurogenic disorders, (2) poor nutrition as in conditions of anorexia, dehydration, poor dentition, also overweight/under weight, (3) sensory impairment as in reduced level of consciousness and decreased pain sensation, (4) incontinence; urinary or fecal and other sources of moisture, e.g. wound exudates, (5) psychosocial status as depression or psychosis, (6) previous history of pressure ulceration, (7) co-morbidity (diabetes, systemic signs of infection, blood supply peripheral vascular disease, pain and medication, congestive cardiac failure, immunodeficiency, or use of corticoids, malignancies, end-stage renal disease, dementia and aging skin) (WOODbury &Houghton 2004).

Extrinsic risk factors of pressure sore include; (1) pressure from any hard surface (e.g. bed, wheel chair, and stretcher), (2) friction from patient's inability to move well in bed. Skin can be damaged when the body is rubbed, dragged or slid against a surface such as bed sheets, (3) moisture from bowel or bladder incontinent (WOODbury &Houghton 2004).

Clinical manifestations of Pressure Ulcer depend on the stage of the ulcer. though early signs of pressure ulcers include the following : Skin redness, warm area, spongy or hard skin and erosion of the top layers of skin or a sore with bacterial invasion (Jun et al. 2004).

In stage I a persistent area of red skin may itch or hurt. The spot can feel warm or spongy to the touch; conversely it may feel hard. In darker skin, the patch may look blue or purple, or appear flakey or ashen. Wounds will usually disappear promptly if the pressure is relieved.

In stage II, an open sore that looks like a blister or abrasion is a red flag. The surrounding area may be discolored. When treated promptly, these sores can heal quickly if the person is otherwise in good health and not experiencing other problems such as diabetes or paralysis. Stage III bedsores are often extremely painful and difficult to treat. The pressure ulcer has extended through all the skin layers down to muscle. The deep, crater-like wound indicates permanently destroyed tissue.

Stage IV bedsores, the most serious stage, destroy muscle, bone, and even tendons and joints. Stage IV bedsores are often lethal (DHHS 2011).

To relieve and spread pressure; (1) bath the patient as often as needed to be clean and comfort, (2) Use special mattresses, bed covers, and chair cushions designed to help reduce PU, (3) avoid sliding, slipping, or slumping, or being in positions that put pressure directly on an existing pressure sore, (4) Change positions at least every 2 hours for bed ridden patient as often as every 15 minutes if in wheelchair, (5) keep the head of a bed, a recliner chair, or a reclining wheelchair raised no more than 30 degrees, (6) use moisturizing creams or lotions to keep skin soft and keep it from getting too dry, (7) in case with bowel or bladder incontinence use a protective barrier cream, lotion, or ointment and pads or briefs that absorb moisture, (8) check patient skin every day for signs of pressure sores. Pay special attention to bony areas such as the hips, elbows, knees, and heels, (9) assess patient diet to conform enough protein and fluids, (10) avoid rub knee or ankles together by use pillow in between, (11) put gloves fill with water or air under bony prominent areas as elbow or ankle (Dealey & Defloor 2009).

2. Aims of the study

- To study the prevalence rate of PU among inpatients of ICU and CCU departments.
- To determine the impact of an educational program on nurses' knowledge and practice about pressure ulcers prevention.

3. Research Questions

The research questions of this study were as follows:

- What is the prevalence of PU in ICU and CCU departments?
- What is the level of nurse's knowledge regarding pressure ulcer prevention and management?
- What is the level of nurse's practice regarding pressure ulcer prevention and management?
- Are there any relationships between nurses' knowledge and practice regarding pressure ulcer prevention and management?

4. Significance of the study

Pressure ulcers have been described as one of the most costly and physically debilitating complications in the 20th century. Pressure ulcers are the third most expensive disorder after cancer and cardiovascular diseases (Qaseen et al. 2012). Pressure ulcer was a significant financial burden to any health care system and had adverse effects on achieving goals of care. Pressure ulcers come at a high cost to everyone. They result in pain, suffering, diminished quality of life and even death for some residents. For a nursing, they represent extra staff hours and medical supplies spent caring for a preventable condition, as well as more residents hospitalized. Moore & Price

(2005) estimated that the annual treatment cost of pressure ulcers in the UK was \$270 to \$481.5 million and prevention cost was \$270 to \$1132.5 million. Pieper (2007) stated that treatment cost of pressure ulcer ranged from US \$2.2 to US \$3.6 billion per year. Pressure ulcer was the third most expensive morbidity due to prolonged hospitalization, and the need for intensive nursing care for pressure ulcer.

The study findings will provide a unique exploration of prevalence of pressure ulcer. Also, this study was expected to improve the nurses' knowledge and practice regarding pressure ulcer prevention and management. The outcomes of this study contribute to future research in nursing. It will provide baseline data for higher authority to plan for an initiation for staff development in order to improve quality of care.

5. Research Hypotheses

- Nurses knowledge and practice about PU prevention will increase after our education program.
- level of education will affect nurses' knowledge, and practice towards PU prevention.

6. Methodology

6.1 Design

An experimental design was used to examine the effect of PU educational program on nurses' knowledge, and practice towards PU prevention. The pre- and posttest were administered to all participants in ICU and CCU departments.

6.2 Sample/participants

List of all units in which there were likely to be patients with pressure ulcer including critical care units (ICU, CCU) was obtained from directors of nursing. Then all available registered nurses (RNs) (Baccalaureate and diploma degrees) (n= 39) at the selected units were invited to participate in the study. Only five nurse refused to participate in the program.

6.3 Setting

The study was conducted at the intensive care units of Prince Miteb Bin Abdulaziz Hospital, Sakaka City, Saudi Arabia

6.4 Procedure

The study was conducted on 3 phases (preparatory phase, implementation phase and evaluation phase).

The Preparatory phase

- The researchers estimated the prevalence of pressure ulcers in ICU and CCU departments using tool of :
- Braden risk assessment scales: The Braden scale for predicting pressure sore risk was first introduced in 1987 (Braden1998). It is a summated rating scale composed of six subscales: sensory perception mobility, activity, moisture, nutrition, and friction and shear. The six subscales are rated from 1 (least impaired) to 4 (most impaired), except friction and shear, which rates from 1-3. A total score range of 6 to 23 is possible, with scores of 18 – 23 at low risk, 11-17 moderate risk and <11 as at high risk development.
- Reviewed the related materials and literature extensively.
- Assessment of the nurse's knowledge and practical skills were made. The three study tools are:
 - *Demographic sheet include:* name of department, age, gender, marital status, levels of education, and service experience.
 - *Knowledge questionnaire sheet:* It was utilized for testing theoretical information related to pressure ulcer to assess the level of nurses' knowledge regarding pressure ulcer. It was composed of 7-questions related to risk factor of PU, methods for risk assessment, early signs of PU, methods of skin care, nutrition for health skin, and preventive measures for PU.

* Scoring system: Each answer was given "1" score for correct answer and "0" for incorrect answer. The total score was (34) and it was then converted into percentage as follows: Those who obtained less than 60% (20 score) are considered having an unsatisfactory knowledge level and from 60% to < 75% (21 to 26 score) are considered satisfactory and 75% to < 90 % (27 to 31 score) are considered good and 90% and above (32 to 35 score) are considered excellent.

- *Observational check list sheets:* Was utilized to assess nurses' performance level. It comprised 17 procedures related to prevention of occurrence of PU include, assess risk factor, assess skin, assess the risk factors, use risk assessment scale, document all data, perform skin care as a routine work, place the pillow under the patient's leg, use water filled glove under the patient's leg, use or advice caregiver to use creams or oils, pay more attention to pressure points, perform and check of lab tests, provide

vitamin and food, monitor a protein and calorie diet, avoid dragging, use a special mattress, avoid massage on bone prominent areas, turn a patient position every two hours, put pillows under the patient's leg ankle, and give advice to the patient or caregiver.

* Scoring system: Each item was scored as follow

(Zero) = Not done or done incorrect and (1) = Done correctly.

The total scores were 17as follows:

- Less than 60% (10 score) is considered unsatisfactory.
- From 60% to less than 75% (11 to 13 score) are considered satisfactory.
- 75% to less than 90%(14 to 16 score) is considered good.
- From 90% to above (17 to 18 score) is considered excellent.
- Performing an educational program; PU education program has been guided by (EUPAP and NPUAP 2009a; EUPAP and NPUAP 2009b) guidelines for PU prevention and treatment was used in this study. The researchers integrated the concepts of PU etiology and development, classification and observation, nutrition, skin assessment, risk assessment, and strategies to reduce pressure and shearing into the PU education program.
- *Pilot study*; the pilot study was carried out on 5 nurses. This was done to test clarity, applicability, feasibility & relevance of the tools used, to estimate the length of the required time for data collection. Based on results of pilot study a modification on tools was made. Pilot study sample was excluded from the final sample.
- *The Implementation & evaluation phase*; data were collected from June, 2017 till August, 2017. Data collection and program application were done during nurses break time by dividing nurses into groups, "2-3 nurse in each group".
- *Ethical considerations*; approval (decision number :4/4/37/38) was obtained from Local Committee for research Bioethics (LCBE), Al-jouf University after submitting the proposal of the study. A formal letter of cooperation was written to Prince Miteb Bin Abdulaziz Hospital, Sakaka City, Saudi Arabia. Objective from study was discussed with authorized management and formal clearance was assured before collecting data. All nurses who participated in the study were those who actually agreed to complete the study. Nurses were approached with a full description of the study and its aim, after which the nurses were free to participate in the study or reject. Confidentiality of the nurses was protected throughout the study.

7. Data analysis

Data entry and statistical analysis were done using SPSS 18.0 statistical software package. Results were presented as the frequencies, percentage, paired t-test, Pearson correlation analysis to test statistical significance of some variables and to test effectiveness of the programs. Statistical significance was considered at p-value < .05.

8. Limitations of the study

- Shortness of nursing staff make nurses very busy which leading to loss of time and effort of the researchers.
- Dropout of some nurses from the study group because of long term leaves e.g. sick leaves or rotating-shifts.

9. Results

Out of the expected 39 respondents, 34 agreed to participate in the study, yielding a response rate of 87.18%. About 22 (64.7%) of them were worked in intensive care unit while 12 (35.3%) were worked in critical care unit.

Table 1. Distribution of study participants regarding their socio-demographic characteristic (N=34)

Variables	Frequency (n= 34)	Percentage (100%)
1-Age in years:		
20-30	33	97.1
31-40	1	2.9
2-Marital status:		
Single	20	58.8
Married	13	38.2
Divorced	1	3
3-Level of education:		
Diploma in nursing	5	14.7
Bachelor degree in nursing	29	58.3
4-Service experience:		
≤ 10	34	100

Table 1. showed that most of participants were ranged age from 20- 30 years old presenting 97.1% while 2.9% were ranged from 30-40 years old. Around half (58.8 %) were single. Regarding educational status (85.3%) had bachelor degree in nursing. While (14.7%) had diploma in nursing. The whole number of participants had working experience of less than 10 years.

Table 2. Mean Braden scale score in subjects in departments of study

Department	Braden scale		
	< 11(high risk)	< 17(moderate risk)	>17 (low risk)
	N(%)	N(%)	N(%)
1-Intensive care unit (ICU)	2 (4.6)	18 (41.9)	11(25.6)
2-Critical care unit (CCU)	0(0)	3(7)	9 (20.9)
Total number= 43	2 (4.6)	21 (48.9)	20 (46.5)

Table 2. showed Most of patients (72.1%) admitted to intensive care unit. The present study revealed that 4.6% were at high risk (< 11) for pressure ulcers,48.9% were a moderate risk (< 17) and 46.5% were at low risk (>17)(based on the total score of the Braden scale.

Table 3. Distribution of the nurses' knowledge score regarding etiology, risk assessment, methods of skin care, and preventive measures of pressure ulcer in pre and post-test (N=34)

*P <0.05 (significant between pre-test and post-test groups)					
Nurses knowledge regarding to pressure ulcer	Pre test		Post test		P
	Correct No (%)	Incorrect No (%)	Correct No (%)	Incorrect No (%)	
1-Common risk Factors for Pressure Ulcers:					
1) Limited mobility (Spinal cord injury, ESRF, Fractures, pain, Alzheimer, stroke, ...etc)	33 (97.1%)	1 (2.9%)	34 (100%)	0 (0%)	0.314
2) Poor nutrition / Dehydration / Low albumin	9 (26.5%)	25 (73.5)	27 (79.4%)	7 (20.6%)	0.000
3) Coma or sedation	8 (23.5%)	26 (76.5%)	23 (67.6%)	11 (32.4%)	0.000
4) High loading pressure / Loss of subcutaneous fat	11 (32.4%)	23 (67.6%)	22 (64.7%)	12 (35.3%)	0.008
5) Bowel or bladder incontinence	5 (14.7%)	29 (85.3%)	15 (44.1%)	19 (55.9%)	0.008
6) Pressure from any hard surface	9 (26.5%)	25 (67.6%)	22 (64.7%)	12 (35.3%)	0.002
7) Friction from patient's inability to move well in bed	5 (14.7%)	29 (85.3%)	22 (64.7%)	12 (35.3%)	0.000
2-Risk assessment					
1) Head to toe skin assessment	16 (47.1%)	18 (52.9%)	31 (91.2%)	3 (8.8%)	0.000
2) Braden scale	4 (11.8%)	30 (88.2%)	14 (41.2%)	20 (58.5%)	0.006
3) Other risk assessment scale	1 (2.9%)	33 (97.1%)	18 (52.9%)	16 (47.1%)	0.000
3-Early Signs of pressure ulcers:					
1) Pale , red , or blue – gray discoloration on the skin	29 (85.3%)	5 (14.7%)	34 (100%)	0 (0%)	0.020

2) Partial skin loss with blister and abrasion	14 (41.2%)	20 (58.8%)	33 (97.1%)	1 (2.9%)	0.000
4-Methods of skin care					
1) Topical cream	16 (47.1%)	18 (52.9%)	26 (76.5%)	8 (23.5%)	0.013
2) Turning position	11 (32.4%)	23 (67.6%)	23 (67.6%)	11 (32.4%)	0.004
3) Cleansing soil	26 (76.5%)	8 (23.5%)	31 (91.2%)	3 (8.8%)	0.100
4) Lift up patient without dragging	0 (0%)	34 (100%)	12 (35.3%)	22 (64.7%)	0.000
5) Use pillow under patients leg	3 (8.8%)	31 (91.2%)	19 (55.9%)	15 (44.1%)	0.000
5-Nutrition to maintain healthy skin					
1) Vitamins	10 (29.4%)	24 (70.6%)	31 (91.2%)	3 (11.1%)	0.000
2) Protein and calories	12 (35.3%)	22 (64.7%)	33 (97.1%)	1 (2.9%)	0.000
3) Serum albumin	5 (14.7%)	29 (85.3%)	28 (82.4%)	6 (17.6%)	0.000
6-Preventive measures					
1)Ensuring a clean, dry and square lower layer of bedclothes	8 (23.5%)	26 (76.5%)	15 (44.1%)	19 (55.9%)	0.073
2)Helping non-bedridden patients lift up or assume a different position	7 (20.6%)	27 (79.4%)	23 (67.6%)	11 (32.4%)	0.000
3)•Elevate the head of bed < 30 ⁰ is the activity for reducing shearing force	1 (2.9%)	33 (97.1%)	19 (55.9%)	15 (31.2%)	0.000
4)Using air mattresses and pillows	8 (23.5%)	26 (76.5%)	29 (85.3%)	4 (11.8%)	0.000
5)Smearing the skin with topical agents to prevent dehydration	16 (47.1%)	18 (52.9%)	33 (97.1%)	1 (2.9%)	0.000
6)Assessing nutritional state and preventing nutritional deficiency	8 (23.5%)	26 (76.5%)	26 (76.5%)	8 (23.5%)	0.000
7)Ensuring good hygiene	16 (47.1%)	18 (52.9%)	31 (91.2%)	3 (8.8%)	0.000
8)Involving family/friends/caregivers in prevention	2 (5.9%)	32 (94.1%)	3 (8.8%)	31 (91.2%)	0.642
9)Turn position for every 2 hours	24 (70.6%)	10 (29.4%)	34 (100%)	0 (0%)	0.001
10) Avoid contact of the heels with the lower layer by putting a pillow under the lower legs	3 (8.8%)	31 (91.2%)	23 (67.6%)	11 (32.4%)	0.000
11) Smearing the skin with topical agents in case of urine and/or faces incontinence	2 (5.9%)	32 (94.1%)	25 (73.5)	9 (26.5%)	0.000
7-Management of mechanical loads					
1) Turning position	12 (35.3%)	22 (64.7%)	30 (88.2%)	4 (11.8%)	0.000
2) Lifting patient without dragging	1 (2.9%)	33 (97.1%)	19 (55.9%)	15 (31.2%)	0.000
3) Elevate head of bed <30 degree	6 (17.6%)	28 (82.4%)	27 (79.4%)	7 (20.6%)	0.000

Table 4. Mean of total percentage of correct knowledge scores of study subjects regarding pressure ulcer (N=34)

Nurses knowledge regarding to pressure ulcer	Pre test		Post test		P
	Mean Percentage ± SD	level	Mean Percentage ± SD	Level	
1-Common risk Factors for Pressure Ulcers	33.63 ± 28.73	Unsatisfactory	64.20 ±11.38	Satisfactory	0.033
2-Risk assessment	20.60 ±23.37	Unsatisfactory	61.77 ±26.15	Satisfactory	0.112
3-Early Signs of pressure ulcers	63.25 ±31.18	Satisfactory	98.55 ±2.05	Excellent	0.251
4-Methods of skin care	32.96 ±30.68	Unsatisfactory	65.30 ±21.15	Satisfactory	0.088
5-Nutrition to maintain healthy skin	26.47 ±10.61	Unsatisfactory	90.23 ±7.40	Excellent	0.001
6-Preventive measures	25.40 ±21.36	Unsatisfactory	69.78 ±26.45	Satisfactory	<0.001
7-Management of mechanical loads	18.60 ±16.22	Unsatisfactory	74.50±16.70	Satisfactory	0.014
Total	31.56±15.06	Unsatisfactory	74.90±14.14	Satisfactory	<0.001

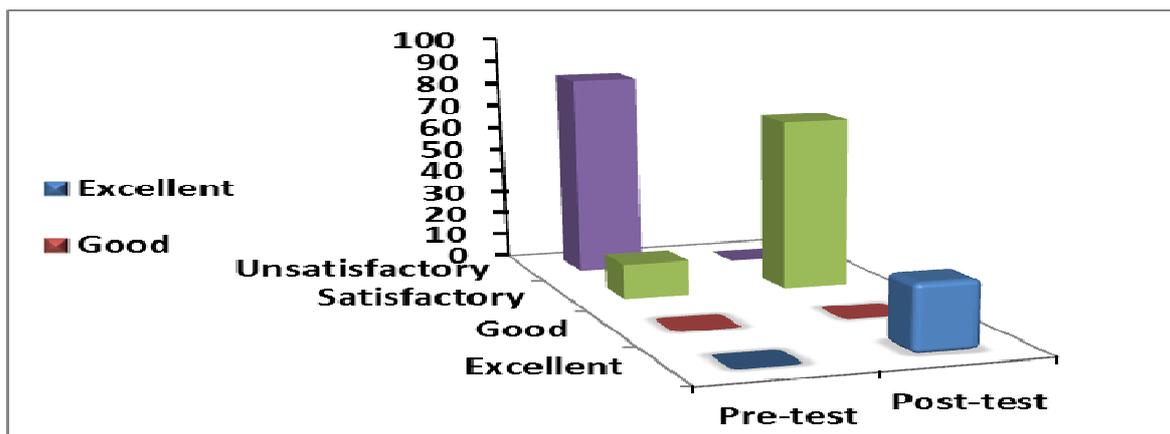


Figure 1. Total Respondents Knowledge Regarding Pressure Ulcer (N=34)

Table 3. reveals frequencies and percentages of nurses knowledge regarding pressure ulcer pre- post-test. Table 4. shows difference between pre and post-test percentage of knowledge as regard to common risk factors , risk assessment , early signs of pressure ulcers , skin care, nutrition to maintain healthy skin, preventive measures and management for mechanical loads ulcer, management of pressure ulcer, and prevention of ulcer (33.63%, 20.60%, 63.25%, 32.96%, 26.47%, 25.40 % and 18.60 respectively) on pre-test compared to (64.20%, 61.77%, 98.55%,65.30%, 90.23%, 69.78% and 74.50% respectively) in the post test (after intervention). Table 4. and Figure 1. also delineated that the minority of nurses (about 15%) obtained the highest mean percentage scores (63.25± 31.18 SD) related to early signs of pressure ulcer pre-test . Almost of nurses had obtained a lowest mean scores related to risk assessment, methods of skin care, preventive measures and dealing with mechanical loads .All the nurses knowledge in the whole aspects improved after program implementation and the scoring ranged from satisfactory to excellent.

Table 5. Bivariate analysis of level of education and overall nurses' knowledge in pre and post-test (N=34)

Level of education	Knowledge							
	Pre test				Post test			
	Mean Percentage (%)	Level	COR R(P)	AOR (95%CI)	Mean Percentage (%)	Level	COR R(P)	AOR (95%CI)
Diploma	25.5%	Unsatisfactory	0.629 (0.43)	1.29 (0.70-2.40)	67.65%	Satisfactory	0.796 (0.37)	1.32 (0.70-2.42)
Bachelor	30.8%	Unsatisfactory			72.4%	Satisfactory		

Table 5. shows that nurses who had diploma and bachelor degrees had unsatisfactory knowledge score pre-test(25.5% and 30.8% respectively) but the knowledge answered correctly were 1.29 times in nurses having bachelor degree rather than diploma [AOR = 1.29, 95 % CI (0.70-2.40)] .The knowledge score improved after program implementation to be satisfactory in both nurses having diploma and bachelor (67.65% and 72.4% respectively). This correlation was statistically not significant (r=0.629 and 0.796 at p >0.05) pre and post program respectively.

Table 6. The mean percentage of correctly nurses' practice regarding pressure ulcer (N=34)

Nurses knowledge regarding to pressure ulcer	Pre test		Post test		P
	Mean percentage \pm SD	Level	Mean percentage \pm SD	Level	
1) Assess the risk factors	5.88 \pm 3.88	Unsatisfactory	76.47 \pm 43.06	Good	<0.001
2) Skin assessment	20.59 \pm 11.04	Unsatisfactory	82.35 \pm 38.70	Good	<0.001
3) Use risk assessment scale	0 \pm 0	Unsatisfactory	32.35 \pm 20.49	Unsatisfactory	<0.001
4) Document all data	0 \pm 0	Unsatisfactory	35.29 \pm 24.50	Unsatisfactory	<0.001
5) Perform skin care as a routine work	55.88 \pm 20.40	Satisfactory	97.06 \pm 17.14	Excellent	<0.001
6) Place the pillow under the patient's leg	26.47 \pm 22.78	Unsatisfactory	88.23 \pm 32.70	Good	<0.001
7) Use water filled glove under the patient's leg	20.59 \pm 22.04	Unsatisfactory	82.35 \pm 38.70	Good	<0.001
8) Use or advice caregiver to use creams or oils	26.47 \pm 22.78	Unsatisfactory	91.18 \pm 28.79	Excellent	<0.001
9) Pay more attention to pressure points	11.76 \pm 10.70	Unsatisfactory	61.76 \pm 30.33	Satisfactory	<0.001
10) Perform lab tests	0 \pm 0	Unsatisfactory	41.18 \pm 32.96	Unsatisfactory	<0.001
11) Provide vitamin and food	17.65 \pm 12.69	Unsatisfactory	85.29 \pm 35.94	Good	<0.001
12) Monitor a protein and calorie diet	17.65 \pm 11.52	Unsatisfactory	85.30 \pm 35.95	Good	<0.001
13) Avoid dragging	2.94 \pm 1.02	Unsatisfactory	61.76 \pm 39.32	Satisfactory	<0.001
14) Use a special mattress	35.29 \pm 8.31	Unsatisfactory	88.23 \pm 30.70	Good	<0.001
15) Avoid massage	2.94 \pm 1.90	Unsatisfactory	73.53 \pm 40.78	Satisfactory	<0.001
16) Turn a patient position every two hours	79.41 \pm 20.04	Good	94.12 \pm 23.88	Excellent	0.07
17) Give advice to the patient or caregiver	5.88 \pm 4.92	Unsatisfactory	8.82 \pm 4.90	Unsatisfactory	0.64
Total	19.38 \pm 11.49	Unsatisfactory	69.21 \pm 26.61	Satisfactory	<0.001

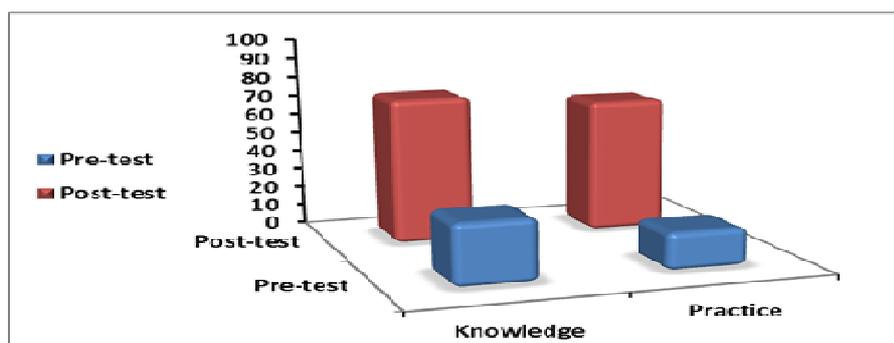


Fig 3. Total percentage of correctly nurses' knowledge and practice score regarding pressure ulcer in pre and post-test

10. Discussion

The incidence and management of pressure ulcers in critically ill patients is an ongoing concern for nurses. Efforts to prevent pressure ulcer development are plagued with inconsistencies and a general lack of best practice guidelines. Establishing current practice approaches to the assessment, prevention and management of pressure ulcers is a necessary first step in the implementation of evidence-based/best practice guidelines (Shahin et al. 2009). So this study aimed to assess intensive care and critical care nurses' knowledge and practice of pressure ulcers and to determine the effect of implementing educational program about pressure ulcer control on nurses' knowledge and practice of immobilized patients.

10.1 Regarding Socio demographic characteristics

Findings of the present study indicated that the majority of nurses (97.1%) their age between 20 to 30 years old. This might be due to almost of nurses were newly graduates from nursing Collages. Supporting to these findings

(El-sayed et al. 2003) and (Taha,2014) studies which stated that almost all nurses working in intensive care unit their age ranged from 20 to 25 years old.

Our study indicated that more than half (58.8%) of nurses are single and less than half (38.2%) are married. This result disagree with (Hamed 2009); (Islam 2010) & (Taha,2014) studies which revealed that the majority of nurses in intensive care units were married and having offspring's.

Current study reveals that all participants (100%) had service experience ≤ 10 years. In agreement with (Taha,2014) study which found 93.3% of intensive care nurses had experience ≤ 10 years. These findings give a prediction of low knowledge and practice of nurses regarding pressure ulcer management before the program. Supported by (Seloma 2003) who reported that more the years of working in ICUs and years of experience the higher efficiency of nurses clinical practices. As years of experience were positively correlated to their knowledge and performance.

The current study showed Most of patients (72.1%) admitted to intensive care unit meaning .Previous study conducted by (Beeckman et al. 2011) was against our results as they stated that 30.9% of the patients at risk received adequate preventive measures in bed as well as while seated in an armchair in ICU. The present study revealed that 4.6% were at high risk (< 11) for pressure ulcers,48.9% were a moderate risk (< 17) and 46.5% were at low risk (> 17) (based on the total score of the Braden scale. The present study was similar to previous study conducted by (Demarre et al. 2012) who stated that Braden risk assessment showed that 42.1% of the patients were at risk for developing a pressure ulcer (Braden score < 17 and/or presence of pressure ulcer).

10.2 Nurse's knowledge related to pressure ulcer

The present study revealed that nurses have poor knowledge (33.63 %) regarding risk factors of pressure ulcer development, (Nasreen et al. 2017) shows similar results in which nurse's knowledge about factors related to pressure ulcer was (35.2%) but in contrast another study conducted in Bangladesh which result shows that nurse's knowledge about factors related to pressure ulcer, was at very low to low level (Islam et al. 2010) . But the study of Uganda revealed that nurses knowledge about risk factors which can cause pressure ulcer in bedridden patients was 92.9%.(Mwebaza et al. 2014) .

According to Bangladesh study results knowledge about the use of the risk assessment scale for pressure ulcers was only 12.1% (Islam et al. 2014) and in our study results was (20.60%).

Nasreen et al. (2017) was higher as it was (37.2%). Study shows that our result regarding Braden scale are worse as compared with study results conducted by (Nasreen et al. 2017) .

Our results showed that most of nurses (70.32%) had unsatisfactory knowledge regarding pressure ulcer pre test, The knowledge is below the minimum acceptable level. This poor knowledge of PU prevention was also shown in other studies including insignificant difference between knowledge levels and years of experience (Buss et al. 2004; El Rnein & Zaghoul 2011).

However, two studies reported good levels of knowledge regarding the prevention of PUs (Ayello & Lyder 2008; Tweed & Tweed 2008). Number of reasons might explain such an observation. Most of the sample of nurses aged between 20 and < 30 years and the majority had < 10 years of experience. These findings are consistent with (Mohamed & Weheida 2015) and also with (El-Sayed et al. 2003) who stated that nurses' age mostly ranged from 20 to 25 years with a mean duration of experience of 25.4 ± 11.6 months.

Clay (2000) found that pressure ulcer prevention and management is beneficial not only to patients but also to the health care system, so education for healthcare professionals is an important factor in the prevention and management of pressure ulcers. Hence, adequate knowledge about pressure ulcer preventive strategies is important, these were also reflected frequently used in practice.

The present study revealed that the nurses' knowledge regarding pressure ulcer were improved after implementing of educational program. This result supported by the work of (Smith & Waugh et al. 2009) who used descriptive study among 435 registered nurses. The Pieper Pressure Ulcer Test was used to assess the nurses' knowledge. Found the significance of this study is a nurse's knowledge were significantly higher when exposed to educational material. In Egypt, study by (El Enein & Zaghoul 2011) who using a descriptive cross sectional study with 122 subjects. This study demonstrated that, unless a nurse had received pressure ulcer education within the past year, her knowledge was below the minimal acceptable standards. Significantly higher scores were obtained when pressure ulcer education was available. This attributed to nurses providing information about skin care and preventive measures help to maintain skin integrity has great benefit. Nuru et al. (2015) [reported that Nurses who took formal training on pressure ulcer prevention were found to have good knowledge than those who had not. Similarly in a study conducted in Swedish healthcare to assess knowledge, attitude and practice of nursing staff on pressure ulcer prevention; nurses who had training were more knowledgeable than those who did not (Kallman & Suserud 2009). This might be due to the fact that training increases the chance of the trainees to get up to date information about pressure ulcer related preventions.

10.3 Nurse's practice related to pressure ulcer

Findings of the present study showed that the majority of nurses who participated in this study had unsatisfactory practice level regarding PU prevention and management.. This in agreement with (Taha,2014) study who found that more than half of nurses had poor knowledge and practice regarding pressure ulcers management.

As regarding to relation between knowledge, practice and level of education, the present study finding revealed that there weren't statistical significant relation between level of education with knowledge and practice. These findings contradicted with (Taha 2006) in his study which reported that the Bachelor degree nurses obtained a low mean scores than others regarding knowledge items. And also disagree with (Taha,2014) here study found highly statistical significant relation between level of education (bachelor degree) with knowledge.

The current study showed that there were low of nurses knowledge and practice regarding PU prevention and management in pre-test. Supporting to our study finding (El-sayed, Mohamed & El-Sonbaty 2003) reported that results of the analysis before program implementation (pretest) showed very low levels of knowledge and practices as regards the identification, prevention and management of bed sores.

In pre-test, as regard to nurses practice in assessment of risk factor, assessment of occurrence of PU, assessment of nutritional status to maintain a healthy skin, dealing with mechanical loads, give education to patient and family about PU, there are unsatisfactory score. Those results agree with (Taha,2014) study who found unsatisfactory score in previous point. While here results disagree with our study in skin care, our participants had satisfactory score and here participants had unsatisfactory score.

11. Recommendation

- Nurses should put best practice activities into place for each patient based on their risk as identified by the Braden Scale. This is because of the evidence-based benefits of guidelines implementation.
- More attention should be taken from critical departments head nurse about nurses application of PU preventive strategies.
- Additional in-service training and educational program must be designed for nurses to enhance their Knowledge and practice regarding PU preventive strategy.

12. Conclusion

Most pressure ulcers can be prevented. Bedsore are easier to prevent than to treat. By following some simple steps that are based on best practice, the health professional can team up with the patient and other caregivers to create an environment where pressure ulcers are reduced or eliminated. What's needed is awareness on the part of patients and health-care professionals about how pressure ulcers can be prevented and a commitment to the actions required to do so. Position changes are a key to pressure ulcer prevention. These changes need to be frequent, repositioning needs to avoid stress on the skin, and body positions need to minimize the risk of pressure on vulnerable areas. Other strategies include skin care, regular skin inspections and good nutrition. Pressure ulcer prevention is an often overlooked aspect of health care. The provision of prevention programs is essential.

Whatever technology that may be in place, the key concept needed to revolutionize pressure ulcer care throughout the world is an old one: The recognition that prevention is better than cure and thus the promotion of prevention strategies by all health workers is essential. As far back as 1894 Florence Nightingale wrote about the benefit of supporting prevention-based practice. This often overlooked aspect of health care must be taken seriously as the world enters an era of chronic disease management that will end in a financial crisis if prevention programmers are not implemented.

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