Monitoring of Rehabilitative Nursing Practices in relation to Functional Ability for Patients with Spinal Cord Injury

Ahlam Rashed Al buwayni [1], Nahed Mresal[2], Samah Mahmoud Sofar[3]

[1]Nurse Educator, MSN, BSN, RN, MOH, SA.
[2]Associate Professor of Medical Surgical Nursing, King Abdul Aziz University, Professor of Medical Surgical Nursing, Ain shams University.
[3]Assistant Professor of Medical Surgical Nursing Department, Faculty of Nursing, Alexandria University, Egypt.

Abstract

Background: Spinal cord injuries (SCI) is a serious medical status that influences the patients' life as well as that of their family, patients with SCI need to perform daily tasks and optimize their physical and cognitive functioning. This can be achieved through rehabilitation. Rehabilitative nurses should be knowledgeable and have an experience to care for patients with SCI and prevent possible complications. **Aim of the study:** to monitor the rehabilitative nursing practices in relation to functional ability for patients with spinal cord injury**. Setting:** Medical Rehabilitation hospital in Madinah city in the Kingdom of Saudi Arabia**. Design:** a cross sectional descriptive and correlational design. **Sample:** A convenient sample of 46 nurses caring for patients with SCIs and a purposive sample of 36 patients who have SCIs based on the inclusion criteria. **Tools:** 1-Observational checklist assessment of rehabilitative nursing practices for patient with SCI. 2- Functional Independence Measure (FIM) instrument was used in this study. **Results:** nearly three quarters **(71.7%)** of nurses had inadequate practices regarding total rehabilitative nursing practices for patients with SCI, while only around quarter (**28.3%**) of nurses had adequate of practice, the mean score of total functional independent measure were **(85.58±20.92).** **Conclusion:** the present study concluded that nearly three quarter of nurses had inadequate practices regarding total rehabilitative nursing practices for patients with SCI. Concerning total motor functional independence measure; it was found that more than half of patients needed helper with modified dependence. Additionally, the highest majority of patients did not needed helper regarding cognitive functional. There was a positive correlation between types of injury with motor functional independence measure. Finally, there were no significant correlation between total rehabilitative nurses' practices for patients with spinal cord injury, motor, cognitive and total FIM of the patients. **Recommendations:** The study recommended future research is required in replicating the study at different settings with large sample size in Saudi Arabia with the aim of generalizing the results.

Key words: Rehabilitative. Nursing practices, functional ability and spinal cord injury.

Introduction:

Spinal cord injuries (SCI) is a serious medical status that influences the patients' life as well as that of their family. It also refers to a physical injury to the spinal cord that disrupts normal functioning [1]. SCI occurs due to damage to the spinal cord resulting in a transient or permanent loss of motor, sensory and autonomic functions [2]. Patients with a SCI experience a significant impairment in different aspects of their life [3].

The worldwide incidence of spinal cord injuries totals 40 – 80 cases per million population. Annually, the incidence rate of people suffering from a spinal cord injury is around 250,000 to 500,000, [3]. It has been stated that in developing countries, the rate is 25.5 million per year [4].The Ministry of Health (MOH) recorded that the Kingdom of Saudi Arabia had one of the highest rates for spinal cord injuries. It has been pointed out that in 2016, there were around 2.1 incidences per million per year in Saudi Arabia. However, the information available is too limited to precisely estimate the incidence of SCI [5].

Sweis and Biller (2017) demonstrated that worldwide, the most prevalent causes of SCI are motor vehicle accidents (46%) followed by falls (22%), violence (16%) and sports-related injuries (12%). On the other hand in Saudi Arabia, SCI cases are mainly caused by road traffic accidents (RTAs) (85%) followed by falling from a height (9%), gunshots (5%), violence/self-harm (4.6%) and sporting injuries (about 1%) [6].

The outcome of a patient with SCI depends on the extent of the injury and the severity of the sensorimotor dysfunction. This might have an effect on their motor-sensory and cognitive functions as well. The motor-sensory loss might have an effect on the autonomic neurologic functions of the body resulting in multiple impairments such as a loss of bowel, bladder and sexual function. Patients with a SCI also face limitations in terms of their daily life activity such as mobility, changing their bodily position, transferring themselves and walking. This is in addition to self-care activities such as bathing, dressing, toileting, eating and cleaning. This is in relation to the cognitive outcomes, which include long-term cognitive impairments observed in the patient after a SCI. Standardized neuropsychological test have identified performance impairments in terms of memory, executive functioning, memory function, concentration ability, attention, processing speed and learning new abilities [7].

Many complications can occur after a spinal cord injury including urinary tract infections, pressure ulcers, hypotension, spasticity, pneumonia, respiratory failure and death. Ko et al. (2018) pointed out that mortality reaches the highest rate during the first year after the injury and among patients with a higher grade of injury.

Patients with a SCI need to perform daily tasks and optimize their physical and cognitive functioning. This can be achieved through rehabilitation. Rehabilitation plays a significant role in maximizing patient independence in their activities of daily living in addition to improving their quality of life. Rehabilitation is also essential to identify the impairments that limit activity and daily tasks and to optimize physical and cognitive functioning. It modifies both the personal and environmental factors.

People with a SCI nowadays are living longer and achieving greater functional independence as a result of improved medical, technological, and pharmacological rehabilitative management [8].

Spinal cord injury rehabilitation aims to help the patient and their family to have hope for tomorrow and to realize that the patient with a SCI can still live a full, independent and productive life within the limits of their disability [9].

The Spinal cord injury rehabilitation team is an interdisciplinary team of physicians, nurses, psychologists, therapists and nutritionists who strive to provide optimum care for the patient. The team works collaboratively to achieve the goals of the patient and their family. Moreover, each discipline provides unique contributions to patient care, which in turn may significantly affect the outcome [10].

Nurses are considered to be an integral part of the SCI rehabilitation team and they provide significant education to the patient and their family about the intricacies of living with a SCI. They help to manage the care process overall. _Moreover, nurses assist the patients with SCI concerning how to adapt to an altered lifestyle. Additionally, the nurses design and implement treatment strategies based on evidence-based practice related to self-care. They promote physical, psychosocial, and spiritual health [9].

Rehabilitative nurses who are caring for SCI patients should be knowledgeable and have experience. This includes knowledge of nursing care plans, preventing complications, and patient education concerning self-care and management. It is necessary to illustrate that the nurse's role is significant when referring to maintaining the patient's functions and outcomes [11].

Additionally, the nurses add value to the rehabilitation process by helping and encouraging the patients to transfer the skills learned in the therapy sessions to their daily routine. This addresses and monitors the issue of rehabilitative nursing practices in relation to the functional ability of patients with SCI [12].

The patient's functional ability is associated with their activities daily life (ADL) such as bathing, eating, changing their bandages and going to the toilet. These activities can be measured using the Functional Independence Measurement (FIM). FIM is widely used in outcome measurements to assess functional ability. The achievement of a functional ability by the patient with SCI through effective rehabilitative practices leads to positive patient outcomes. The FIM is extensively used when measuring the outcomes as a part of assessing functional ability, primarily motor skills and cognitive ability [12]. A few previous studies have been related to the assessment and monitoring of rehabilitative nursing practices in Saudi Arabia. This is because this type of injury is increasing. Consequently, the main aim of the current study is to monitor and assess rehabilitative nursing practices in relation to the functional ability of patients with SCI in Saudi Arabia.

Significant of the study:

Saudi Arabia is a country with one of the highest rates of traumatic SCI in the world compared with Western countries [13]. The government of Saudi Arabia has assigned great importance to the health care services including nursing care. As a

result, health care has improved significantly in terms of quantity and quality over the past few decades. Nevertheless, SCI remains one of the most indispensable social and economic medical issues in the Kingdom [14]. The current study might also be able to detect any decline or defects within the rehabilitative practices among the nurses who are working with patients with SCI. Detecting these defects can facilitate the suggestion of new evidence-based rehabilitative practices, which in turn might lead to substantial improvements in the rehabilitative nursing practices themselves. Improving the rehabilitative nursing practices for SCI patients will lead to a substantial decrease in future serious complications and a cardinal improvement in the patients' quality of life as well as their functional ability levels.

Aim of the study:

The aim of the present study was to monitor the rehabilitative nursing practices in relation to functional ability for patients with spinal cord injury.

The specific research questions:

1- What is the level of rehabilitative nurse's practices for patients with spinal cord injury?

2- What is the degree of functional ability of patient with spinal cord injury?

3- What is the relation between the level of rehabilitative nursing practices and functional ability of patients with spinal cord injury?

Material and Method

Material

Design

The design of this study was a cross sectional descriptive and correlational design

Setting

This study was carried out at the All of the inpatient departments in the Medical Rehabilitation hospital in Madinah city in the Kingdom of Saudi Arabia. This hospital has a bed capacity of 130 beds, including 3 admission departments: a Male Rehabilitation Ward (MRW1 with 24 beds), Male Rehabilitation Ward (MRW2 with 21 beds) and a Female Rehabilitation Ward (FRW with 32 beds), outpatient clinic and artificial kidney unit (AKU). There are 16 nurses in MRW1, 16 nurses in MRW2 and 20 nurses in FRW.

Study Sample

The study sample of the current study consisted of two groups:

Nurses sample:

The population size of nurses who are working at rehabilitation hospital in Madinah city was 52. The estimated convenient sample size was calculated by Epi Info [margin error = 0.05, the confidence level is 95%]. After calculation, the sample consisted of 46 nurses who were caring for patients with SCIs. The sample was selected based on the following criteria: Male and female registered nurses with experience for more than 6 months, caring for patients with SCI, and nurses who are willing to participate in the current study.

Patients' sample

The population size of the patients with spinal cord injuries was 40 patients at Rehabilitation hospital in Madinah city according to the hospital statistics 2018. The estimated sample size was calculated by Epi Info [margin of error= 0.05, confidence level = 95%]. After the calculation, the sample consisted of **36** patients with SCIs. Purposive sampling was used to select the patients from the rehabilitation hospital based on the following inclusion criteria: patient age between 20 -60, classified according to American Spinal Injury Association (ASIA) A, B and C, and patients welling to participate in the study. Exclusion criteria for patient: Patient on mechanical ventilator classified according (ASIA) as D, E.

The SCI was classified by the American Spinal Injury Association (ASIA) as following:

A = Complete: No sensory or motor function is preserved in the sacral segments S4 - S5. B = Incomplete: Sensory but not motor function is preserved below the neurologic level and it extends through the sacral segments S4 - S5. C = Incomplete: Motor function is preserved below the neurologic level and most of the key muscles below the neurologic level have a muscle grade of less than 3. D =Incomplete: Motor function is preserved below the neurologic level and most of the key muscles below the neurologic level have a muscle grade that is greater than or equal to 3. E = Normal: Sensory and motor functions are normal. This Scale is used in the setting of the study and obtained from the medical record, [15].

Study tools and measurements

Tool 1: Observational checklist assessment of rehabilitative nursing practices for patient with SCI. Assessment of rehabilitative nursing practices for patient with SCI observational checklist was used for the nurses to assess their rehabilitative nursing practices for patients with SCI, the tool consisted of two parts as following:

Part I: Nurses' demographic questionnaire form:

This part was developed by the researcher in English language to assess demographic characteristics for nurses; it included nurses' gender, age, educational level, marital status, years of experience, and the work department.

Part II: Observational checklist for rehabilitative nursing practices for patients with SCI.

This checklist was adapted from the Medical Rehabilitation hospital in Madinah city by Nursing standards organization committee for hospital service,2011 , which used routinely by the department of Medical Education to assess the nurses' competency skills of the daily practices. This part consisted of 9 observed main practices with 58 observed skills.

Observational checklist for rehabilitative nursing practices included: 1) Prevention of Infection [5 items], 2) Safety measures and fall precautions [6 items], 3) Measure patient's vital signs [6 items], 4) Maintain Respiratory function [7 items], 5) Maintain Cardiovascular Function [5 items], 6) Support and Maintain Nutritional Requirements [4 items], 7) Posture, Mobility, and

Ambulation. Management of spasticity [4 items], 8) Pressure Ulcers prevention [11 items], and 9) Maintain of bowel and urinary functions [11 items].

Observed skills were measured on a three point scale: two indicate correctly done, one indicate incorrectly done, while zero indicate not done. The maximum score for each observed practice is 2, while the lowest one is 0. The total score of this checklist is 116.Scoring: The points were summed up and converted into percent score. A total score of 60%=69.6 and more was consider adequate nursing practice and Less than 60%(69.6) that consider inadequate nursing practice , [16].

Tool II - functional ability assessment for patient with SCI: The tool consisted of the two parts:

Part I: Demographic and clinical data sheet for patients with SCI.

It was developed by the researcher. Demographic data for patient was included: gender, age, marital status, and their level of education .Clinical data of the patients such as: diagnosis (cervical injuries, thoracic injuries, lumbar injuries, and sacral injuries), type of injury (complete, sensory incomplete, motor incomplete, motor incomplete, and normal).

Part II: Functional Independence Measure (FIM) instrument:

This checklist was adopted from McDowell and Newell (1983) in English language, [17, 13]. It was used to assess patients' level of disability and any change in patients' status in response to rehabilitative nursing practices. This part consisted of two main functional scales:

motor function skills and cognitive function skills.

The motor scale consisted of 13 motor functions skills (eating, grooming, bathing, dressing upper body, dressing lower body, toileting, bladder management, bowel management, transfer: bed/chair/wheelchair, transfer toilet, transfer bath/shower, walk/wheelchair, and stairs). The maximum score for each motor functions skill is 7, while the lowest one is 1. The total score of this scale is 91.

The cognitive functions scale consisted of 5 cognitive functions items (comprehension, expression, social interaction, problem solving, and memory).The maximum score for cognitive functions skill is 7, while the lowest one is 1. The total score of this scale is 35.

The responses of the motor and the cognitive functions scale were measured on a 7-point scale from 1 to 7 level: seven is complete independence, six is modified independence, five is supervision, four is minimal assistance, three is moderate assistance, two is maximal assistance, and one is total assistance.

The total score for the FIM motor subscale will be a value between 13 to91.The total score for the FIM cognition subscale will be a value between 5 to 35.The total score for the FIM instrument (the sum of the motor and cognition subscale scores) will be a value between 18 to 126. It evaluates 18 items (13 motor and 5 cognitive) . FIM Score have been divided into three groups as helper–complete dependence (FIM score <45), helper–modified dependence (FIM 45–99), and no helper (FIM 100-126), [13].

Ethical consideration

Written approval was obtained from the faculty of nursing, King Abdul Aziz University, Institutional Review Board (IRB) and the Ministry of Health in the Kingdom of Saudi Arabia and Medical Rehabilitation hospital, written informed consent was obtained from all participants (patients and nurses) after explained the purpose of the study.

Validity

Validity is the extent to which the scores from a measure represent the variable they are intended to [18]. Regarding the observational checklist assessment of rehabilitative nursing practices for patient with SCI; this tool was reviewed by jury of 5 experts in the field of Medical Surgical Nursing at Faculty of Nursing in postgraduate studies at King Abdulaziz University and validity was done. Regarding The Functional Independence Measure (FIM) instrument, it was adopted from McDowell and Newell (1983) in English language. Validity for this tool was already done [19].

Reliability

Regarding the observational checklist assessment of rehabilitative nursing practices for patient with SCI, the total Cronbach's alpha coefficient was 0.913. Regarding the Functional Independence Measure (FIM) instrument, Inter-Rater Reliability was already done by McDowell and Newell (1983), it was 0.86 to 0.88 [20].

Pilot study

Pilot study was conducted on 10%, 4 patients and 5 nurses of actual number of the study. It done before start of actual data collection. Pilot study was done to test clarity, feasibility and applicability of the study and tools. Minor modifications were done. Patients and nurses included in the pilot were excluded from the study.

Data Collection

From the patients: the researcher recruited the patients who meet the inclusion criteria in the selected hospital. The questionnaire was filled by the researcher. Every patient has been interviewed individually once to fill the FIM sheet by researcher, each interview lasted about 30-45 minutes, twice per week according to patient rehabilitation session. Moreover, patients' ethical considerations and anonymity were assured.

From the nurses: The researcher recruited the nurses who meet the inclusion criteria in the selected hospital. The Observational checklist was done by the researcher. The researcher conducted an observation for the nurses while they are providing care to the patients with SCI during the duty in the morning and evening working shift, weekly based on Sunday, Tuesday and Thursday . This process took 1-2 hours every shift per day for one nurse to complete observational checklist. Data collection was conducted on a one year's basis (from September 2018 till September 2019). Nurses' ethical considerations and anonymity were assured.

Data analysis:

To achieve the goal of the study, the researcher used the statistical package for Social Science (SPSS version 22) for analysing the data. Statistical procedures that have been used included descriptive statistics such as frequencies, mean, and

percentages. In addition, One-way ANOVA and Pearson correlation test were used.

Results

Table (1): shows that more than half (54.3%) of nurses were in the age group between 30<40 years old, while 30.4% of nurses were between 23<30 years old. Also, the majority of nurses (82.6%) in the current study were females, while only 17.4% of nurses were males. Regarding marital status of nurses, more than half (58.7%) of nurses were married, and only 21.7% of nurses were single.

Concerning educational level, it was noticed that nearly three quarter (71.7%) of the nurses had a bachelor degree or higher, while the rest (28.3%) had diploma degree. Also, less than half (43.5%) of the nurses in the current study were working in Male(2) department, Female department. Nearly two third of nurses (69.6%) had more than 4 years of experience, while only 8.7% had less than 2 years of experience. Related to previous training, it was found that near three quarter of nurses (73.9%) attended an training program on spinal cord injury management while only 26.1 % had never attended.

Table (2): shows number and percentage distribution of Nurses' practices regarding implementation of infection control, maintain patients' safety and environmental safety**,** vital signs, maintenance of respiratory and cardiovascular function.

Regarding the implementation of infection control practices, whole of the nurses (100%) washed hands and air dry or dry with clean towel" and performed gowning, gloving, masking correctly. The majority of nurses (91.3%),(89.1%) and (87%) correctly disposed contaminated linen, used of isolation, barrier precautions and personal protective equipment when indicated and maintained standard precautions ,respectively. Regarding of maintaining patients' safety and environmental safety; the majority of nurses (80.4%) Performed Morse fall scale correctly, Moreover, more than half of nurses (63%) made sure that locks on the bed or wheelchair are secured at all times and used bed rails correctly.

Concerning vital signs, the majority of nurses (87%), (89.1%) correctly checked blood pressure and measured temperature either oral, axillary, rectal or tympanic, respectively. In addition, nearly one third of nurses (32.6) checked pulse correctly by palpation, while the other two third of nurses (67.4%) checked pulse only through reading monitor.

Regarding the nurses' practice of maintenance of respiratory function it was noticed that all of nurses (100%), and most of nurses (91.3%) correctly maintained a patent airway and monitor for oxygen saturation and maintained O2 therapy, respectively. while only (26.1%) of nurses checked capillary refill correctly.

According to the nurses' practice toward maintenance of cardiovascular function, nearly two thirds (65.2%) of nurses palpated central and peripheral pulses for rate, rhythm and volume correctly, while only (17.4%) of nurses auscultated the chest for heart sounds and murmurs correctly.

Table (3): represents number and percentage distribution of nurses' practices regarding support, maintain nutritional requirements, posture,

mobility, ambulation and pressure ulcers prevention. It was noticed that the highest majority of nurses (91.3%),(95.7%) and (93.5%) correctly checked diet is in accordance to the patient's medical condition, position the patient for the meal if allowed, elevated the head of the bed and checked placement/patency of feeding tubes, respectively. In addition more than half (58.7%) of nurses maintained hydration status correctly.

Regarding the nurses practice of maintain posture, mobility, and ambulation, more than half (58.7%) of nurses assessed symmetry, strength, and degree of mobility correctly. While only around quarter (23.9%) of nurse encouraged trial of ambulation and teach proper use or function of adaptive equipment correctly.

Concerning, pressure ulcers prevention, the majority of nurses (82.6%) turned patient to sides every 2 hours with written schedule to direct and cleaned linen correctly. While around half of nurses (47.8%) avoided massage reddened areas or bony prominent areas correctly.

Table (4): illustrates the nurses' practices regarding maintenance of bowel function, it was observed that half of nurses (50%) correctly auscultated bowel sounds, assessed tolerates diet and presence of pain. While nearly one third of nurses (30.4%) palpated abdomen for tenderness, stool in colon correctly. Regarding nurses' practices of maintain urinary function, nearly three quarter of nurses (71.1%) used of indwelling catheters if there is urinary incontinence as order. Near two thirds of nurses (63%) recording intake and output correctly. While

only (23.9%) nurses were assisting a client to use a urinal correctly.

Table (5): shows number and percentage of the total of rehabilitative nursing practices for patients with spinal cord injury. The most of nurses (97.8%) had adequate practices in implement of infection control practices. The majority of nurses (80.4%) maintained posture, mobility, and ambulation adequately and near three quarter (73.9%) of nurses measured vital signs adequately. Meanwhile, none of nurses adequately maintained of bowel and urinary function and prevented pressure ulcers.

Figure (1): shows that nearly three quarter (71.7%) of nurses had inadequate practices regarding total rehabilitative nursing practices for patients with SCI, while only 28.3% of nurses had adequate of practice .

Table (6): Regarding relation between rehabilitative nursing practices and work-related characteristics, it was revealed that there is no significant relation between rehabilitative nursing practices with educational level, past experience and previous training courses regarding SCI of nurses with (p>0.05).

Table (7): shows that three quarter (75%) of patients were males, while quarter (25%) of patients were females. Also, more than one third (41.7%) of SCI patients age was between 35<45 years old. According to marital status of patients, more than half (52.8%) of patients were single, and (38.9%) were married. In relation to educational level, around one third (36.1%), (33.3%) of patients had a secondary school and university degree and/or higher of education, respectively, while only(13.9%) of patient was illiterate.

Table (8): shows clinical characteristics for SCI patients, more than half (61.1%) of patients had cervical injuries, while around one third (38.9%) of patients with had thoracic injuries. Regarding type of injury, near half (44.4%) of patients had complete injury, while only (16.7%) of patient had motor incomplete injury. According to the patients' vital signs, it was observed all patients (100%) had normal temperature, pulse rate, respiratory rate and blood pressure. Regarding body mass index near half (44.4%) of patients were overweight, while only (5.6%) were underweight.

Table (9): shows number and percentage of Patients' according to level functional independence measure (motor and cognitive), it was noticed that nearly to three quarter of patients (72.2%), (69.4%) needed helper with complete dependence in bowel and bladder management, respectively. More than half of patients (55.6%) needed helper in toileting. Concerning total motor functional independence measure (FIM), it was found that more than half of patients (55.6%) needed helper with modified dependence, near one quarter (27.8%) of patients needed no helper. While only (16.7%) of patient needed helper with complete dependence.

Regarding, cognitive functional independence. It was noticed that majority of patients (94.4%), (86.1%) were no needed to helper in problem solving, memory and social interaction, respectively. Additionally, the highest majority of patients (94.4%) needed no helper regarding cognitive functional. While only (2.8%) of patients needed helper.

Figure (2): shows the mean and standard deviation of motor, cognitive and total FIM toward patients with SCI. Mean score of motor function were (52.61±18.96), mean score of cognitive function were (32.97±4.47) while the mean score of total functional measure were (85.58±20.92).

Table (10): shows the correlation between demographics/clinical characteristics and Functional Independence Measure (FIM) of patients with SCI, there was a positive correlation between type of injury with motor functional independence measure with p= (0.003). In addition, there is no significant correlation between patient's diagnosis, body mass index with motor functional with p> (0.05)

Regarding cognitive functional, there was a positive correlation between level of education and cognitive functional independence measure p=0.007, while there was negative correlation between body mass index and cognitive functional independence measure with p =0.009.

On other hand, there was a positive correlation but not significant between patients age, gender and marital status with patients motor FIM, while there was negative correlation but not significant with cognitive FIM (p>0.05).

Table (11): reflects that there was a positive correlation but not significant between support, maintain nutritional requirements and Posture, mobility, ambulation with total FIM of the patients (p>0.05).

According to the nurses' practice toward maintenance of cardiovascular function, pressure ulcers prevention, vital signs and maintain of bowel and urinary functions there was negative correlation but no significant with total FIM of the patients (p>0.05).

Table (12): presents that there were no significant correlation between total rehabilitative nurses' practices for patients with spinal cord injury , motor, cognitive and total FIM of the patients (p>0.05).

Table (1): Number& percentage distribution of nurses' demographic and work-related characteristics (n=46).

Demographic characteristics	Number No = 46	Percentage %
Age (years)		
23<30 years	14	30.4%
30<40 years	25	54.3%
≥40	7	15.2%
Gender		
Male	8	17.4%
Female	38	82.6%
Marital status		
Single	10	21.7%
Married	27	58.7%
Widowed	3	6.5%
Divorced	6	13.0%
Educational level		
nursing diploma	13	28.3%
BSc nursing and higher	33	71.7%
Past Experience		
< 2 years	4	8.7
2≤4 years	10	21.7
>4 years	32	69.6
Working department		
Male(1) rehabilitation word t**(MRW1)**	17	37.0%
Female rehabilitation word **(FRW)**	9	19.6%
Male (2) rehabilitation word **(MRW2)**	20	43.5%
Previous Training courses regarding SCI		
Yes	34	73.9%
No	12	26.1%

Table (2): Number & percentage distribution of nurses' practices regarding implementation of infection control, maintenance of patients 'safety and environmental safety, vital signs, maintenance of respiratory and cardiovascular function (n=46).

Nursing Practices level	Correctly done		Incorrectly done & not done	
Implement of Infection Control Practices	NO	%	NO	%
Wash hands and air dry/dry with clean towel.	46	100%	0	0
Perform gowning, gloving, masking	46	100%	0	0
Use of isolation/barrier precautions and Personal Protective Equipment when indicated	41	89.1%	5	10.9%
Maintain standard precautions anytime dealing with: Mucous membranes, skin with wounds or lesions, blood and body fluids.	40	87%	6	13%
Disposal of contaminated linen/trash correctly.	42	91.3%	4	7.8%
Maintain Patients' Safety and Environmental Safety				
Performed Morse Fall Scale (Falls Risk Assessment)	37	80.4%	9	19.6%
Make sure locks on the bed or wheelchair are secured at all times. Use bed rails	29	63%	17	37%
Provide adequate lighting. Use a night light during sleeping hours.	15	32,6%	31	67.4%
Remove excess equipment, supplies, furniture, and other objects from rooms and walkways.	18	39.1%	28	60.9%
Provide a 'low bed' to replace regular hospital bed.	24	52.2%	22	47.8%
Use floor mats if patient is at risk for serious injury.	16	34.8%	30	65.2%
Patient's Vital Signs				
Measure temperature either oral, axillary, rectal or tympanic	40	87%	6	13%
Check Pulse	15	32.6%	31	67.4%
Measure Respirations (Rate and Quality)	32	69.5%	14	30.4%
Check Blood Pressure	41	89.1%	5	10.9%
Measure height and weight: uses standard scale and bed scale	27	58.7%	19	41.3%
Document findings in record sheet.	35	76.1%	11	23.9%
Maintain Respiratory Function				
Maintains a patent airway	46	100%	0	0
Auscultate breath sounds in all lung fields.	13	28.3%	33	71.7%
Encourages cough and deep breathing; uses incentive spirometer if need.	16	34.8%	30	65.2%
Monitor for oxygen saturation and maintain O2 therapy as order	42	91.3%	4	8.7%
Palpation bilateral symmetry of chest expansion	4	8.7%	42	91.3%
Assess skin condition- temperature, turgor and moisture	16	34.8%	30	65.2%
Check capillary refill (central/peripheral)	12	26.1%	34	73.9%
Maintain Cardiovascular Function				
Palpate central and peripheral pulses for rate, rhythm and volume.	30	65.2%	16	34.8%
Inspect the neck for jugular vein distention, observing for pulsations.	10	21.7%	36	78.3%
Examine circulatory status and Presence of edema (central and/or peripheral).	10	21.7%	36	78.3%
Assess hydration status: Skin turgor, oral mucosa.	19	41.3%	27	58.7%
Auscultate the chest for heart sounds and murmurs.	8	17.4%	38	82.6%

Table (3): Number and percentage distribution of nurses' practices regarding support, maintain nutritional requirements, posture, mobility, ambulation and pressure ulcers prevention (n=46).

| Nursing Practices level	Correctly done		Incorrectly done & not done	
Support and Maintain Nutritional Requirements	NO	%	NO	%
Check that diet is in accordance with the patient's medical condition	42	91.3%	4	8.7%
Position the patient for the meal if allowed, elevate the head of the bed or assist the patient to sit up in a chair.	44	95.7%	2	4.3%
Check placement/patency of feeding tubes.	43	93.5%	3	6.5%
Maintain hydration status and appropriate fluid supplementation to treat or prevent dehydration.	27	58.7%	19	41.3%
Posture, Mobility, and Ambulation				
Assess symmetry, strength, and degree of mobility.	27	58.7%	19	41.3%
Performance Passive/Active Range of motion exercises as ordered by physician	15	32.6%	31	67.4%
Encourage trial of ambulation.	11	23.9%	35	76.1%
Check/teach proper use/function of adaptive equipment.	11	23.9%	35	76.1%
Pressure Ulcers prevention				
Turn to sides every 2 hours with written schedule to direct	38	82.6%	8	17.4%
Document repositioning	28	60.9%	18	39.1%
Maintain head of bed at 30 degrees or less, unless contraindicated.	29	63%	17	37%
Use of protective padding pillows or foams placed between knees, ankles, and heels.	32	69.6%	14	30.4%
Elevate heels off bed with pillow or protective boots / splints.	26	56.5%	20	43.5%
Use of Air mattress that are alternately inflated and deflated by a pump.	30	65.2%	16	34.8%
Avoid massage reddened areas or bony prominent areas	22	47.8%	24	52.2%
Maintain clean and dry skin	30	65.2%	16	34.8%
Linen clean	38	82.6%	8	17.4%
Linen changed daily and as needed	28	60.9%	18	39.1%
Linen is soft, well stretched, tucked and wrinkle free.	28	60.9%	18	39.1%

Table (4): Number and percentage distribution of nurses' practices regarding maintenance of bowel and urinary function (n=46).

Nursing Practices level	Correctly done		Incorrectly done & not done	
Maintain of bowel and urinary function	No=	%	No=	%
Bowel function				
Auscultate bowel sounds	23	50%	23	50%
Assess the tolerates diet; no nausea/vomiting/diarrhea	23	50%	23	50%
Observe abdomen for distention	16	34.8%	30	65.2%
Palpate abdomen for tenderness	14	30.4%	32	69.6%
Assess for presence pain	23	50%	23	50%
Urinary function				
Recording Intake and Output.	29	63%	17	37%
Assessment (voiding: last time, frequency, urgency, difficulty starting stream)	18	39.1%	28	60.9%

Assisting a Client to use a Urinal.	11	23.9%	35	76.1%
Use of indwelling catheters if there is urinary incontinence as order	33	71.7%	13	28.3%
Discontinuing an Indwelling Catheter Performing an Intermittent Catheter Irrigation Continuous Bladder Irrigation.	12	26.1%	34	73.9%

Table (5): Number & percentage distribution of rehabilitative nursing practices for patients with spinal cord injury (n=46).

Rehabilitative Nursing Practice	Adequate		Inadequate	
	No=	%	No=	%
1. Implement of infection control practices	45	97.8%	1	2.2%
2. Maintain patient safety and environmental safety	17	37%	29	63%
3. Patient's vital signs	34	73.9%	12	26.1%
4. Maintain respiratory function	9	19.6%	37	80.4%
5. Maintain cardiovascular function	10	21.7%	36	78.3%
6. Support and maintain nutritional requirements	24	52.2%	22	47.8%
7. Posture, mobility, and ambulation	37	80.4%	9	19.6%
8. Pressure ulcers prevention	0	0	46	100%
9. Maintain elimination function of bowel and urinary systems	0	0	46	100%
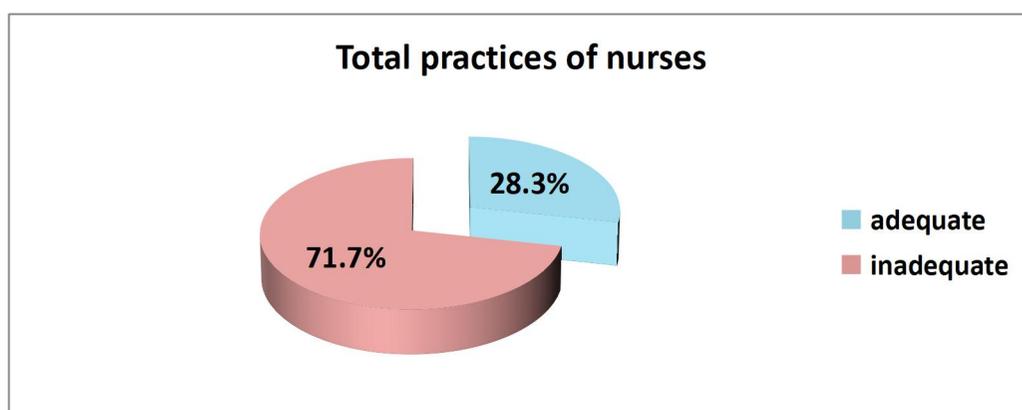
Figure (1): Percentage distribution of nurses regarding total rehabilitative nursing practices (n=46).

Table (6): Relation between rehabilitative nursing practices and work related characteristics (n=46).

Work related characteristics	Nursing practices				Chi-square	
	Inadequate		Adequate			
	No	%	No	%	χ^2	P value
Educational level					2.86	0.091
Diploma	7	15.2	6	13		
BSN and higher	26	56.5	7	15.2		
Past Experience					MC	0.152
less than 2 years	3	6.5	1	2.2		
2-4 years	10	21.7	0	0		
More than 4 years	20	43.5	12	26.1		
Previous Training courses regarding SCI					0.206	0.650
No	8	17.4	4	8.7		
Yes	25	54.3	9	19.6		

MC: Monte Carlo test: 2 cells have expected cell count <5.
χ2: Chi-square test.P: Significance. * Significant (p≤ 0.05).

Table (7): Number & percentage distribution of Patients with SCI according to demographic characteristics (n=36).

Demographic Characteristics	No = 36	%
Age (years)		
< 25 years	2	5.6%
25 <35 years	6	16.7%
35< 45 years	15	41.7%
≥ 45	13	36.1%
Gender		
Male	27	75%
Female	9	25%
Marital status		
Single	19	52.8%
Married	14	38.9%
Widowed	2	5.6%
Divorced	1	2.8%
Educational level		

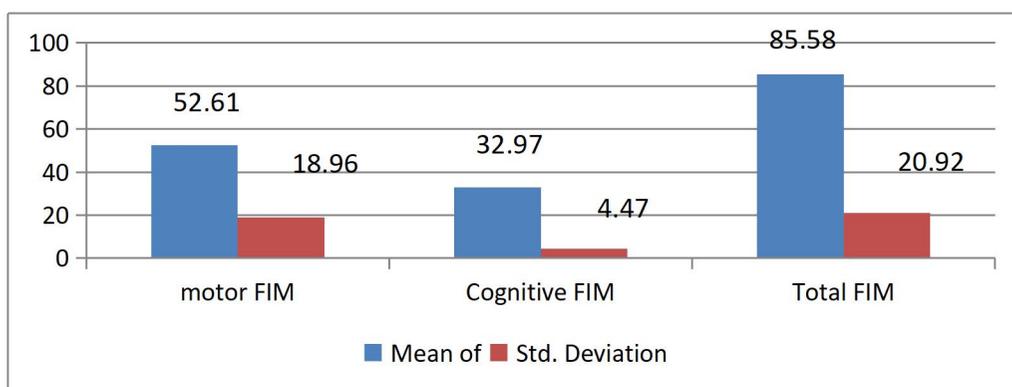| Demographic Characteristics	No = 36	%
Illiterate	5	13.9%
Primary or below	6	16.7%
Secondary	13	36.1%
Graduate or higher	12	33.3%

Table (8): Number & percentage distribution of Patients with SCI, regarding clinical characteristics (n=36).

Clinical characteristics	No = 36	%
Diagnosis		
Cervical injuries	22	61.1%
Thoracic injuries	14	38.9%
Type of injury		
A=complete	16	44.4%
B=sensory Incomplete	14	38.9%
C=Motor Incomplete	6	16.7%
Temperature		
Normal	36	100%
Blood pressure		
Systolic / Normal	36	100%
Diastolic / Normal	36	100%
Respiration		
Normal	36	100%
Body mass index (BMI)		
Less than 18.5 kg/m2 (underweight)	2	5.6%
18.5 -24.9 kg/m2 (normal)	13	36.1%
25 - 29.9 kg/m2 (overweight)	16	44.4%
30 - 39.9 kg/m2 (obese)	5	13.9%

Table (9): Number & percentage distribution of Patients' according to level of Functional In-dependence Measure (FIM) (n=36).

Functional Independence	Helper – complete		Helper – modified		No helper	
	NO	%	NO	%	NO	%
Motor FIM						
Eating	13	36.1%	10	27.8%	13	36.1%
Grooming	15	41.7%	12	33.3%	9	25%
Bathing	16	44.4%	16	44.4%	4	11.1%
Dressing Upper Body	13	36.1%	13	36.1%	10	27.8%
Dressing Lower Body	16	44.4%	12	33.3%	8	22.2%
Toileting	20	55.6%	8	22.2%	8	22.2%
Bladder Management	26	72.2%	7	19.4%	3	8.3%
Bowel Management	25	69.4%	8	22.2%	3	8.3%
Transfer :bed/chair/wheelchair	11	30.6%	20	55.6%	5	13.9%
Transfer toilet	12	33.3%	18	50%	6	16.7%
Transfer bath/shower	14	38.9%	15	41.7%	7	19.4%
Walk/wheelchair	12	33.3%	17	47.2%	7	19.4%
Stairs	15	41.7%	15	41.7%	6	16.7%
Total motor FIM	**6**	**16.7%**	**20**	**55.6%**	**10**	**27.8%**
Cognitive FIM						
Comprehension	1	2.8%	8	22.2%	27	75%
Expression	1	2.8%	10	27.8%	25	69.4%
Social interaction	1	2.8%	4	11.1%	31	86.1%
Problem solving	1	2.8%	1	2.8%	34	94.4%
Memory	1	2.8%	1	2.8%	34	94.4%
Total cognitive FIM	**1**	**2.8%**	**1**	**2.8%**	**34**	**94.4%**

Figure (2): Mean and standard deviation of motor, cognitive and total functional independence measure of patients with SCI (n=36).

Table (10): Correlation between demographics/clinical characteristics and Functional Independence Measure (FIM) of patients with SCI (n=36).

Demographics/ clinical characteristics	Functional Independence Measure (FIM)				
	Motor (FIM)			**Cognitive (FIM)**	
	Correlation (r)		P	Correla tion (r)	P
Patient age	0.195		0.2 54	-0.285	0.0 92
Gender	0.225		0.1 88	-0.273	0.1 08
Marital status	0.206		0.2 28	-0.143	0.4 05
Level of education	0.209		0.2 22	0.443**	0.0 07
Diagnosis	0.044		0.7 99	0.082	0.6 33
Type of injury	0.476**		0.0 03	0.110	0.5 25
BMI	0.042		0.8 08	-0.431**	0.0 09

Table (11): Correlation between Nurses' Rehabilitative Practices and Patients' total Functional Independence Measure (FIM).

Rehabilitative Practices	Motor function		Cognitive function		Total FIM	
	r	p value*	r	p value*	r	p value*
Implement of infection control practices	-0.037	0.829	-0.020	0.907	-0.038	0.826
Maintain patient safety and environmental safety	-0.038	0.826	0.126	0.463	-0.005	0.977

Patient's vital signs	-0.146	0.396	-0.237	0.165	-0.185	0.281
Maintain respiratory function	0.042	0.809	-0.110	0.524	0.012	0.944
Maintain cardiovascular function	-0.149	0.387	-0.113	0.512	-0.159	0.355
Support and maintain nutritional requirements	0.201	0.239	-0.224	0.189	0.129	0.455
Posture, mobility, and ambulation	0.123	0.477	0.164	0.340	0.147	0.392
Pressure ulcers prevention	-0.122	0.478	-0.001	0.993	-0.109	0.525
Maintain of bowel and urinary functions	-0.167	0.331	0.083	0.628	-0.130	0.449

Table (12): Correlation between Patients' total Functional Independence Measure (FIM) and Nurses' Rehabilitative Practices.

Patients' total Functional Independence Measure (FIM)	Nurses' Rehabilitative Practices	
	r	P value
Motor functional independence measure	-0.027	0.874
Cognitive functional independence measure	0.010	0.956
Total functional independence measure	-0.022	0.898

Discussion:

Spinal cord injuries (SCI) can have a devastating effect on the motor and cognitive status of individuals. SCI injuries impact on the psychological, physical, social and economic aspects of a patient and other adverse events may contribute to additional harm. A spinal cord injury is a disease that requires appropriate nursing and rehabilitative practices to provide optimal care [21].

Demographic and work-related characteristics for nurses

This study revealed that more than half of the nurses were in the age group 30<40 years old. The majority of nurses in the current study were female. This result is line with the results of the study by Reynold et al (2016) that sought to improve the knowledge and adherence to the spinal cord injury guidelines. They found that all of the nurses were female and that the mean age was 38.5 years old. This might be related to the high ratio of

female nurses compared to male nurses in Madinah hospitals [22].

Regarding education level, the present study revealed that nearly three quarters of the nurses had a Bachelor's degree or higher. Nearly two thirds of the nurses had more than 4 years' experience. The present study is consistent with the study conducted by Reynold et al (2016) who found that 100% of the nurses had a bachelor's degree. The average experience was 11 years. This result may be due to the universities of Saudi Arabia establishing a bridging degree for the purpose of converting the nursing diploma into a bachelor's degree. The present study was contradicted by the study conducted by Abd-Elhameed and Sayed (2018) on the training of nurses in the rehabilitation of patients with spinal cord injuries. They reported that 63% of the nurses in Egypt have a diploma in nursing and that 36% of the nurses had graduated from a technical nursing institute. In addition, 71% of the studied nurses had between 1 to 6 years of rehabilitation nursing experience [23].

Regarding the previous training and course programs on SCI, it was found that nearly three quarters of the nurses had attended a training program on spinal cord injury management. The possible reason for this is that the hospital will want to improve patient outcome. A similar result was found by Jaddoue and Badir (2012) regarding the impact of an educational program on the nurses' knowledge and practices concerning neurogenic bladder rehabilitation for spinal cord injury patients. It revealed that the majority of nurses attended training courses on SCI. This result contradicts that of with Abd-Elhameed and Sayed (2018) who noted that 59% of the studied nurses had not attended any training previously [24].

Rehabilitative Nursing Practices for Patients with Spinal Cord Injury

The current study revealed that all of the nurses practiced correctly in relation to washing their hands followed by air drying or drying their hands with a clean towel. They also performed gowning, gloving and masking up correctly. The majority of nurses practiced correctly in terms of disposing of contaminated linen, using isolation/barrier precautions and personal protective equipment when indicated and maintaining standard precautions regarding the implementation of infection control practices. The possible reason for this is that there is mandatory continuous training in hospitals about infection control practices for all nurses. This result is similar to that of Fashafsheh et al (2015) regarding the practices of the nursing staff and infection control measures in Palestinian Hospitals. They found that the majority (91.1%) of the nursing staff executed the infection control well while the level was more than 80% for adequate[25]. In addition,

Iliyasu et al (2016) studied the practice of infection control among the healthcare workers in a Tertiary Referral Center in North-Western Nigeria. They indicated that 87.9% of the nurses didn't correctly wash their hands and they identified it as the most effective method to prevent healthcare-acquired infections.

Regarding maintaining both patient and environmental safety, the present study revealed that the majority of nurses assessed the risk of falling using the Morse Fall scale. Moreover, more than half of the nurses made sure that there were locks on the bed or that the wheelchair was secured at all times. They also used the bed rails correctly. This result may be due to the patient with SCI need more safety precautions. All of the nurses follow the guidelines for universal patient safety. The present results are congruent with the findings of Lim and Yam (2016). Their study was on the level of competence in relation to the use of the Morse Fall scale as an assessment tool in the prevention of patient falls. It was found that 66% of the nurses had a total score of 10 – 14. This shows that more than half of the nurses had a good competency level in terms of intervening in patients with a high fall risk based on the Morse Fall Scale. The nurses' competency level related to the rating of the Morse Fall scale was considered to be moderately adequate[26]. On the other hand, Wannapakhe et al (2015) studied falls in patients with a spinal cord injury during the immediate phase after the completion of rehabilitation. They found that the incidence of falls ranged from 35% to 75%. Patients with medical complications had a higher risk, and so the rehabilitation nurses should considers more closely any patient with complications during patient care[27].

The results of the current study regarding the practice of pressure ulcer prevention founds that the majority of nurses turned the patient every 2 hours with a written schedule to direct them. The linen was also cleaned correctly. Around half of the nurses avoided massaging reddened areas and the bony prominent areas were massaged correctly. This may be related to the head nurse of the department monitoring the patient's skin care once it is done by the nurses. This finding is similar to that of Dilie and Mengistu (2015) and Shrestha (2017) in their study of the practice of bed sore prevention among the staff nurses working in the selected hospital, Ludhianapunjabindia. They found that 67.3% of nurses undertook good pressure ulcer prevention practices [28]. In addition, Bayoumi and Bassuni (2016) assessed Saudi nurses' level of practice regarding pressure ulcer preventive measures. They found that the majority of all participating nurses, rated at 81.6%, executed the proper turning and positioning of the patient at least every 2 hours[29]. However, 42.1% of the nurses didn't turn and properly position the patient at least every 2 hours. Nuru et al, (2015), in their study on the knowledge and practice of nurses concerning the prevention of pressure ulcers and associated factors in Gondar University Hospital, Northwest Ethiopia, found that only less than half (48.6%) of the nurses had a good level of practice regarding the prevention of pressure ulcers among the 248 nurses caring for SCI patients[30].

In this study, regarding the maintaining of bowel function, half of the nurses practiced correctly how to auscultate bowel sounds, how to assess the toleration of the patient's diet and how to assess for the presence of pain. Nearly one third of the nurses palpated abdomen for tenderness and for stool in the colon correctly. The possible reason why the patients with SCI need special care from the nurse is according to the level of injury and it may also be due to the limited time and resources. The studies by Saga (2014) and Liu et al (2015) on neurogenic bowel dysfunction after a spinal cord injury found that during actual nursing practices, 59% of the nurses assessed for the presence of abdominal pain. In addition, 66.2% of the nurses controlled the emptying of the patient's bowels and 38.6% of them assessed the patient concerning their tolerance of their current diet[31,32].

Regarding the nurses' practice of maintaining urinary function, nearly three quarters of the nurses used indwelling catheters if there was urinary incontinence as ordered correctly. Nearly two thirds of the nurses recorded intake and output correctly. The possible reason behind the use of indwelling catheters is that it is part of the nursing role and they spend every day doing that. This study is similar to that of Mukakamanzi (2017) concerning the practices of the nurses related to the prevention of catheter-associated urinary tract infection in selected referral hospitals in Rwanda. They found that a total of 53 nurses working in the patient care unit were included in the study with an 86.8% response rate[33]. A high percentage was shown to have a good implementation of different practices, as 79.9% of them demonstrated good catheter-associated urinary tract infection prevention. Viswanathan (2015) studied the management of adults with indwelling urinary catheters and the related practices. They found that the indwelling urinary catheters were managed correctly by 91% of nurses[34].

In this study, most of the nurses displayed adequate practices regarding

the implementation of infection control practices. The majority of the nurses-maintained posture, mobility and ambulation adequately. Meanwhile, none of the nurses adequately maintained bowel and urinary functions and prevented pressure ulcers. In general, nearly three quarters of the nurses displayed inadequate practices regarding the total rehabilitative nursing practices for SCI patients while only around quarter of the nurses demonstrated adequate practices. The possible reason for this may be due to the lack of continued nursing training programs, which must be done to improve their practices. According to Reynolds et al (2018) in their study on the implementation of strategies to improve knowledge, practice and adherence to spinal cord injury guidelines, they found that the most improvements were shown in relation to the program of nursing practices on integumentary, mobility and respiratory interventions followed by bowel and bladder interventions for the total improvement of the nursing practices [35].

The present result is congruent with the findings by Abd-Elhameed and Sayed (2018) and Reynolds et al (2018) who mentioned that 61% of the studied nurses' performance score level concerning the patients' transfer from bed to chair, and the opposite was done correctly. Other findings in the same study contradicted this and it was found that 66% of the studied nurses, referring to their total performance score for the level of urinary catheter care and bowel rehabilitation performance, did so correctly. The majority (90%) of the studied nurses' total performance score level for the wound care of pressure ulcers showed that they performed correctly. In addition, the present result differed from that of Abd-Elhameed and Sayed (2018) who found that 42% of the

studied nurses had an adequate level of performance regarding the rehabilitation and nursing of patients with spinal cord injuries. This increased to 92% after training [23].

In this study, there is no significant correlation between all of the rehabilitative nursing practices and the work-related characteristics of the nurses. This finding is consistent with that of Taha and Ali (2013) referring to the impact of a training program on the nurses' practice and patient outcomes , They found that there is no significant correlation between the practice scores and the nurses' age, qualifications or experience. Qtait and Sayej (2016) studied whether the demographic variables of age, gender, marital status and educational qualifications affected the nurses' performance in Hebron Hospitals. [36] They found that regarding the 181 nurses working in the West Bank of Palestine, there is no significant correlation between gender, level of education, years of experience and the nurses' performance. The present finding was contradicted by that of Nuru et al (2015). in a cross sectional survey conducted on They conducted a cross-sectional survey focused on 248 nurses in Gondar University hospital to assess the knowledge and performance of the nurses concerning the prevention of pressure ulcers in spinal cord injury patients. They found that there was a positive statistical correlation between education level, knowledge, previous received training and years of experience [30].

Demographic and clinical characteristics for the Patients with SCI

The present study revealed that three quarters of the patients were male while a quarter of the patients were female. More than a third of the SCI

patients were aged 35< 45 years old. The possible reason for this is that the males are more exposed to this type of injury as the result of a car accident or fall. The present result is similar to that of Mahmoud et al (2017) in their study of spinal cord injury rehabilitation in Riyadh, Saudi Arabia. They looked at time to rehabilitation admission, the length of the hospital stay and functional independence [37]. They found that 75% of the SCI patients were male out of the 532 patients with a SCI in Saudi Arabia. The mean age of the patients was 35±17 years. In another study conducted by Tasoglu et al (2018) on the demographic and clinical characteristics of patients with a spinal cord injury in Turkey, [38], they found that 69.8% of the patients were male from among the 262 patients with a spinal cord injury. The male: female ratio was 2.31:1 and the mean age was 38.3 ± 17.6 years old. In the Spanish study by Cuapio et al (2011) on the level of independence of the patients with a spinal cord injury and its relationship with the nursing interventions, they found that 65% of the patients with a spinal cord injury were men and 35% of the patients were women [39].

Regarding the marital status of the patients, more than half of the patients were single and around a third were married. This finding is consistent with that of Cuapio et al, (2011) who reported that upon referring to the marital status of the patients, 75% were single and 25% were married [39].

Concerning the clinical data, the current study found that more than half of the patients had cervical injuries. Around one third of the patients were diagnosed with thoracic injuries. In addition, the present study revealed that more than one third of the patients had a complete injury while only 16.7% of the patients had an incomplete motor injury. These results may depend on the mechanism of injury and the patient's condition. This result is in agreement with the findings of Walter et al (2017) [40]. They compared the dependency scores in order to assess the resource allocation for patients with spinal cord injuries. They reported that 43% had cervical injuries and that 22% had thoracic injuries. Cuapio (2011) found that out of the SCI patients, 32.14% had a cervical injury, 53.57% had a thoracic injury and 14.29% had a lumbar injury. On the other hand, Tasoglu et al (2018) found different results. Referring to the patients, 46.2% had a thoracic injury, 27.5% had a lumbar injury and 26.3% had a cervical injury. Regarding the patient's body mass index, more than a third of the patient's in this study were overweight. The present results are similar to those of Wen et al (2019) in their study on the impact of body mass index after spinal cord injury. They reported that 30.9% of patients were overweight [41].

Functional Independence Measure (FIM) of patients with SCI

Regarding the patients' Functional Independence Measure, the results of the present study indicate that nearly three quarters of the patients need helper to the level of complete dependence regarding bowel and bladder management. More than half of the patients needed help when toileting. For motor FIM, it was found that more than half of the patients need help with modified dependence. Only 16.7% of patients needed help in terms of complete dependence. The possible reason for this is that the patients were scheduled for rehabilitation sessions that can improve motor function. This result is in line with the findings of Cuapio (2011) who reported that the functional independence measure

indicated that independence when eating totaled 72%. Given the characteristics of this type of patient, 96% of patients are dependent when walking on stairs. They use wheelchairs for their transfer and they cannot walk [39].

Regarding the cognitive functional independence measurement, the majority of the patients did not need help in terms of problem solving, memory and social interaction. Additionally, the majority of patients did not need help regarding cognitive function. This may be due to all of the patients not having a brain disorder. This result is agreement with that of Saltychev et al (2018) in their study on the Functional Independence Measurement of patients with a spinal cord injury. They reported that the mean score of total cognitive functional independence measure was 33.5 and that 90% of the SCI patients have good functioning in terms of problem solving, memory and social interaction [42].

Regarding patient FIM in this study, the mean score for motor function was (52.61±18.96). The mean score of cognitive function was (32.97±4.47). The mean score of the total functional measurement was (85.58±20.92). This indicates that the patients need help with modified dependence. This result is line with the results of Bindawas et al (2018) about the functional outcomes among the patients from the inpatient rehabilitation facility in Saudi Arabia who reported that the mean score of motor function was (59.9±21). The mean score of cognitive function was (28.8±6.6) while the mean score of the total functional measure was (88.8±25) [43].

Correlation between Nurses' Rehabilitative Practices and FIM of patients with SCI

In this study, the result revealed that there is no significant correlation between rehabilitative nurses' practices for the patients with spinal cord injury and motor, cognitive, and total FIM of the patients with SCI. This result is contradicted by the study of Cuapio et al (2011) who found that there is a significant correlation between the functional ability outcome and the nursing interventions. They concluded that the training related to the rehabilitation nursing practices had a positive impact on their knowledge and the performance of caring for patients [39]. Other studies conducted by Güneş et al (2017), Truchon et al (2017), Lee (2016) and Fawaz et al (2019) focused on the impact of therapy on recovery during the rehabilitation of patients with a spinal cord injury reported that FIM was used to measure the level of functional ability and the effects of the rehabilitation intervention. There is a positive effect from rehabilitation on functional ability [44, 24, 45, 46] .

So, there is no significant correlation between rehabilitative nurses' practices for the patients with spinal cord injury and motor, cognitive, and total FIM of the patients with SCI, this result may be due to on the other studies the nurses participants has training or interventions which enhance nursing practices , and have a positive impact in patient functional ability ,while nearly three quarter of the nurses participant in this study had inadequate practices regarding total rehabilitative nursing practices for patients with SCI, which may affect the relation between the nurses' practices and functional ability .

The results of the present study illustrate that there was a significant correlation between the type of injury and total motor function independence. The present results are congruent with the findings of Nas et al, (2015) in the study of rehabilitation of SCI. They mentioned that there is a strong correlation between functional ability and the level of injury [8].

In addition, there was not significant correlation between the demographic characteristics, the diagnosis, body mass index and motor function. The present study is similar to the study conducted by Abdul-Sattar (2014). They found that the total FIM score showed there to be a significant positive correlation between functional outcome and the type of injury. There are significant associations noted between FIM motor functions and age at injury. Abdul-Sattar (2014) looked at the predictors of functional outcome in patients with a traumatic spinal cord injury after inpatient rehabilitation in Saudi Arabia [47]. Dvorak et al, (2015) looked at the influence of time from the point of injury in terms of motor recovery and the length of the hospital stay of the patients with a spinal cord injury. They found that the level of injury, the severity of the injury, the interval between the onset of the injury and the admission to rehabilitation and the length of stay in terms of rehabilitation can be used to assess the functional outcomes. The findings in the study refer to another issue related to the level of injury and the relationship that exists between the rehabilitative nursing practices and the level of patient injury. This can impact on the patient's functional ability. The study indicated that delays in initiating these actions may have a negative effect on the patient's functional independence and thus extend rehabilitation time [48].

Conclusion:

The present study concluded that nearly three quarter of nurses had inadequate practices regarding total rehabilitative nursing practices for patients with SCI, while only about quarter of nurses had adequate of practice. Concerning total motor functional independence measure, it was found that more than half of patients needed helper with modified dependence, near one quarter of patients did not needed helper. Additionally, most patients did not needed helper regarding cognitive functional, the correlation between demographics and clinical characteristics and FIM of patients with SCI, there was a positive correlation between type of injury with motor functional independence measure. Regarding cognitive functional, there was a positive correlation between level of education and cognitive functional independence measure. Finally, there were no significant correlation between total rehabilitative nurses' practices for patients with spinal cord injury, motor, cognitive and total FIM of the patients.

Recommendations:

1. Head nurse and nurse educator should assess nurses' competence rehabilitative caring for patients with spinal cord injury.
2. Based on the results of current study there were many rehabilitative nursing practices that had performed inadequately and need practical training such as maintaining bowel, urinary function and preventing pressure ulcers.
3. correlation between rehabilitative nurses' practices; motor and cognitive

should be done with FIM for the patients with spinal cord injury.

4. Future research is required in replicating the study at different settings with large sample size in Saudi Arabia with the aim of generalizing the results.

5. Future research is required in identifying the factors influencing the rehabilitative nursing practices for patients with spinal cord injury.

References:

Hastings, B.M., Ntsiea, M.V. & Olorunju, S., 2015, 'Factors that influence functional ability in individuals with spinal cord injury: A cross-sectional, observational study', South African Journal of Physiotherapy, 71(1), 1 – 7.

Sweis, R., Biller, J. (2017). Systemic Complications of Spinal Cord Injury. Curr Neurol Neurosci Rep, 17, 8.

World Health Organization. (2018). International perspectives on spinal cord injury.http://www.who.int/disabilities/policies/spinal_cord_injury/en/ [Accessed 6 Oct. 2018].

Elshahidi, MH., Monir, NY., Elzhery, MA., Sharaqi, AA., Haedaya, H., Awad, BI, Zaghloul, K. (2018). Epidemiological Characteristics of Traumatic Spinal Cord Injury (TSCI) in the Middle-East and North-Africa (MENA) Region: A Systematic Review and Meta-Analysis. Bull Emerg Trauma, 6(2), 75-89.

Aldosari, K. H., Aldhfyan, Y. M., Karrar, M. H., Aldossary, A. M., Al Deailj, A. A., Al-Ameer, K. H., & Alsubaie, M. L. (2019). Severity and neurosurgical management of patients with traumatic spinal fractures in Saudi Arabia: a cross sectional study. The Pan African Medical Journal, 34.

Alshahri, F., El-Taher, A., & Elzain, A. E. A. (2019). Measurement of radon exhalation rate and annual effective dose from marine sediments, ras tanura, saudi arabia, using cr-39 detectors. Romanian Journal of Physics, 64, 811.

Craig, A., Perry, K. N., Guest, R., Tran, Y., Dezarnaulds, A., Hales, A., ... & Middleton, J. (2015). Prospective study of the occurrence of psychological disorders and comorbidities after spinal cord injury. Archives of physical medicine and rehabilitation, 96(8), 1426-1434.

Nas, K., Yazmalar, L., Şah, V., Aydın, A., & Öneş, K. (2015). Rehabilitation of spinal cord injuries. World journal of orthopedics, 6(1), 8.

Emerich, L., Parsons, K. C., & Stein, A. (2012). Competent care for persons with spinal cord injury and dysfunction in acute inpatient rehabilitation. Topics in spinal cord injury rehabilitation, 18(2), 149.

Kunz, S., Joseph, S., Geyh, S., & Peter, C. (2017). Posttraumatic growth and adjustment to spinal cord injury: Moderated by posttraumatic depreciation?. Psychological Trauma Theory, Research, Practice, and Policy, 9(4), 434.

Khan, S. M., Phadke, K., Singh, P. K., & Jain, S. (2017). The Role of Nursing Staff in Spinal Cord Injured Patients. J Perioper Crit Intensive Care, 3(1).

Tajima, F., Kamijo, Y. I., Sumiya, T., Nishimura, Y., Arakawa, H., Nakamura, T., & Furusawa, K. (2017). Physiological basis and practice of rehabilitation medicine in the management of individuals with spinal cord injury. Clinical and Experimental Neuroimmunology, 8, 47-53.

McDowell, I., Newell, C. (1996). a guide to rating scales and questionnaires, Measuring health.(2nd Ed.), (pp. 63-67). New York: Oxford University Press.

Robert, A. A., & Zamzami, M. M. (2013). Traumatic spinal cord injury in Saudi Arabia: a review of the literature. The Pan African medical journal, 16, 104.

Roberts, T. T., Leonard, G. R., & Cepela, D. J. (2017). Classifications in brief: American spinal injury association (ASIA) impairment scale. Clinical orthopaedics and related research, 475(5), 1499.

Taha, N. M., & Ali, Z. H. (2013). Physical restraints in critical care units: impact of a training program on nurses' knowledge and practice and on patients' outcomes. J Nurs Care, 2(2), 1-9.

Granger, C. V., Hamilton, B. B., Linacre, J. M., Heinemann, A. W., & Wright, B. D. (1993). Performance profiles of the functional independence measure. American journal of physical medicine & rehabilitation, 72(2), 84-89

Polit, D., and Beck, C. (2014). Nursing Research: Principles and Methods (7th edition). Wolters Kluwer Health. Lippincott Williams & Wilkins. China.

Hoenig, H., Branch, L. G., McIntyre, L., Hoff, J., & Horner, R. D. (1999). The validity in persons with spinal cord injury of a self-reported functional measure derived from the functional independence measure. Spine, 24(6), 539-543.

Hamilton, B. B., Laughlin, J. A., Fiedler, R. C., & Granger, C. V. (1994). Interrater reliability of the 7-level functional independence measure (FIM). Scandinavian journal of rehabilitation medicine, 26(3), 115-119

Munce, S. E., Webster, F., Fehlings, M. G., Straus, S. E., Jang, E., & Jaglal, S. B. (2016). Meaning of self-management from the perspective of individuals with traumatic spinal cord injury, their caregivers, and acute care and rehabilitation managers: an opportunity for improved care delivery. BMC neurology, 16(1), 11.

file:///C:/Users/User/Desktop/1433.pdf.

Khalil Abd-Elhameed, F., & Amin Sayed, M. (2018). Training of Nurses on Rehabilitation of Patients with Spinal Cord Injuries. Egyptian Journal of Health Care, 9(4), 28-44.

Truchon, C., Fallah, N., Santos, A., Vachon, J., Noonan, V. K., & Cheng, C. L. (2017). Impact of therapy on recovery during rehabilitation in patients with traumatic spinal cord injury. Journal of neurotrauma, 34(20), 2901-2909.

Fashafsheh, I., Ayed, A., Eqtait, F., & Harazneh, L. (2015). Knowledge and Practice of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals. Journal of Education and Practice, 6(4), 79-90.

Lim, S. G., & Yam, S. W. (2016). The level of knowledge and competency in the use of the Morse Fall Scale as an assessment tool in the prevention of patient falls. IeJSME, 10(3), 14-23

Wannapakhe, J., Arrayawichanon, P., Saengsuwan, J., & Amatachaya, S. (2015). Medical complications and falls in patients with spinal cord injury during the immediate phase after completing a rehabilitation program. J Spinal Cord Med, 38(1), 84-90.

Dilie, A., & Mengistu, D. (2015). Assessment of nurses' knowledge, attitude, and perceived barriers to expressed pressure ulcer prevention practice in Addis Ababa government hospitals, Addis Ababa, Ethiopia, 2015. Advances in Nursing, 2015.

Bayoumi, M., & Bassuni, E. (2016). Saudi Nurses' Level of Knowledge Regarding to Pressure Ulcer Preventive Measures. International Journal of Prevention and Treatment, 5(1), 7-11.

Nuru, N., Zewdu, F., Amsalu, S., & Mehretie, Y. (2015). Knowledge and practice of nurses towards prevention of pressure ulcer and associated factors in Gondar University Hospital, Northwest Ethiopia. BMC nursing, 14(1), 34.

Saga, S., Seim, A., Mørkved, S., Norton, C., & Vinsnes, A. G. (2014). Bowel problem management among nursing home residents: a mixed methods study. BMC nursing, 13(1), 35.

Liu, C., Hou, L., & Zhang, H. (2015). Standardized Bowel Training Benefits Patients with Neurogenic Bowel Dysfunction After Spinal Cord Injury.

American Journal of Nursing Science, 4(6), 305.

Mukakamanzi, J. (2017). Knowledge, attitude and practices of nurses towards the prevention of catheter-associated urinary tract infection in selected Referral Hospitals in Rwanda (Doctoral dissertation, University of Rwanda).

Viswanathan, K., Rosen, T., Mulcare, M. R., Clark, S., Hayes, J., Lachs, M. S., & Flomenbaum, N. E. (2015). Emergency department placement and management of indwelling urinary catheters in older adults: knowledge, attitudes, and practice. Journal of Emergency Nursing, 41(5), 414-422.

Reynolds, S. S., Murray, L. L., McLennon, S. M., Ebright, P. R., & Bakas, T. (2016). Implementation strategies to improve knowledge and adherence to spinal cord injury guidelines. Rehabilitation Nursing.

Qtait, M., & Sayej, S. (2016). Demographic Variable (Age, Gender, Marital Status, and Educational Qualifications, in Come) and Affect in Nurses' Performance in Hebron Hospitals. Journal of Health, Medicine and Nursing, 2422-8419

Mahmoud, H., Qannam, H., Zbogar, D., & Mortenson, B. (2017). Spinal cord injury rehabilitation in Riyadh, Saudi Arabia: time to rehabilitation admission, length of stay and functional independence. Spinal cord, 55(5), 509–514

Taşoğlu, Ö., Koyuncu, E., Daylak, R., Karacif, D. Y., İnce, Z., Yenigün, D., & Özgirgin, N. (2018). Demographic and clinical characteristics of persons with spinal cord injury in Turkey: One-year experience of a primary

referral rehabilitation center. The journal of spinal cord medicine, 41(2), 157-164

Cuapio, M. A. B., Corral, S. H., Jiménez, M. A. G., & Ángeles, A. A. (2011). Level of independence of the patient with spinal cord injury and its relationship to nursing interventions. Revista de Enfermería Neurológica, 10(2), 77-80.

Walter, E., Jeffrey, C., Hackwood, B., Kemp, I., & Burmeister, E. (2017). Comparison of dependency scores to assess resource allocation for patients with spinal cord injuries. Journal of the Australasian Rehabilitation Nurses Association, 20(1), 16.

Wen, H., DeVivo, M. J., Mehta, T., Baidwan, N., & Chen, Y. (2019). The impact of body mass index on one-year mortality after spinal cord injury. The journal of spinal cord medicine, 1-9.

Saltychev, M., Lähdesmäki, J., Jokinen, P., & Laimi, K. (2018). Pre-and post-intervention factor structure of functional independence measure (Fim®) in patients with spinal cord injury. Annals of Physical and Rehabilitation Medicine, 61, e233

Bindawas, S. M., Vennu, V., Mawajdeh, H., Alhaidary, H. M., & Moftah, E. (2018). Length of stay and functional outcomes among patients with stroke discharged from an inpatient rehabilitation facility in Saudi Arabia. Medical science monitor. international medical journal of experimental and clinical research, 24, 207.

Güneş, S., Aytür, Y. K., Gök, H., Kutlay, Ş., Güneş, N., Tur, B. S., & Küçükdeveci, A. A. (2017). Demographic and clinical profile and functional outcomes of patients with spinal cord injury after rehabilitation. Turkish Journal of Physical Medicine & Rehabilitation/Turkiye Fiziksel Tip ve Rehabilitasyon Dergisi, 63.

Lee, S. Y., & Lee, Y. K. (2016). The Effects of a Motorized Aquatic Treadmill Exercise on Isometric Strength of Knee and Cardiorespiratory Fitness in Subacute Stroke Patients. Archives of Physical Medicine and Rehabilitation, 97(10), e86.

Fawaz, S., Kamel, F., El Yasaky, A., El Shishtawy, H., Genedy, A., Awad, R. M., & El Nabil, L. (2019). The therapeutic application of functional electrical stimulation and transcranial magnetic stimulation in rehabilitation of the hand function in incomplete cervical spinal cord injury. Egyptian Rheumatology and Rehabilitation, 46(1), 21.

Abdul-Sattar, A. B. (2014). Predictors of functional outcome in patients with traumatic spinal cord injury after inpatient rehabilitation: in Saudi Arabia. NeuroRehabilitation, 35(2), 341-347.

Dvorak, M. F., Noonan, V. K., Fallah, N., Fisher, C. G., Finkelstein, J., Kwon, B. K., ... & Townson, A. (2015). The influence of time from injury to surgery on motor recovery and length of hospital stay in acute traumatic spinal cord injury: an observational Canadian cohort study. Journal of neurotrauma, 32(9), 645-654.