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Nurses' Knowledge, Attitudes and Practice regarding Pressure Ulcers Prevention and Treatment

Edouard Niyongabo[1,2]*, Emmanuel Gasaba[1], Pascal Niyonsenga[1], Marius Ndayizeye[1], Jean Bosco Ninezereza[1], Désiré Nsabimana[1], Annonciate Nshimirimana[1], Schadrypeluth Abakundanye[1]

[1]Faculty of Health Sciences, Hope Africa University, Bujumbura, Burundi
[2]Department of Public Health Sciences, National Institute of Public Health, Bujumbura, Burundi
Email: *niyongaboedouard@gmail.com

Abstract

Pressure ulcers (PU) are one of the most common hospital-acquired problems that occur in patients with mobility limitations. Such wounds can produce pain and deterioration of the underlying condition. Sometimes, they can be life-threatening, and their treatment can impose a financial burden on both the patient's family and society. Nurses' knowledge, attitude, and practice are the most important weapons to fight this preventable burden of PU among patients with impaired mobility. The purpose of this study was to assess nurses' knowledge, attitude, and practice regarding PU prevention and treatment at Clinique Prince Louis Rwagasore (CPLR) in Bujumbura, Burundi. A cross-sectional study design was used. Convenience sampling was used to invite all 28 qualified nurses and nurses' aids who work in the services where critically ill patients are admitted to participate. A questionnaire was created, and underwent evaluation of face validity before using it to collect data which was analysed using SPSS 21.0. Results revealed that nurses' knowledge and practice scores were low as participants scored less than 50% on the six knowledge items and the six practice items. However, the attitude scores were greater than 65% on the five items used to evaluate attitude. A strong negative correlation was found between nurses' knowledge and their attitude scores (r = −0.479, p = 0.015). Education level was negatively associated with nurses' knowledge and practice scores of PU prevention and treatment. A high attitude score did not correlate with a higher practice score which might be explained by low knowledge scores (less than 50% on knowledge items). Continuous professional development (CPD) was recommended to improve nurses' knowledge scores and implementation of PU preventive practices at CPLR.

Keywords

1. Introduction

Pressure ulcers (PU) are one of the most common hospital-acquired problems that occur in patients with impaired mobility such as those with spinal cord injuries, the hemodynamically unstable, the elderly and very young, patients with a nutritional deficit, debilitated and immobile (e.g. orthopaedic) clients, those with severe acute illness (e.g. those in intensive care units), as well as those with decreased tissue perfusion (patients who smoke, have diabetes or vascular disease, etc.) [1] [2]. PU are the consequence of prolonged pressure on the skin over a bony prominence, and its location depends on the patient's position (lying, sitting). They are also known as pressure sores, bedsores, decubitus ulcers, and pressure injuries. This damage is a result of external forces such as pressure, shear, and/or friction. Sustained mechanical loads such as when sitting in a wheelchair or wearing a lower-limb prosthesis could also lead to PU. The most common pressure points are: the sacrum, iliac crest, greater trochanters, shoulders, inner or lateral aspect of the knees, prominences of the head, ankle, the heel (the calcaneum), and elbow [3] [4]. PU can produce pain and contribute to the deterioration of the underlying condition. Sometimes, PU can be life-threatening due to the impact on prolonged hospital stays, pain, and higher mortality rates. PU treatment can impose a financial burden on patients, their families, the health care system, and society while it could be prevented [5] [6]. It is among the top five causes of preventable harm to patients [7]. Critically ill elderlies are at higher risk for developing PU than any other patient population.

The risk factors for developing PU include impaired mobility, old age (>65 years), and pre-existing severe illness such as urogenital disorders, stroke, and diabetes [8]. PU development is a complex multifactorial process because it usually involves more than one risk factor [8].

PU are costly in terms of healthcare expenditures, lost wages, and decreased productivity [2]. In the United States of America (US), a retrospective nationwide study (2008 to 2012) revealed that medical management of PU cost the US health care system $9.1 billion to $11.6 billion per year [9] [10]. In the UK, PU cost almost 4% of the total health care expenditure [11], and accounted for $2.41 billion in excess healthcare expenditure in the USA between 2005 and 2007 [11]. Little information is available on the cost of decubitus ulcers in developing countries; however, the situation could be expected to be comparable to, if not worse than, that in developed countries owing to even greater resource constraints [12].

In 2004, among the 1.5 million U.S. nursing home residents, 159,000 (11%) had PU of any stage. The majority of these residents' (5%) have developed Stage

2, accounting for about 50% of all pressure ulcers, while the 1st, 3rd, and 4th stages make up the other 50% of all ulcers [13]. In 2007, more than 2.5 million patients in the US developed PU [11] [14]. In 2009, the national pressure ulcer advisory panel reported that the prevalence of PU in critical care units in the US was approximately 22% [15].

In several African countries, the incidence of pressure ulcers varies within and among countries. In northern Ethiopia, a study conducted to assess the prevalence of PU among hospitalized patients in Felegehiwot referral hospital found that among the 422 patients admitted, 71 (16.8%) were found to have PU. This prevalence was higher in male respondents (42) than in female respondents (29) [16]. Moshi, Sundelin, Sahlen, and Sörlin, (2017) found that the most frequently documented complication of traumatic spinal cord injury was PU (19.7%) in their retrospective study conducted in Kilimanjaro Christian Medical Center, north-east Tanzania from 2010-2014 [17]. In Burundi, a prospective study over 18 months at three public hospitals (Hôpital Roi-Khaled, HôpitalMilitaire de Kamenge, and Hôpital Prince Regent Charles) in Bujumbura recruited 48 patients who had pelvic bone injuries. Over the time of the study, 2% developed PUs during their inpatient stay [18].

PU prevalence and incidence studies document the magnitude of the problem, and can be used to evaluate the effectiveness of interventions aimed at prevention and treatment. In Kenya, the Ministry of Health reported that in 2018, the incidence of PU was about 20% in most clinical settings, despite the existence of numerous national and international guidelines on PU prevention and treatment [5].

PU is still a major concern to hospitalized patients despite the numerous strategies developed to control the problem [11]. Some of the factors impacting effective prevention and management of PU among nurses include knowledge and attitude towards evidence-based recommendations as well as the actual implementation of PU prevention strategies. Nurses are in a better position to prevent PU compared to other healthcare providers such as medical practitioners, laboratory technicians, pharmacists, etc. [7]. In hospitals, patients and nurses spend a great deal of time together. Nurses assess, observe and educate patients by providing curative, preventive, and promotive nursing care. However, this practice would be only possible if they have an adequate level of knowledge, positive attitudes, and better practices. PU prevention's knowledge was identified to be poor among nurses, which is reflected in care that does not correlate with PU practice guidelines [7] [19]. Nurses' knowledge, attitude and practice status are unknown at Clinique Prince Louis Rwagasore (CPLR), because no study is known to have been published before on this matter. The words "pressure ulcers in Burundi" were searched in Google Scholar and PubMed, and no result was retrieved. This study answers the main question, what is the current knowledge, attitude and practice among nurses at CPLR regarding PU prevention and treatment? The main goal of our study was to assess nurse's knowledge, attitude and practice regarding prevention and treatment of PU in patients at CPLR, and the

following specific objectives were addressed 1) Determine the level of nurses' knowledge regarding PU prevention and treatment. 2) Assess nurses' attitudes towards PU prevention and treatment. 3) Assess nurses' practices regarding PU prevention and treatment. 4) Identify demographic factors that may be associated with knowledge, attitude, and practice of nurses regarding PU prevention.

2. Theoretical Framework

Martha E. Rogers developed her model of unitary human beings based on the concepts of systems theory [20]. Rogers viewed a human being and his environment as integral that cannot be separated. She believed that human and his environment are a single unit and therefore, must be studied together. She also believes that human beings and their environment evolve, change, and move ahead together and after change occurs, both humans and their environment cannot return to their former stage [20].

In Roger's theory of human beings, nursing is defined as an art and science that is humanistic and humanitarian [21]. There are two dimensions in the science of unitary human beings; the science of nursing, which is the knowledge specific to the field of nursing that comes from scientific research; and the art of nursing, which involves using the science of nursing creatively to help patient' outcome. She argued that the patient can't be separated from his environment when addressing health and treatment.

According to Rogers, nursing aims to promote symphonic interaction between the man and his environment thereby strengthens the coherence and integrity of the human beings and to direct and redirect patterns of interaction between the energy fields for the realization of maximum health potential [20].

Nurses' knowledge, attitude and practice derived from the science of nursing can be used in the process of changing patient outcome of preventing and treating PU in the hospital by assessing this unitary being. The patient outcome of PU prevention and treatment will be facilitated by the patient and environment relationship (Figure 1). When nurses apply scientific knowledge, and improve attitudes and practices by assessing the human factors (mobility, health status, nutrition deficit status, age, tissue perfusion) and environmental factors (moisture, inadequate bedding, pressure, shear and/or skin friction, use of a wheelchair or lower-limb prosthesis) of the patient, could help to prevent and treat PU. To apply a holistic nursing care to patients for the purpose of PU prevention and treatment, these two dimensions of human being and environment must be assessed. Once the nurses' KAP assessment improves the patient's wellbeing and their environment, there is quality assurance guaranteeing patient's outcome.

3. Methods

This study was carried out at Clinique Prince Louis Rwagasore (CPLR) in Bujumbura, Burundi in July, 2021 among nurses for the purpose of assessing
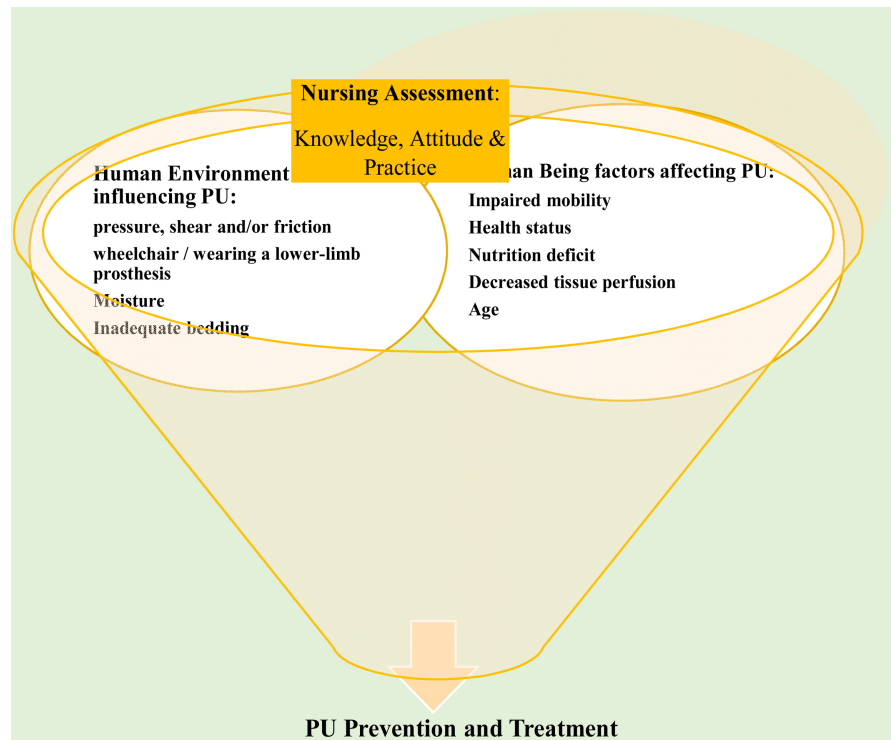
Figure 1. Conceptual framework for PU treatment and prevention based on by Rogers' theories of unitary human beings.

nurse's knowledge, attitude and practice regarding PU prevention and treatment during a period of two months. CPLR is one among the 3 publics institution with 187 beds and serves as the tertiary level hospital for national referrals. Bujumbura, city, is located in the western of country. The participants of this study were qualified nurses (Master, Bachelor/License and A2) and nurses' aide (A3) who works in the inpatient chirurgery unit, intensive care unit and internal medicines unit in CPLR. The A3 and A2 level nurses are not graduate students. These are nurses who did vocational secondary school. The A3 level nurses had 2 years of training after O' level, however, there is no longer any training for A3 level since 2008. The A2 level is nurses with 4years of training in general nursing after O' level. As the country does not yet have nurses' council, in Burundi, there is no define scope of practice, as all nurses' level seems to have the same scope of practice. There is no legal document that defines any scope of nursing practice. This is a really challenge to nursing practice, as these A3 nurses seems to do the same work as masters' ones and which could predict the patients' outcomes. This is why all levels of nurses were included in this study to assess their knowledge, attitude and practice for PU prevention and management. Across-sectional study design was used to describe the nurse's knowledge, attitude and practice on prevention and treatment strategies of PU among nurses who work in ICU, Internal medicine and inpatient surgery unit at CPLR where patients develop mostly PU. The CPLR counts 103 nurses within 7 works in ICU, 10 in Internal medicine and 11 in inpatient surgery unit. As the number of nurses working these selected

units was small (28 nurses), convenience sampling method was used in this study to include all of them (N equal to simple size: N = 28). A self-report method involving questionnaire completion with four components addressing demographic data, participants' knowledge, attitudes and practices was used to collect data. It had 29 items divided into four sections: demographic data section with 5 items exploring the participants' socio-demographic characteristics, section two of the nurse's knowledge of PU prevention and treatment, with six open-ended and seven closed-ended questions, section three on the nurse's attitude towards PU prevention and treatment with seven items and section four in the practice of PU prevention and treatment with six items. The questionnaire was designed by authors in reference to two published clinical practice guidelines, the Pan Pacific Guideline for the Prevention and Management of Pressure Injury (2012) published by the Australian Wound Management Association and the Association for the Advancement of Wound Care (AAWC) Venous. It was presented in French and in English. Participants had used a French questionnaire as this is the language of professionals used in Burundi. The currently used questionnaire was given to four nurses with advanced nursing skills for face validity and the nurse in charge of CPLR. The feedback was with high consistency even if some remarks did not lack. The literature review was generally reviewed on nurses' KAP for PU prevention and treatment. A Statistical Package for Social Scientists version 21.0 software (SPSS) was used to analyze the data which were presented as a frequency table, pie charts, and bar graphs. The score of the results were classified refer to the items' scored by participants in each section of variables. It was good/high for those who scored more than 50%, poor/low for those who scored less than 50% for the items of the questionnaire. Ethical principles had been respected where an informed consent form was attached to the questionnaire, participants were given a choice whether to participate in the survey or not and the authorization to carry out the study was required from Hope Africa University and CPLR Superintendent.

4. Results

By analyzing the nurses' KAP of PU prevention and treatment, twenty-eight questionnaires distributed to participants, between 13th October to 27th October 2021, twenty-five were filled in and returned to the researcher. This represents a response rate of 89.2%.

4.1. Socio-Demographic Data for the Study Participants

The findings unveiled that majority of participants (92%) were female while 8% were male. Their age ranged from 22 to 54 years (X = 37.48 years). In addition, majority of the participants worked in inpatient surgery unit (36%) and in Internal medicine (36%), while 28% were in ICU, and majority (44%) of them had more than 10 years in service, while 24% had 5 to 10 years, 20% had 1 - 5 years and 12% less than one year in service. The mean work experience of participants

was 3 years. None of our participants had master degree and majority (52%) of them had A2 level, 28% had A3 level while 20% had a bachelor degree in nursing (BSN).

According to the Table 2, the majority of participants had low knowledge of prevention and treatment of PU, as for all variables, participants scored less than 50% except the item asking about the most vulnerable areas for developing PU, where their score was (92%). Participants scored lower on the elements assessed for reducing the risk for PU, 12%; how to prevent the occurrence PU, 28%; which patients are prone to develop PU, 48%; the stages of PU development, 12%; and the risks factors for developing PU, 32%. Participants knew that continuous assessment of at-risk patients could prevent PU (68%). They were aware that PU prevention is a higher priority than treatment (80%). A large majority of nurses erroneously believe that all patients are at high risk for developing PU (96%), and that treatment of PU is a higher priority than prevention (80%). No respondent was aware of the existence of any assessment tool for predict PU in their service (100%) and no clinical guideline for PU prevention or treatment (Figure 2). However, regarding the evidence-based nursing interventions for PU prevention, participants, had scored higher indicating a good knowledge. They were able to identify the correct evidence-based nursing intervention, such as regular repositioning (88%), mobilization (84%), assess nutritional status (52%), provide high protein nutritional supplements (52%), involve the patient and family in care of PU (64%) and the patient's health status (56%) (Figure 3).

The Bivariate Pearson correlation revealed a strong negative correlation (−0.401) between the education level of the participants and the ability to list the

Table 1. Socio-demographic characteristics of participants (N = 25).

	Characteristics	Frequency (N = 25)
Age:	Range	22 years – 54 years
	Mean	37.48 years
Sex:	Female	23 (92%)
	Male	2 (8%)
Length of time on your unit:	Less than 1 Year	3 (12%)
	1 - 5 Years	5 (20%)
	5 - 10 Years	6 (24%)
	More than 10 Years	11 (44%)
Education Level:	A3	7 (28%)
	A2	13 (52%)
	BSN	5 (20%)
	MSN	0 (0%)
Department	Surgery Unit	9 (36%)
	ICU	7 (28%)
	Internal Medicine	9 (36%)

Nurse's knowledge of pressure ulcer prevention and treatment.

Table 2. Nurse's knowledge for PU prevention and treatment (N = 25).

Characteristics	Able to list n (%)	Enable to list n (%)	Mean	Std. Deviation
Elements to assess for reducing the risk for PU	3 (12%)	22 (88%)	1.88	0.332
Most vulnerable areas to develop PU	23 (92%)	2 (8%)	1.08	0.277
Prevention of PU occurrence	7 (28%)	18 (72%)	1.72	0.458
Patients prone to develop PU	12 (48%)	13 (52%)	1.52	0.510
Stages for PU development	3 (12%)	22 (88%)	1.88	0.332
Risks factors for developing PU	8 (32%)	17 (68%)	1.68	0.476
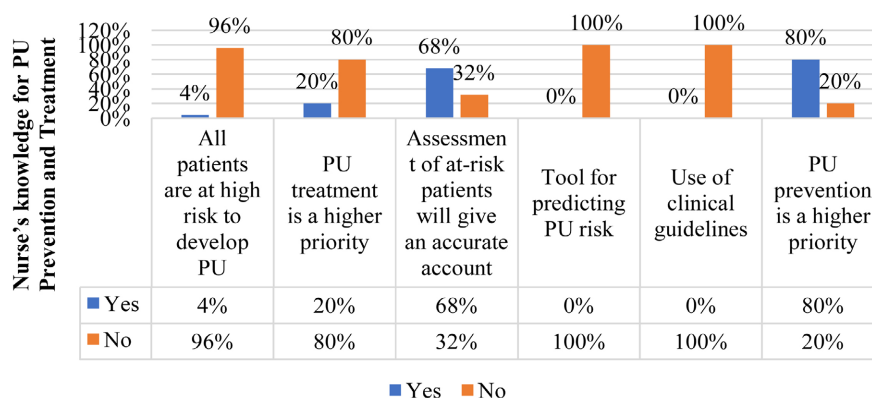
Figure 2. Nurse's knowledge for PU prevention and treatment.

Figure 3. Evidence-based nursing interventions to prevent PU.

elements assessed for reducing the risk for PU (p = 0.047). The Bivariate Pearson correlations revealed a weak negative correlation (−0.180) between the education level of the participants and their ability to list the most vulnerable areas to de-

velop PU (p = 0.389). The Bivariate Pearson correlation revealed a strong negative correlation (−0.461) between the education level 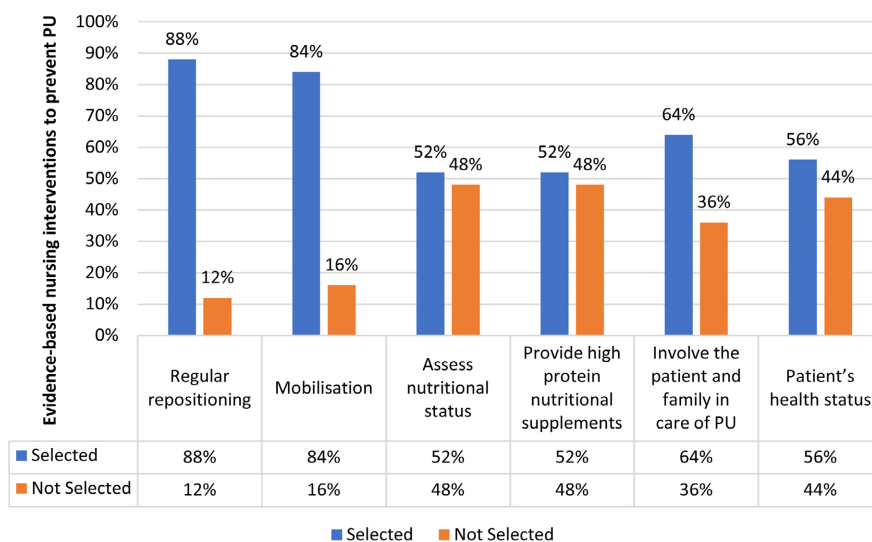of the participants and their ability to list those patients who are prone to develop PU (p = 0.020), then there was a greater statistically significant between these two variables (Table 3).

4.2. Nurse's Attitude on Pressure Ulcer Prevention and Treatment

The current study revealed that the attitude was quietly good regarding the prevention and treatment of PU as for the 5 variables, participants had a good attitude as they scored greater than 65%. Even though that they could assume that prevention is a time consuming for them to carry out (80%) and nowadays patients tend to not get as many PU (52%) (Table 4).

4.3. Nursing Practice on Pressure Ulcer Prevention and Treatment

Regarding the assessment and documentation of risk factors for every patient admitted to their service, majority of the participants (60%) said that they do not practice it, while 40% confirm it. 56% accepted that they do not assess nutritional parameters for every patient on admission, while 44% assessed it. Majority of the participants (56%) said that they do not use honey to treat infection in patients presenting PU, while 44% confirmed to itsuse. Additionally, most of them (60%), said that honey did not give any remarkable clinical outcomes while 40%

Table 3. Correlations of the participants' education level to nurses' knowledge for PU prevention and treatment.

Correlations of the participants' education level and the elements to assess for reducing the risk for PU			
Education level	Pearson Correlation	1	−0.401*
	Sig. (2-tailed)		0.047
Elements to assess for reducing the risk for PU	Pearson Correlation	1	−0.401*
	Sig. (2-tailed)		0.047
Correlations of the participants' education level and the most vulnerable areas to develop PU			
Education level	Pearson Correlation	1	−0.180
	Sig. (2-tailed)		0.389
Most vulnerable areas to develop PU	Pearson Correlation	−0.180	1
	Sig. (2-tailed)	0.389	
Correlations of the participants' education level and patients who are prone to develop PU			
Education level	Pearson Correlation	1	−0.461*
	Sig. (2-tailed)		0.020
Patients prone to develop PU	Pearson Correlation	−0.461*	1
	Sig. (2-tailed)	0.020	

Table 4. Nurse's attitude towards the prevention and treatment of PU (N = 25).

Characteristics	Agree n (%)	Disagree n (%)
PU prevention is time consuming for me to carry out	20 (80%)	5 (20%)
Patients tend to not get as many PU nowadays	13 (52%)	12 (48%)
No need to concern myself with PU prevention in my practice	6 (24%)	19 (76%)
Less interested in pressure ulcer prevention than other aspects of care	8 (32%)	17 (68%)
PU prevention is a low priority	6 (24%)	19 (76%)
Regularly care of PU risk assessment in all patient	17 (68%)	8 (32%)
Need to focus more on PU prevention in my practice	22 (88%)	3 (12%)

Table 5. Nursing practice on pressure ulcer prevention and treatment (N = 25).

Characteristics		Frequency
Assess and document the risk factor for PU development	Yes	10 (40%)
	No	15 (60%)
Assessing nutritional parameters	Yes	11 (44%)
	No	14 (56%)
Use of honey to treat clinical infection	Yes	11 (44%)
	No	14 (56%)
Remark a positive clinical outcome	Yes	10 (40%)
	No	15 (60%)
Read any paper on the use of honey	Yes	0%
	No	100%
Participate in a PU workshop	Yes	0%
	No	100%

were confirming to show a remarkable outcome. None of the participants (100%) assumed to read any scientifical research on the use of honey or sugar for PU treatment or ever participate in a PU management and prevention workshop (Table 5).

The Bivariate Pearson correlation revealed a strong negative correlation (r = −0.526) between the nurses' education level and their practice (p = 0.007), then there was a statistically significant between the nurses' education level and their practice (Table 6).

4.4. Relationship between the Knowledge, Attitude, and Practices

The nurses' scores on their knowledge, attitudes and practices were correlated. Table 7 showed that there was a strong negative correlation between the nurses' knowledge and their attitudes (r = −0.479, p = 0.015). There was no statistically

Table 6. Correlations between the nurses' education level and their practice.

		Education level	Practice
Education level	Pearson Correlation	1	−0.526**
	Sig. (2-tailed)		0.007
	N	25	25
Practice	Pearson Correlation	−0.526**	1
	Sig. (2-tailed)	0.007	
	N	25	25

**Correlation is significant at the 0.01 level (2-tailed).

Table 7. Correlations matrix between the knowledge, attitude, and practices.

		knowledge	Attitude	Practice
knowledge	Pearson Correlation	1	−0.479*	0.304
	Sig. (2-tailed)		0.015	0.140
	N	25	25	25
Attitude	Pearson Correlation	−0.479*	1	−0.333
	Sig. (2-tailed)	0.015		0.103
	N	25	25	25
Practice	Pearson Correlation	0.304	−0.333	1
	Sig. (2-tailed)	0.140	0.103	
	N	25	25	25

*Correlation is significant at the 0.05 level (2-tailed).

significant between the nurses' knowledge and their practice ($r = 0.304$, $p = 0.140$), neither to the nurses' attitudes and their practice ($r = -0.333$, $p = 0.103$).

5. Discussion

Nurses' knowledge, attitudes and practices are the major factors that have been pointed out in the contribution of PU prevention and treatment among patients with impaired mobility. The study findings revealed that majority of our participants were female (92%), none of them had master degree, while (52%) of the participants were A2 nurse (with 4 years of nursing training after O' level), 28% were A3 nurse-aide (With 2 years of nursing training after O' level) and 20% had bachelor's degree in nursing (BSN). This could be explained by the fact that the first master program was launched in Burundi in 2012. Furthermore, it is offered by only one university locally, Hope Africa University. In Burundi, from 1945 to 1997, the nursing skills were taught only at vocational high school, and all nurses were either A3 or A2 levels. Among them, the A2 nurses were working in the healthcare facilities (HCF) with a largest scop of practice. The A3 level was considered as assistant professionals in the nursing practices [22]. There was no lev-

el with high competencies compare to A2 till 2009, when Licence (Bachelor) level was launched at INSP (Institut National de la SantePublique). Since the CPLR had opened its door in 1945 with the beginning of nursing profession in Burundi, this might explain the high number of these A2 and A3 level nurses within this institution. Study conducted in two healthcare facilities of Bujumbura (Van Norman Clinic and Military Hospital of Kamenge), revealed that majority of the participants were A2 nurses (49.4%) while 37.6% had Bachelor degree, 9.4% were A3 nurses and 3.5% had master's degree [23]. Majority (44%) of the participants had more than 10 years in service, while 24% had 5 to 10 years, 20% had 1 - 5 years and 12% less than one year in service (Table 1).

CPRL nurses' knowledge regarding PU prevention and treatment was found to be at a very low level. Except one variable concerning the most vulnerable areas for developing PU where nurse scored 92%, participants have scored less than 50% in the knowledge items. This high score (92%) might be explained by their experience of seeing patient developing PU in their daily activities while their low score would be explained these latter do not attend any workshop (Table 5) or receive any in-service training regarding PU. Ebi, *et al.* (2019) recommended in-service training to facilitate PU prevention in Wollega zones after that their study findings revealed inadequate nurses' knowledge to PU prevention (91.5% of participants) due to lack of in-service training and self-documentation by reading published articles [24].

Even though participants were able to confirm that continuous assessment of at-risk patients could give an accurate patients' outcomes (68%) and PU prevention is a higher priority than treatment (80%), these nurses had poor knowledge on several items as they responded that all patients are at high risk for developing PU (96%), treatment of PU is a higher priority than prevention (80%), no existence of an assessment tool of predicting PU in their service (100%) and no guideline for PU prevention or treatment exist (Figure 2). This could also be justified by the above reason on the lack of in-service training or workshop and clinical practice guidelines. The low knowledge among nurses on PU prevention and treatment could lead to poor patient outcomes because nurses' knowledge of PU prevention is an important predictor for the implementation of PU prevention in practice by assessing the human and environmental risk factors [7]. Even though participants' knowledge towards PU prevention and treatment was low, they had a significant knowledge regarding evidence-based nursing interventions for PU prevention (Figure 3). This might be explained by an inexplicable reason, because if they were implementing this evidence-based knowledge, it could result in significant patients' outcomes regarding the PU prevention and treatment (137 patients had developed PU from 1st January, 2019 to 7th December, 2021; CPLR statistic report). Another thing is that participants may try to grabble the correct answers, or by collaborating each other due to the use of self-report questionnaire which might not reflect the really participants' knowledge. Evidence-based nursing practices (EBNP) have been promoted to enhance

the delivery of patient care, reduce cost, increase patient and family satisfaction and contribute to professional development [25]. It could be better that CPLR administration to adopt a culture of implementing EBNP for effective clinical patients' outcomes.

The nursing staff at CPLR had a positive attitude regarding PU prevention (more than 68%) with a non-negligible number of participants who have negative attitude (less than 50%). The negative attitude was noticed among nurses who believe that the prevention of PU is a time consuming for them to carry out (80%) and patients tend to not get as many PU nowadays (52%) (Table 4). These negative attitudes could be the factors which might increase the incidence of PU among admitted patients especially for those with risk factors. Therefore, in-service training should be carried out for the purpose of improving their knowledge, hence, improving their attitude. The training of health care professionals is considered as an integral part of the prevention of PU for the purpose of reducing the frequency of pressure ulcers by changing behavior pattern, thus, increase the knowledge level of health professionals on the prevention of pressure ulcers [26].

Generally, findings revealed that nurses' practice was poor. Participants scored less than 45% in all practical items. This might be explained by the fact that this study finding revealed that nurses' at CPLR did not have any clinical practice guideline for PU prevention and treatment and none of the participants did not yet attend any workshop on PU prevention and treatment. This lack of in-service training and awareness session in some professional practice could result to poor practice among CPLR nurses. The prevalence of PU within healthcare settings is considered an indicator of nursing care quality because nurses are principally responsible for assessment of patient risk of PU and management of skin integrity [27].

Additionally, majority of the participants (56%) assumed that they do not use honey to treat local of infection in patients presenting PU, while (60%) revealed that honey did not give any remarkable clinical outcomes (Table 4). This controversy might result to lack of personal documentation or to the quality of honey that had been used with these latter. A 5-week randomized clinical trial which evaluated the effect of a honey dressing on pressure ulcer healing revealed that patients who were treated by honey dressing had significantly better Pressure Ulcer Scale for Healing (PUSH) tool scores than subjects treated with the ethoxy-diaminoacridine plus nitrofurazone dressing (6.55 ± 2.14 vs 12.62 ± 2.15, p < 0.001) [28].

Education revel was the most socio-demographic factor that was associated with nurses' knowledge and practice towards PU prevention and treatment (Tables 3-6). This could be explained by the fact that most our participants (80%) had secondary level of nursing training (A_2 and A_3). This level of nursing training, especially the A_3 (28%) who was not qualified nurse but assistant nurse may be also the problem the patient care. These latter may be find managing

nursing care in the service alone due to the hospital organization and lack of staff. This contrasts the findings of Ebi, *et al.* (2019), where they argued that nurses' knowledge score on PU prevention has no significant difference between education level (p = 0.72) [24]. However, the same study had revealed that nurses' knowledge score to PU were higher among those who read articles about PUs (p = 0.000) and attended training (p = 0.003) [24]. The CPLR should revise the policies of staffing and promote in-service training or CPD.

Generally, this study has revealed a strong negative correlation between the nurses' knowledge and their attitudes (r = −0.479, p = 0.015) (Table 7). While the nurses' knowledge was low, their attitude was quietly good. These findings are controversial, because, if the current finding reflected the real attitude, the number of PU case would be decreased and their practice score was supposed to be significantly good, which is not the case in this study. This may be due to the use of self-report questionnaire while assessing nurses' attitude which might not reflect the actual nursing attitude as participants may want to give the social behavior accepted answers. The current study correlates the findings of GreššHalász, Bérešová, Tkáˇcová, Magurová and Lizáková (2021), which also revealed insufficient knowledge (45.5%) and attitudes (67.9%) of nurses towards PU prevention [29]. Finally, there was no statistically significant between the nurses' knowledge and their practice (r = 0.304, p = 0.140) and the nurses' attitudes and their practice (r = −0.333, p = 0.103). This is also another dilemma between these two dimensions, because, if the participants' attitude regarding PU prevention and treatment was good, there should be a decrease in PU incidence among patients. The current findings did not support Bloom taxonomy of educational learning objective developed by Bloom (1956) in which practice is influenced by knowledge and attitude, because knowledge is a necessary precondition for putting skills and abilities into practice [30]. Additionally, if the participants knowledge regarding PU prevention and treatment was good, their practice was supposed to be good also. This align with the current findings whereby, the participants' knowledge was poor, which had reflected the poor practice score among the participants. This concurs the finding of Murugiah, Ramuni, Das, Che Hassan and Abdullah (2019) whose findings revealed a low knowledge among participants, where they argued that lack of knowledge regarding pressure ulcer prevention may lead to increases incidence of pressure ulcer in the hospital [31].

6. Recommendations

The following are recommendations arising from this study:

- To the researchers, further interventional studies to enhance nurses' knowledge to generally improve the practice in regard to PU prevention and treatment are needed as a non-negligible number have a low level of knowledge and practice. Moreover, a study on the implementation of evidence-based practice for PU prevention and treatment could be conducted to allow nurses in

healthcare settings to use it. Therefore, a clinical practice guideline for PU prevention and treatment could be developed also to facilitate this implementation.

- To the Universities, specifically, the program of nursing, to revise and update the curriculum in regards to PU prevention and treatment to enhance students' nursing knowledge before they reach the clinical setting.
- To the hospital, it is highly recommended to conduct continuous professional development (CPD) among nurses and monitor its effectiveness on a regular basis. Protocols, guidelines, and assessment tools are also needed and should be availed in services and be taught to nurses for their best utilization and ultimately for the best nursing care in regards to PU prevention and treatment which could lead to the best patients' outcome.
- To the government, it is recommended to implement policies for career advancement for these nurses with a low level of training, especially the A_3 whose program no longer exists locally so that they can contribute to the improvement of patients' effective care. A board of nursing council should be created to regulate the nurses' practice on regional or international standards of practice.
- The researcher also recommended that the PU cases should be well documented and reported to the Ministry of Health as it is done for non-communicable and communicable diseases to easily know the incidence and prevalence at the central level so that policy makers are able to take measures accordingly.

7. Conclusion

This study unveiled that the nurses' knowledge and practice were low. However, their attitude was good, even though it did not reflect a good practice which could be the effect of insufficient knowledge. Thus, continuous professional development (CPD) was recommended to overcome this barrier. The education revel was the most socio-demographic factor that was associated with nurses' knowledge and practice towards PU prevention and treatment. This study revealed a strong negative correlation between the nurses' practice and their level of education (r = −0.526, p = 0.007), and between the nurses' knowledge and their attitudes (r = −0.479, p = 0.015).

8. Limitation

This study has some limitations. This study focuses only on nurses and nursing assistants while other healthcare providers are excluded. Secondly, the study was conducted in one public hospital (CPLR) with 187 beds, while the city of Bujumbura has five public hospitals.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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