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Original Article

A cross-sectional study on oncology nurses' knowledge and practice of oral mucositis among cancer patients in Jordan

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ABSTRACT

Objectives: This study was conducted to evaluate oncology nurses' knowledge and compliance with oral mucositis (OM) management guidelines.
Methods: A cross-sectional design with a nonparticipant observation approach was utilized. In phase I, a cross-sectional convenience sample ($n = 140$) of oncology nurses completed the knowledge test. In phase II, a random sample ($n = 20$) of oncology nurses from participants in phase I was observed during their practice.
Results: Fifty-seven (40.7%) of the participants had an unsatisfactory level of knowledge. Most of them had knowledge deficits regarding pathology, OM definition, assessment, scoring, treatment, and patient education and advice. A significant difference existed among nurses with diploma, bachelor, and post-graduate degrees as determined by one-way ANOVA ($P = 0.001$). There were no significant difference between average scores of male and female nurses were higher than those of nurses ($P = 0.45$). No significant difference was observed among knowledge scores of nurses with different job titles ($P = 0.51$). The average score of male nurses in terms of skill performance was higher than that of female nurses (29.20 ± 2.10 vs 27.10 ± 1.80) without statistical significance.
Conclusion: The knowledge and compliance with OM management guidelines among Jordanian oncology nurses need to be improved. National OM prevention and management guidelines are adopted in Jordan. Continuing education and training are also recommended.

What is known?

- Oral mucositis is a common oral complication among patients with cancer receiving systematic chemotherapy.
- Oral complications affect the quality of life, disrupt the treatment plan, delay cancer treatment in terms of dosage reduction and altered nutrition, and cause severe pain.
- Nurses' knowledge is associated with the effectiveness of oral care performed.

What is new?

- Nurses with a high education level had a higher score of knowledge and skill performance about oral mucositis.
- The lack of continuing education and training was identified as the main reason for insufficient levels of knowledge and limited skills regarding oral care and oral mucositis assessment and management.
- The current results highlighted the importance of continuing education and training for oncology nurses about the use of a standard protocol for oral mucositis assessment and care.

1. Introduction

Cancer is considered a life-threatening health problem in Jordan. The number of new cases has increased by 44% in the last 10 years. The incidence of cancer is 79.4 per 100,000 [1]. Patients diagnosed with cancer undergo different treatment modalities, including chemotherapy, radiotherapy, surgery, and bone marrow transplantation. As a result, they experience a wide range of long- and short-term complications, such as oral complications [2]. Oral complications affect the quality of life, disrupt treatment plans,

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delay cancer treatment in terms of dosage reduction and altered nutrition, and cause severe pain [3].

Oral mucositis (OM) is a common oral complication among patients with cancer receiving systematic chemotherapy [4]. This complication is defined as an inflammation of the oral cavity and characterized by erythema and mucous membrane degeneration, which then develops into ulcers and bleeding. The complication usually begins 3–5 days after the initial dose of chemotherapy and reaches its peak within 14 days [5].

The incidence of OM depends on cancer type and treatment modality. The complication is commonly associated with a high dose of systemic chemotherapy [4]. The incidence of OM in patients with cancer ranges between 30% and 75% [6]. In Jordan, a previous study found that 81.3% of reviewed patients are diagnosed with OM, and 52.4% are scored at 2 according to the World Health Organization scale [7].

Numerous agents have been studied to determine their efficacy and usefulness in the treatment and prevention of OM, but none has been highly effective [8,9]. Consultation and treatment are effective in preventing and treating OM in accordance with a systematic guideline for oral care, including assessment [8,9].

Despite the availability of various guidelines for OM management, their effect on clinical practice is limited. The actual care provided by nurses to patients with or without risk of OM is unclear. This inconsistency in care is due to the lack of knowledge and skills among oncology nurses in relation to OM guidelines and evidenced-based practices [2,5,6,8,10] because they are not exposed to this during undergraduate study. The lack of knowledge is considered a major barrier to providing evidenced-based oral care [11,12]. In addition to the nurses' knowledge, numerous factors, including standard guidelines to follow, level of knowledge among nurses, and nurse–patient ratio, have been associated with the effectiveness of oral care performed [13]. In Europe, the results of a large study have indicated that 88.1% of the nurses state that oral care is a top priority in their daily practice [14]. Consistent with this study, another study in Malaysia has reported that 84.7% of nurses ask for updated knowledge regarding a recent evidence-based guideline for performing oral care and preventing OM [15]. Despite the importance of oral care in preventing OM, few studies have been conducted to determine nurses' knowledge about OM and to investigate nurses' practices [6,10].

Nurses have a significant role in preventing and managing OM and decreasing its adverse effect on patients' health status. Their role, including conducting frequent oral assessment, patient education, and implementing oral care, has been acknowledged as an important factor in the treatment plan for OM [16]. However, nurses' practices and advice available for best practices are inconsistent. Improving nurses' knowledge and skills through continued training is required to improve oral care and minimize the risk of OM. This study responded to these demands and was conducted to evaluate the oncology nurses' level of knowledge and compliance with OM management guidelines and to determine if a structured educational program should be established.

2. Materials and methods

2.1. Study design

A cross-sectional design with a nonparticipant observation approach was used to evaluate nurses' knowledge and compliance with OM management guidelines. The study was conducted in two phases. The first phase was conducted to assess the nurses' knowledge. The second phase observed the nurses' practices regarding OM management.

2.2. Setting and sample

In phase I, a convenience sampling technique was used to recruit participants from oncology units, including surgical, medical, hematological, pediatric, and adult clinics. Power analysis was conducted to estimate the sample size; a sample of 120 nurses was estimated with an effect size of 0.5, α at 0.05, and a power of 0.80 [17]. Contact details, including their full name, address, mail box, and telephone or cell phone numbers, were collected from the participants in phase I so that they could be contacted for phase II. The researcher used a code to match a patient's ID and contact details. In phase II, a random sampling technique was used to select the participants from the participants in phase I. A sample of 20 nurses was observed.

Ethical approval was granted from an ethics and research committee and from the participants. The participants who met the inclusion criteria included those working in oncology units for more than 6 months and worked with patients with OM. An invitation poster was distributed in the units to provide potential participants with an overview about the study purpose and methodology. Once the potential participants agreed to participate, the research assistant (who holds a BSN degree and has experience in data collection) provided them with the study instruments and collected them when completed. A sample of 140 participants participated and returned the questionnaire, whereas 60 participants declined to participate and did not return the questionnaires without clarification. The response rate was 70%. In phase II, the research assistants observed the participants in the examination of patients, and 20 observations were made over a 2-week period. The research assistant spent a portion of a shift with the participants. The study was explained to the participants before their permission to participate was obtained. Their participation was to involve having the researcher accompany them during oral care and OM care. They were told that the research assistant would observe the OM care practices.

2.3. Instruments and procedures

A demographic sheet, including data related to the participants' gender, age, job title, level of academic qualification, experience, hours of education about OM pregraduation, and continued education at the hospital regarding OM, was developed by the researcher.

2.3.1. Knowledge test

Nurses' knowledge was assessed using a knowledge test. Thirty multiple choice questions were developed by the researcher to test the oncology nurses' knowledge regarding OM. The test included comprehension, understanding, application, and analysis-level questions. The questions emerged from related textbooks, guidelines, and the literature. *Mosby's Oncology Nursing Advisor: A Comprehensive Guide to Clinical Practice* (2016) was used to develop the questions for the test [18]. The Oral Care Guidance and Support by the European Oral Care in Cancer Group (2017) was used as the scale [7,19]. Various questions related to anatomy (3 questions), pathology of oral care (3 questions), oral care (6 questions), OM (12 questions related to definition, assessment, scoring, and treatment), and patient education and consultation (6 questions) were included in the test. The total potential score of the test was 30 points (one point for each question). The participants were asked to select one choice from the four choices that were provided. Their knowledge was compared with expert opinion, which was derived from the literature and textbook. A score of 1 was given for each correct response, and 0 was given for each incorrect response. The critical score was 15 points (50% of the total score). A score between

15 and 20 was considered satisfactory, between 21 and 25 was considered good, between 26 and 30 was considered excellent, and below 15 was considered unsatisfactory. The participants took 30–60 min to complete the test. Face and content validity were checked before the test was implemented. The researcher, in consultation with a panel of experts (three professionals), checked the content validity and measured the reliability.

2.3.2. Observation of care/practice performance

An observation checklist was used to evaluate the oncology nurses' skills in providing oral care for patients with OM. The 44-item checklist included those skills related to oral check (3 items), assessment of oral cavity (12 items), oral hygiene performance (23 items), providing patient advice (3 items), and documentation (3 items). The scores of the checklist ranged between 0 and 44 points. The critical score was 22 points (50% of the total score). Scores of 22 and above were considered satisfactory and below 22 was considered unsatisfactory. The observation checklist was adopted from the previous literature and reviewed by a panel of experts to check the content validity. The panel consisted of three nurse educators who have a master's degree and a PhD degree in nursing with a clinical experience [20].

2.3.3. Pilot testing

A pilot study was conducted to evaluate the knowledge test and observation checklist, determine difficulties, and identify the applicability of the instruments. No major changes were made. Fifteen participants completed the knowledge test. The results showed the reliability of the test with Cronbach's α 0.81, and the content validity index was excellent for all the subsections of the questionnaire (content validity index = 0.81–0.86). Moreover, 10 nurses were observed using the observation checklist. The results showed that the checklist had good internal consistency and reliability with Cronbach's α of 0.84, and the content validity index was excellent for all the subsections of the scale (content validity index = 0.78–0.87). Lastly, the panel of experts reviewed these results and approved the instruments.

2.4. Statistical analyses

The Statistical Package for the Social Science (version 23.0) was used to analyze the data. Descriptive analyses included mean, standard deviation, and frequencies. One-way ANOVA was used to determine the differences in nurses' knowledge on the basis of their qualifications and job title. Pearson's correlation coefficient was used to identify the relationships between the study variables.

3. Results

A sample of 140 oncology nurses participated in the study. Of these nurses, 80 were males (57.1%) and 60 were females (42.9%). The mean age was 26.4 (*SD* 5.24) years. The results showed that the majority of the participants held a bachelor's degree in nursing (89.3%). Finally, 91.4% (128) of the participants reported a desire to attend a structured educational program about OM. Table 1 presents these results in detail.

Table 1
Demographic characteristics of the participants ($n = 140$).

Variable	Number (n)	Percentage (%)
Age, *Mean* ± *SD*	26.4 ± 5.2	
Gender		
Male	80	57.1
Female	60	42.9
Job Tittle		
Practical Nurse	10	7.2
Registered Nurse	110	78.5
In Charge Nurse	14	10.0
Unit Manager	6	4.3
Level of academic qualification		
Diploma degree	10	7.2
Bachelor degree	125	89.3
Postgraduate degree	5	3.5
Hours of received education about OM pre-graduations, *Mean* ± *SD*	4.1 ± 2.1	
Experience in oncology field, years, *Mean* ± *SD*	2.5 ± 1.1	
Desire to attend continue education program regarding OM at hospital		
Yes	128	91.4
No Need	12	8.6
Had received continue education program regarding OM at hospital		
No	135	96.4
Yes	5	3.6

3.1. Knowledge results

This study evaluated the oncology nurses' level of knowledge, including knowledge about anatomy, pathology of oral care, oral care, OM (definition, assessment, scoring, and treatment), and patient education and advice. The results showed that the participants' score was low; that is, the mean was 19.5 (*SD* = 3.10). Sixty-eight participants (3 with a diploma and 65 with a bachelor degree) had a satisfactory level of knowledge, whereas 40.7% ($n = 57$) of the participants (7 with a diploma and 50 with a bachelor degree) had an unsatisfactory level of knowledge. Six participants had an excellent level of knowledge.

A high percentage of participants had poor knowledge regarding pathology (64.3%); OM definition, assessment scoring, and treatment (71.4%); and patient education and advice (69.3%). Table 2 presents these results in detail.

Nurses' knowledge according to their academic qualification was also evaluated. Further analysis was performed through ANOVA. A statistically significant difference existed between groups (diploma, bachelor, and postgraduate) as determined by one-way ANOVA ($F = 2.46$, $P = 0.001$). Nurses with a postgraduate degree had a higher level of knowledge ($P = 0.02$) than that of nurses with a bachelor degree ($P = 0.035$) and nurses with a diploma degree ($P = 0.045$). No significant difference was observed between the male and female nurses ($F = 1.10$, $P = 0.450$). No significant difference was observed in the knowledge score among the job titles ($F = 1.80$, $P = 0.51$). Table 3 presents the distribution of the knowledge score in accordance with the participants' qualifications and represents the ANOVA results.

3.2. Observation of skill performance

Twenty nurses were observed in this phase, and the results showed that the mean score of the skill performance was 25.60 (*SD* = 3.81). A large percentage of the participants (60%) committed mistakes in performing an oral assessment, such as using improper

Table 2
Results of knowledge test sub-items ($n = 140$).

Test Sub-items	Correct answer [n (%)]	Wrong answer [n (%)]
Anatomy	65 (46.5)	75 (53.5)
Pathology	50 (35.7)	90 (64.3)
Oral care	78 (55.7)	62 (44.3)
OM (definition, assessment, scoring and treatment)	40 (28.6)	100 (71.4)
Patient education and advice	43 (30.7)	97 (69.3)

Table 3
Oncology nurse' level of knowledge and demographic variables ($n = 140$).

Category	Knowledge Score (*Mean* ± *SD*)	*F*	*P*
Level of academic qualification			
Diploma degree	14.50 ± 3.60	2.20	<0.05
Bachelor degree	19.70 ± 2.10		
Postgraduate degree	24.10 ± 0.80		
Gender			
Male	19.80 ± 1.81	1.20	0.450
Female	19.30 ± 1.51		
Job title			
Practical Nurse	14.50 ± 3.60	2.10	0.510
Registered Nurse	19.70 ± 2.10		
In Charge Nurse	20.10 ± 0.50		
Unit Manager	24.10 ± 0.80		

Table 5
Oncology nurse' skills performance and demographic variables ($n = 20$).

Category	Skills performance score (*Mean* ± *SD*)	*F*	*P*
Level of academic qualification			
Diploma degree	18.50 ± 4.58	3.15	<0.05
Bachelor degree	26.50 ± 3.18		
Postgraduate degree	28.50 ± 0.65		
Gender			
Male	29.20 ± 2.10	1.35	0.350
Female	27.10 ± 1.80		
Job title			
Practical Nurse	18.50 ± 4.58	3.10	0.550
Registered Nurse	26.50 ± 3.18		
In Charge Nurse	27.50 ± 0.10		
Unit Manager	28.50 ± 0.65		

equipment and incorrect anatomical location of inspection. The majority of them (18, 90%) did not use a valid and reliable assessment instrument, which is easily interpreted. Our results showed that 16 (70%) nurses did not assess the risk factors among the patients; 14 (70%) did not check previous oral status before an oral assessment was facilitated; 16 (70%) of the participants did not offer lip balm or petroleum jelly, 14 (70%) did not use high-fluoride toothpaste/foam/gel/tray; and 13 (65%) did not use 0.9% sodium chloride/salt water rinse.

Patient education and counseling were inadequate and brief. For example, the nurses did not cover advice related to plaque reduction and early nutritional intervention, including dietician support to detect possible malnutrition before therapy began; consider oral rinses, such as caphosol, benzydamine, and mucosal protectants/barrier rinses licensed to use as a preventative measure and reduce pain; and report of swallowing problems, malnutrition, and weight loss. Table 4 presents the mean and standard deviation of the observation checklist subscales.

Nurses' skill performance based on their academic qualification, gender, and job title was also evaluated. Further analysis was performed through ANOVA. A statistically significant difference between groups (diploma, bachelor, and postgraduate) was determined by one-way ANOVA ($F = 3.08$, $P = 0.001$). Nurses with a postgraduate degree had a higher score of skill performance ($P = 0.018$) than those of nurses with a bachelor degree ($P = 0.031$) and nurses with a diploma degree ($P = 0.025$). No significant difference existed between male and female nurses ($F = 1.09$, $P = 0.35$). The skill performance score did not significantly differ among job titles ($F = 1.90$, $P = 0.55$). Table 5 shows these results in detail.

4. Discussion

This study was conducted to evaluate oncology nurses' level of knowledge and skills in OM and oral care provided to patients with cancer. Gaps in nurses' knowledge and skills regarding OM and oral care assessment, management, advice, and recording were identified. The results showed that a large percentage of participants (68, 48.5%) had a satisfactory level of knowledge, whereas 57 (40.7%) had an unsatisfactory level of knowledge. A high percentage had poor knowledge regarding OM pathology (64.3%); OM definition, assessment, scoring, and treatment (71.4%); and patient education and advice (69.3%). These results were supportive of previous studies. The findings indicated that nurses have inadequate knowledge regarding oral health and OM assessment and management, leading to inadequate oral care of patients with cancer [11].

Table 4
Mean and Standard deviation of the observations checklist's subscales ($n = 20$).

Observations checklist's subscales	*Mean* ± *SD*
Check oral history of oral status before the assessment (3 items)	1.50 ± 0.90
Follow a standard protocol in assessing oral cavity (12 items)	8.50 ± 1.20
Assisting the patients in performing oral hygiene (23 items)	15.50 ± 2.40
Consult and Advice the patient for oral care (3 items)	1.00 ± 0.70
Document the finding in nursing progress report (3 items)	1.50 ± 0.60

In this study, the nurses showed a knowledge deficit, particularly in pathology; OM definition, assessment, scoring, and treatment; and patient education and advice. These results contributed important knowledge to previous studies that showed that nurses have deficient knowledge mainly regarding signs and symptoms and cleaning solutions [21]. This lack of knowledge can be related to inadequate training during their undergraduate study and lack of continuing education post-graduation at their medical institutions. Previous studies indicated that nurses can determine simple oral problems; however, they cannot diagnose or manage severe conditions, such as OM and xerostomia [11,22]. The results of the current study and previous studies highlighted the importance of incorporating OM assessment and management into nursing curricula or adding these issues to nursing procedures. Furthermore, our results showed that 91.4% of the participants stated that they desired to attend continuing education programs regarding OM, and 96.4% of the participants received no continuing education during their career. These percentages were higher than the percentages reported in previous studies, which showed that 79.1% of the participants did not attend any continuing education, and 81% expressed a need for regular training and education about oral care and OM [11,23].

Moreover, 69.3% of the participants from the current study provided poor advice to patients regarding oral care and management. These findings supported previous results obtained by Araújo [24]. Their findings indicated that 78.9% of staff nurses were unfamiliar with self-care guidelines and lacked specific knowledge that should be provided to clients [24].

The results of the current study showed a statistically significant difference between groups (diploma, bachelor, and postgraduate) and level of knowledge, which support the previous study conducted in Sudan [25]. Their results showed that nurses with a diploma had poorer knowledge and skills than those with a bachelor degree. In the USA, another study has revealed a positive correlation between level of education and level of knowledge regarding oral care [26]. Such difference might be related to undergraduate preparation.

The results of the current study also showed that no significant differences were found among nurses' gender, job titles, and skill performance. These findings supported the results of a current study in Thailand [27]. The majority of the participants was

registered nurses and had similar undergraduate preparation and job description. In addition, 96.4% of them did not receive a continued education program regarding OM in their hospitals.

Years of experience and level of knowledge were correlated positively with the level of performance in the current study. These results were expected because knowledgeable and experienced nurses are competent in their performance. These results supported the previous studies [28,29]. Knowledge and experience can change the behavior and practices among the nurses toward OM care and management. Improving nurses' knowledge improves their oral care for patients with OM.

The current study had some limitations, including the aspect of shadowing and the possibility of a Hawthorne effect. The participants could not behave normally when they were observed. Another potential limitations were ethical problems related to the practice of the participants in the presence of the research assistant. The purpose and methods of the study were explained to the participants prior to obtaining their agreement to participate and thus overcome these limitations. Confidentiality and trust were assured.

5. Conclusion

To the author's knowledge, this study is the first one conducted in Jordan to assess oncology nurses' knowledge and skills regarding oral care and OM among patients with cancer. The results show insufficient levels of knowledge and limited skills regarding oral care and OM assessment and management. The lack of continuing education and training is identified as the main reason for these results. The current results highlight the importance of continuing education and training for oncology nurses about the use of a standard protocol for OM assessment and care. Incorporating OM assessment and care in nursing curricula is also recommended. Further research with a larger sample size is recommended to better generalize the results. These results suggest the need for an effective structured training program about OM.

Ethical compliance

Institutional Review Board approval was obtained. Permissions from the participants were obtained.

Conflicts of interest

The author declares no conflict of interest.

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Appendix A. Supplementary data

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References

[1] Abdel-Razeq H, Attiga F, Mansour A. Cancer care in Jordan. Hematol Oncol Stem Cell Ther 2015;8(2):64–70.
[2] Coolbrandt A, Wildiers H, Aertgeerts B, de Casterlé BD, van Achterberg T, Milisen K. Systematic development of CHEMO-SUPPORT, a nursing intervention to support adult patients with cancer in dealing with chemotherapy-related symptoms at home. BMC Nurs 2018;17(1):28.
[3] Southern H. Oral care in cancer nursing: nurses' knowledge and education. J Adv Nurs 2007;57(6):631–8.
[4] Tranmer R, Boyd L, Johnson T, Howlett B, Bowen D, Peterson T. *National survey of* oncology members' knowledge, education and patient management regarding oral care in *cancer therapy*. Health Interprofessional Pract 2013;2(1):6.
[5] Suminski JA, Inglehart MR, Munz SM, Van Poznak CH, Taichman LS. Oral care: exploring education, attitudes, and behaviors among nurses caring for patients with breast cancer. Clin J Oncol Nurs 2017;21(3):371–8.
[6] Kanagalingam J, Wahid MIA, Lin JC, Cupino NA, Liu E, Kang JH, etal. Patient and oncologist perceptions regarding symptoms and impact on quality-of-life of oral mucositis in cancer treatment: results from the Awareness Drives Oral Mucositis PercepTion (ADOPT) study. Support Care Canc 2018;26(7):2191–200.
[7] Al Ibraheemi AA, Shamoun S. Incidence and risk factors of oral mucositis in patients with breast cancer who receiving chemotherapy in Al-Bashir hospital. Int J Hematol Oncol Stem Cell Res 2016;10(4):217.
[8] Chaveli-López B, Bagán-Sebastián JV. Treatment of oral mucositis due to chemotherapy. J Clin Exp Dent 2016;8(2):e201.
[9] Worthington HV, Clarkson JE, Eden TO. Interventions for preventing oral mucositis for patients with cancer receiving treatment. Cochrane Database Syst Rev 2007;17(4):CD000978.
[10] Potting CMJ. Oral mucositis: a nurse's perspective. 2008. Nijmegen: UB Nijmegen [Host].
[11] Pai RR, Ongole R. Nurses' knowledge and education about oral care of cancer patients undergoing chemotherapy and radiation therapy. Indian J Palliat Care 2015;21(2):225.
[12] Perry AD, Iida H, Patton LL, Wilder RS. Knowledge, perceived ability and practice behaviors regarding oral health among pediatric hematology and oncology nurses. Am Dent Hygienists' Assoc 2015;89(4):219–28.
[13] Feider LL, Mitchell P, Bridges E. Oral care practices for orally intubated critically ill adults. Am J Crit Care 2010;19(2):175–83.
[14] Rello J, Koulenti D, Blot S, Sierra R, Diaz E, De Waele JJ, Rodriguez A. Oral care practices in intensive care units: a survey of 59 European ICUs. Intensive Care Med 2007;33(6):1066–70.
[15] Soh KL, Soh KG, Japar S, Raman RA, Davidson PM. A cross-sectional study on nurses' oral care practice for mechanically ventilated patients in Malaysia. J Clin Nurs 2011;20(5-6):733–42.
[16] Sung L, Robinson P, Treister N, Baggott T, Gibson P, Tissing W, etal. Guideline for the prevention of oral and oropharyngeal mucositis in children receiving treatment for cancer or undergoing haematopoietic stem cell transplantation. BMJ Support Palliat Care 2015. bmjspcare-2014-000804.
[17] Faul F, Erdfelder E, Lang AG, Buchner AG. * Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods 2007;39(2):175–91.
[18] Newton S, Hickey M, Brant J. Mosby's oncology nursing advisor E-book: a comprehensive Guide to clinical practice. Elsevier Health Sciences; 2016.
[19] EOCC. EOCiCG, european oral care in cancer group oral care guidance and support. Athena; 2018.
[20] Grove SK, Burns N, Gray J. *The practice of nursing research: appraisal, synthesis, and generation of evidence* 2012: Elsevier Health Sciences.
[21] Fotedar V, FOtedar S, Gupta M, Manchanda K, SharMa M. Oral cancer knowledge, attitudes and practices: a survey of undergraduate medical students in Himachal Pradesh, India. J Clin Diagn Res 2015;9(8):XC05.
[22] Hollaar V, Cvd MW, Gvd P, Rood B, Elvers H. Nursing staff's knowledge about and skills in providing oral hygiene care for patients with neurological disorders. J Oral Hyg Health 2015;3. 2332-0702.
[23] Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. J Adv Nurs 1996;24(3):552–60.
[24] Araújo SN, Luz MH, da Silva GR, Andrade EM, Nunes LC, Moura RO. Cancer patients with oral mucositis: challenges for nursing care. Rev Latino-Am Enferm 2015;23(2):267–74.
[25] Ibrahim SM, Mudawi AM, Omer O. Nurses' knowledge, attitude and practice of oral care for intensive care unit patients. Open J Stomatol 2015;5(7):179.
[26] Grap MJ, Munro CL, Ashtiani B, Bryant S. Oral care interventions in critical care: frequency and documentation. Am J Crit Care 2003;12(2):113–8.
[27] Sinavarat P, Manosoontorn S, Anunmana C. Knowledge, attitudes, and behavior towards oral health among a group of staff caring for elderly people in long-term care facilities in Bangkok, Thailand. Mahidol Dent J 2018;38(1):23–38.
[28] Lin YS, Chang JC, Chang TH, Lou MF. Critical care nurses' knowledge, attitudes and practices of oral care for patients with oral endotracheal intubation: a questionnaire survey. J Clin Nurs 2011;20(21-22):3204–14.
[29] Labeau S, Vandijck D, Rello J, Adam S, Rosa A, Wenisch C, Dimopoulos G. Evidence-based guidelines for the prevention of ventilator-associated pneumonia: results of a knowledge test among European intensive care nurses. J Hosp Infect 2008;70(2):180–5.