Review Articles

The Importance of Oral Mucositis Scoring Tools among Children with Cancer: Review of Literature

Arwa Assaf,[1]

Abstract

Background: In studies that investigate oral mucositis (OM) among children, several scoring tools have been used for different purposes, and adult tools have been tested and validated in pediatric settings. Nurses are challenged to choose the most appropriate assessment tool that accurately reflects OM in children and is easy to use in the clinical setting.

Objective: To review the literature related to OM among children, specifically, to identify an assessment tool that may be appropriate to use in children and to highlight the scoring tools that pediatric oncology nurses can use in daily practice.

Data Sources: The PubMed and EBSCO databases, with a publication range from the years 2000 to 2010, were searched for studies published regarding OM in children with cancer.

Data Synthesis: Several oral mucositis scoring tools have been created for adults; however, a lack of pediatric OM scoring tools was noticed.

Conclusion: To date standard practices for OM assessment that particularly focus on the special aspects in children do not exist. However, there is a new pediatric OM scoring tool, the Children Oral Mucositis Assessment Scale (ChIMES) and other valid tools which can be used in the pediatric setting, such as the Oral Mucositis Daily Questionnaire, the Oral Mucositis Assessment Scale (OMAS), and the Oral Assessment Guide (OAG).

The implication for nursing is that nurses have to evaluate the oral cavity as a routine nursing practice by a valid and appropriate scoring tool. The performance of an effective assessment requires skillful and trained nurses who are knowledgeable about the anatomical changes of the oral cavity, patient's risk factors and the circumstances that predispose OM. Moreover, the standard criteria for an oral assessment are needed.

Keywords: Oral mucositis, children, cancer, assessment tool, scoring, scale, measurement

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The goal of this literature review is to improve nurses' knowledge on the topic of oral mucositis, the anatomical changes, risk factors and scoring tools for assessing children suffering from oral mucositis.

Oral mucositis (OM) is one of challenging symptoms facing pediatric oncology nurses. OM is a common and serious side effect of cancer treatment. [1, 2] In childhood cancer cases, mucositis is more observed and poorly documented. It varies among investigators with

1. King Hussein Cancer Center, Amman, Jordan.
**** Correspondence should be addressed to:***
Arwa Assaf

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a range of 35% - 70%. [3-6] OM was frequently reported as one of the painful and distressing experiences to children with cancer. OM is defined as mucosal damage that results from the direct and indirect toxic effect of chemotherapy and radiation; it is characterized by a thinning out of the oral tissue, atrophy, erythema, ulcerative lesions and severe pain. [2, 7]

The process of OM develops from an interaction between the oral environment and various mucosal components. [1] The epithelium, extracellular matrix and blood vessels are affected and injured which provides an entry way for colonized organisms to invade the whole body producing a systemic infection or sepsis. [8]

Mucositis commonly causes severe pain and discomfort that can affect the oral intake as well as the child's ability to communicate and sleep, [9] and, therefore, a significant impairment in a child's quality of life. OM affects the progression of the treatment regimen and utilization of health care services. According to Kwong, 27% of patients with OM require hospitalization due to pain management and for nutritional support [10] which influences the effectiveness and cost of the whole treatment for cancer.

In order to have effective management, nurses must consider an assessment of the oral cavity as one of the daily routine practices. The oral cavity must be constantly assessed before and during chemotherapy. Assessment includes lips, mucosal membrane, tongue, saliva and teeth.[11] The assessment of OM is affected by the child, the scoring tool and the evaluator. A skillful evaluator knows that children need an extra effort and the appropriate communication skill in addition to deeply understanding the painful experience of OM in order to enhance the child's cooperation with the evaluator. Using simple instruments, quick and easy to use in almost all children can be appropriate. [12] In addition, the assessment and scoring criteria tend to be easy to use in daily nursing practice for both nurses and children. [13] Both subjective and objective data are essential to document the overall score of mucositis. For children, it's believed that the functional aspect of mucositis such as swallowing and chewing is better to assess from a child's perspective. [12]

Barriers to routine assessment practices include gaps in the staff's basic knowledge, inadequate training and insufficient skills, inconstant and periodic oral cavity evaluation in addition to the lack of documentation criteria and absence of oral health care policies that guide assessment practice.

Although there are several scoring tools for OM cited in the literature, a limited or adopted version of the adult scale is used in studies that investigate OM in children. This review of literature aims to summarize the oral mucositis risk factors in addition to identifying the available oral mucositis scoring tools and their applicability to pediatric patients.

There are many theories that can be used to guide the development of this paper, and by focusing on the roles of nurses, OM is considered as a problem that patients face which needs organized nursing care; thus the twenty-one nursing problem theory can be used.

Literature Review

A literature search was conducted of the Pub-Med and EBSCO databases using the terms oral mucositis, children, assessment, scoring, tools, and cancer. A total of 41 studies investigating mucositis in children were found. There were only five studies for etiology and risk factors in children and five articles that described oral mucositis assessment tools for use in children with cancer.

Information provided in the review could facilitate nursing care for children who suffer mucositis and provide knowledge to help pediatric oncology nurses in the selection of a scoring tool to integrate with effective practices. The scoring tools that will be highlighted in this review were chosen for two reasons. First, the validity and reliability of these tools were examined in a child population. Second, the scales that were the most frequently used in

interventional studies to investigate mucositis among children may be the most appropriate tools for use in daily practices.

Significance

OM is described as one of the most common distressing symptoms reported by pediatric oncology nurses. The Nurses' Distress and Interventions for Symptoms Survey (NDISS) results concerning the presence of symptoms reported that mouth sores were presented by 82% as one of the most common distressing symptoms that face 401 pediatric nurses. Also, evident from this study was the use of mouth care/hygiene as the first nursing intervention.[14] This is consistent with another study that focused on symptom management that said oral mucositis was found to be one of the seven most common symptoms experienced by children with cancer.[15]

OM is a source of extra morbidity which has increased health care costs and affected a patient's quality of life. [1] In addition to the pain and discomfort, mucositis can result in under-nutrition and an increased risk of systemic infection or sepsis. [16] OM has had a complex bio-psychosocial impact on children's lives and *their* families too. [17, 18] The dilemma of eating and the experience of negative emotion in addition to the physical impairment make OM a challenging situation for both nurses and families. Eventually, children need effective measures to decrease or relieve mucositis as well as psychological support from health care professionals. [17]

Pathophysiology

OM is a change in the mucosal membrane of the oral cavity, secondary to cancer therapy. Visible signs of atrophy, erythema, ulcerative lesions and severe pain can be observed 3-21 days following therapy. [2, 7] OM develops from the interaction between various mucosal components and the oral environment including the epithelium and extracellular matrix.[1] OM has five phases: initiation, up-regulation and message generation, amplification and signaling, ulceration and healing. Initiation of Oxidative Stress and Reactive Oxygen Species (ROS) by chemotherapy or radiation causes direct injury of the cells, tissue and blood vessels. The generation of messengers that lead to the apoptosis of sub-mucosal and basal epithelial cells, signal amplification, and a prolonged tissue injury with biological alteration needs regulation even though it may appear a normal ulceration with inflammation, due to the invasion of the colonized organism into the sub mucosa, finally healing with a start from a signal from the extracellular matrix. This leads to a renewal of epithelia proliferation and differentiation and reestablishment of the local microbial flora. [1, 19] Fungal organisms have been the most common isolates from oral mucosal lesions followed by bacterial while ulcers were the most common presentation (70%). [16] The course of change of the oral mucosal membrane taken from the first day up to the twentieth day after starting chemotherapy [7] and the signs and symptoms can be identified five to seven days after chemotherapy. [20]

Risk Factor

The risk factors for developing mucositis are vague (some factors including tumors, the anti-neoplastic agent, the radiation source, treatment dosage, treatment schedule, combination of treatment, duration of exposure to drug and systemic clearance of drug during treatment as well as genetic factors). Almost half of the patients (46%) who were treated for OM were diagnosed with acute lymphoblastic leukemia.[5] According to the anti-neoplastic agent, the risk of developing OM increased with certain drugs, where the **anti-metabolites** agents were the most frequently associated with oral mucositis. [21-23] A study of 241 children reported that the alkalizing agent mainly Busulfan had the highest prevalence of mucositis with 63.5% [24] while Cytarabine had the most toxic effect. [7, 25] High MTX plasma levels, concentrations and the cycle number of MTX were suggested to be risks for mucositis. [26-28]

Although the type of chemotherapy regimen was thought to be the only factor independently associated with the risk of oral mucositis, there

were studies suggesting that a genetic factor could explain the differences in individuals' susceptibility for developing OM within the same groups of patients under the same regimen. Three lines of evidence support the genetic hypothesis [1] which explains how metabolic enzyme defects, anti-apoptotic gene levels and DNA-repair mechanisms can influence the development of OM. Another study of 641 patients (395 boys and 246 girls) which demonstrated an association between ABO blood group and mucositis patients treated by standard chemotherapy with blood group O showed those patients were at higher risk of developing OM. [23]

Association Condition

OM in children was associated with neutropenia and nausea/vomiting. Neutropenic children experienced a higher incidence of mucositis [16, 21] and a low body weight prior to chemotherapy which posed a risk. [21] Oral ulcers were associated with herpes simplex virus (HSV) [29] and was linked with an extended mucositis period and resulted in a poorer response to the initial therapy. [30] For patients who were treated with radiotherapy, the severity of OM depended on the type of radiation fractionation schedule, total cumulative dose and irradiated tissue volume. [31] Altered/ hyper fractionation radiotherapy (RT-AF) patients experienced severe mucositis compared to patients who received conventional radiotherapy. [32, 33]

Assessment Criteria

Assessment of the oral cavity is the most critical and important step in improving the management of mucositis. The oral cavity must be constantly assessed before and during chemotherapy. Assessment includes lips, mucosal membrane, tongue, saliva and teeth.[11] Recently, teeth, lips, and saliva have shown no direct relation with the severity of mucositis. [34] The frequency of assessment varied from daily by pediatric dentists [35] to once weekly. [36] Other researchers have suggested the evaluation of the oral cavity during each nurses' shift.[37] Conceding that new ulcers could appear or heal within a week, evaluation of the oral cavity should be done two times weekly. [38-40]

Assessment has three aspects: the child, the scoring tool, and the evaluator. To assess mucositis in a pediatric patient is difficult because most likely the pain will affect the cooperation of the child with the evaluator. Oral assessment in children, therefore, needs an extra effort and the appropriate communication skills in addition to the deep understanding of the painful experience of OM. Thus simple instruments are needed to quickly and easily use in almost all children. [41]

The importance of the evaluator's skills in scoring OM has taken on more significance than before when it was believed the difference in studies was surely due to the interventions under study and not the evaluators. Stokman conducted clinical trials on 65 trainers. The study showed that training evaluators had a significant positive influence on scoring oral mucositis. He emphasized on didactic training that comprised a review of the pathophysiology of mucositis and the scoring method. [42] Training was needed even though the assessment and scoring criteria tended to be easy to use in daily nursing practices for both nurses and children. [43]

Assessment Tools

Several scales were available to assess mucositis but they were limited or an adopted version of an adult scale to use in studies that investigate this problem in children. The scales were mainly three types. The first type was the functional scale which examined what a patient could do or could not do such as a WHO scale. The second was the objective scale that depended on what the examiner could observe such as OMAS and the third type contained the subjective, objective and functional data. [34] Some institutions have developed their own criteria for mucositis scoring and assessment while others have tried to validate the existing tools. The Nijmegen Medical Center in the Netherlands achieved reliability and validity of their scale (NNMSS) . [43]

Four instruments have been evaluated in terms of the psychometric properties for its applicability in a pediatric population. These instruments are the OAG, OMAS, OMDQ and ChIMES.

The validation of the Oral Assessment Guide (OAG) for a pediatric patient was done by two researchers [44, 45] and the validation of the Oral Mucositis Assessment Scale (OMAS) was done by Sung and both have proved to be predictive and accurate for mucositis in children. Objective items were included which focused on visible mouth lesions that were associated with oral mucositis and scored lips, cheeks, tongue, mouth floor, soft palate and hard palate. The score estimated the presence of the ulcer size (score 0-3; 0 = no lesion; 1 = lesion <1 cm; 2 = lesion 1-3 cm and 3 = lesion >3 cm) and erythema (score 0-2; 0 = non; 1= not sever; 2 = sever [47)] while in fact, lips, tongue, teeth and saliva were not typically associated with mucositis, so it may have led to a false score of OM. [34] Sung also found the OMAS to display construct validity in 16 children of at least six years of age. Although the OMAS scale has been used, the problem regarding the assessment that required an observation of the whole oral cavity was that the child was incapable of opening his/her mouth during painful events.

The second instrument was the oral assessment guide (OAG) which was used to describe the pattern of mucositis in several studies designed to objectively assess the physiological changes of the oral cavity. OAG, an oral mucositis scale designed by Eilers in 1988, was used in pediatric studies with a slight modification. The OAG contained eight categories: voice, swallow, lips, tongue, saliva, mucous membrane, gingiva and teeth. The items were assessed and given a score of 1 (normal) to 3 (sever mucositis). Thus the total score on the OAG ranged from 8 (normal) to 24 (sever lesions of oral cavity). The OAG items were modified to reflect the actual score of mucositis, so the category of teeth was omitted from the scale and other sites of the effected mucosal membrane were added such as buccal, palate and labial mucosa. The modified scale was tested for construct validity by experts and inter-rater reliability.

The content validity of the OAG in children was established by Gibson in 2006. The study revised the use of OAG in children and young people who received chemotherapy and radiotherapy. [45] The author found that the OAG could be an appropriate and reliable oral assessment instrument for children if it specified all types of alteration in the mucosal membrane. The study was concerned with the fact that the lips, tongue, teeth and saliva were not typically associated with mucositis, so it may lead to a false score of OM.[34]

Furthermore, the OAG was used in many clinical research studies that focused on oral care. [7, 38, 48] Cheng in 2004 examined the efficacy of two oral care protocols using different types of mouthwashes, either Chlorhexidine or Benzydamine, in patients with childhood cancer. [40] The sample in the study consisted of 34 children who were receiving high doses or combination chemotherapy for hematological and solid tumors and the status of the oral cavity was assessed using OAG. The authors found that patients who used Benzydamine had a higher OAG score for mucositis than Chlorhexidine. However, the clinical benefit of the study may be due to the use of Chlorhexidine or simply the effect of frequent and consistence use of oral care. Moreover, children less than 6 years old may not be able to perform oral care daily. Also, another study examined the efficacy of an oral hygiene regimen among 30 children ranging in age from 2-17 who received chemotherapy. The status of the oral cavity was assessed using OAG to measure the difference between pre- and post-oral hygiene care regimen. [44] Tewogbade investigated the pediatric oncology nurses' skills in diagnosing mucositis and other oral complications. The OAG was used and found to be applicable and simple with a limited number of items. It required about five minutes to complete. [37]

The symptom of mucositis includes subjective terms such as pain, which were not included in the OAG scale and OMAS. Pain is one of the symptoms present in mucositis and the symptom that is experienced the most by children. [17]An interview and oral examination was used to assess the oral complications for 150 pediatric patients receiving chemotherapy. The results indicated that oral pain and dry mouth were the most frequent patients' complain.[22] Pain was often

so severe that it affected the oral intake as well as the child's ability to communicate and sleep. It was believed that children preferred not to eat during OM even if they felt very hungry. [49]

To measure the pain intensity during mucositis events, the OAG and OMAS scale were used in combination with other assessment tools, such as a visual analogue scale and FACE scale in addition to the objective findings to reflect an accurate score of the severity of oral mucositis. Cheng in 2001 evaluated pain associated with oral mucositis after cancer treatment by using the FACE scale. The study results revealed that the intensity of pain was significantly correlated with the score of mucositis. [7]

The lack of a patient-reported assessment scale, which attempted to measure the subjective symptoms associated with mucositis from a patient's perspective like pain and difficulty swallowing led to the adoption of the Oral Mucositis Daily Questionnaire (OMDQ). Tomlinson evaluated the psychometric properties of the third instrument and examined the understandability and acceptability of the OMDQ among twelve pediatric oncologic and hematologic patients. The study results reflected a need for minor changes to be done to this scale.[12]

Assessment tools for children have been investigated in recent years, particularly by Tominson and colleagues. They pioneered the development of the fourth scale reviewed in this paper. Children Oral Mucositis assessment scale (ChIMES) was designed to measure the symptom of mucositis including subjective terms such as mouth sore, pain and the effect of OM on children's functions such as swallowing and eating. This grading system has been validated in the setting of chemotherapy-related mucositis but not for radiotherapy. The documented reliability and clinical sensitivity of such tools could significantly improve the accuracy of OM reporting as well as assist in the development of mucositis interventions. As with adults receiving radiotherapy, there is a need for the feasibility and validity in pediatric population. [12]

Regardless of the number and variety of scales that have been developed, it's worthy to modify the existing tools, particularly to combine the three dimensions of mucositis scoring. [50] In addition, it is useful to consider other factors that reflect the special nature of children including attention, cooperation, space, etc.

Conclusion

Oral mucositis is a common and serious complication of cancer therapy. There aer a limited number of studies focused on the pediatric population. Most of these studies don't provide evidence of a particular scoring tool to be used in children and limited evidence to support specific tools that may be used in clinical nursing practice; therefore, there is need for further work to modify and validate the adopted adult scales to emphasize children's nature such as add pictures to reflect the degree of mucositis and its effect on children's physical and psychological status.

A promising assessment tool for the testing and usage on pediatric patients must address the mucositis problem from a child and family perspective and hopefully this may help nurses in an accurate assessment.

Implication

Nurses have to evaluate the oral cavity as a routine nursing practice by veiled and appropriate scoring tools. Performing an effective assessment needs skillful and trained nurses who have the knowledge of the anatomical changes of oral cavity, the patient's risk factor and the circumstances that predispose oral mucositis. Moreover, the standard criteria for oral assessment are needed.

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أهمية أدوات التقييم المناسبة للتعرف على التهاب الغشاء المخاطي الفموي (OM) بين الأطفال المصابين بالسرطان: مراجعة أدبية

أروى عساف

مركز الحسين للسرطان، عمان، الأردن

الملخص

تم استخدام العديد من أدوات القياس لأهداف مختلفة في الدراسات التي تعنى بالتهاب الغشاء المخاطي الفموي (OM) بين الأطفال،كما تم اختبار أدوات قياس البالغين والتحقق من صحتها عند استخدامها مع الأطفال. يواجه الممرضون تحدي اختيار أداة التقييم الأنسب والتي تعكس بدقة التهاب الغشاء المخاطي الفموي OM بين الأطفال وتكون سهلة الاستخدام عند التطبيق السريري.

الأهداف: مراجعة الأدبيات ذات الصلة بالتهاب الغشاء المخاطي الفموي OM بين الأطفال، وعلى وجه التحديد، التعرف إلى أداة التقييم المناسبة للأطفال وتسليط الضوء على أدوات التقييم التي من الممكن أن يستخدمها ممرضو أورام الأطفال السرطانية في الممارسة اليومية.

مصادر البيانات: تم البحث في منشورات قواعد البيانات PubMed وEBSCO، خلال الفترة الزمنية 2000 – 2010 ، في ما يتعلق بالتهاب الغشاء المخاطي الفموي OM في الأطفال المصابين بالسرطان.

تأليف البيانات: تم العثور على العديد من أدوات قياس التهاب الغشاء المخاطي الفموي (OM) بين البالغين، ولكن لوحظ وجود ندرة في أدوات قياس التهاب الغشاء المخاطي الفموي(OM) بين الأطفال.

الخلاصة: حتى هذا التاريخ، لا توجد ممارسات قياسية لتقييم التهاب الغشاء المخاطي الفموي (OM) تركز بشكل خاص على الأطفال. ومع ذلك، يوجد هناك أدوات جديدة لقياس التهاب الغشاء المخاطي الفموي (OM) بين الأطفال مثل أداة تقييم التهاب الغشاء المخاطي الفموي بين الاطفال (ChIMES)، وغيرها من الأدوات الصالحة لقياس التهاب الغشاء المخاطي الفموي (OM) بين الأطفال مثل الاستبانة اليومية لالتهاب الغشاء المخاطي الفموي، ومقياس تقييم التهاب الغشاء المخاطي الفموي (OMAS)، و دليل التقييم الفموي (OAG).

تطبيقات للتمريض: يجب على الممرضين تقييم تجويف الفم باعتباره ممارسة روتينية باستخدام أداة القياس المناسبة. يتطلب أداء تقييم فعال من ممرضين ذوي مهارة وتدريب، وعلى معرفة ودراية بالتغيرات التشريحية للتجويف الفموي، والعوامل التي تزيد خطر التهاب الغشاء المخاطي الفموي (OM) للمريض، والظروف التي تهيئ حدوث التهاب الغشاء المخاطي الفموي OM. وعلاوة على ذلك، هناك حاجة إلى معايير موحدة للتقييم الفموي.

الكلمات الدالة: التهاب الغشاء المخاطي الفموي، الأطفال، السرطان، أدوات التقييم، مقياس، القياس.