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Assessment of oral health problems and oral hygiene practices among palliative care patients using a new tool: A pilot study

Abstract

Introduction: This research paper is a cross-sectional study that aims to estimate the prevalence of oral health problems among adult patients in palliative care, as well as to investigate the oral hygiene practices of palliative care patients in Brunei Darussalam.

Patients and methods: In this study, the Oral Palliative Care and Assessment and Referral tool (OPCAR) along with a 15-item questionnaire were utilized as reliable tools for measurements. All palliative care patients who had been assessed in this study were invited to participate. A total of 90 palliative care patients were invited to participate and 73 patient data were used for the subsequent data analysis.

Results: The three most common problems among palliative care patients were saliva, lips, and teeth category. Fisher's exact test identified there were significantly higher teeth-related problems (teeth caries, fracture, broken root stumps) in non-denture wearing patients as compared with denture wearing patients. However, other associations between denture wearing to oral hygiene was of little significance.

Conclusions: Using the normal approximation sample method, it was revealed that almost all the participants were eligible to be referred to the dental clinic for at least one oral problem.

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Key words: oral assessment, prevalence, dental problems, dental hygiene, denture

Introduction

The basic principles of palliative care originate from a modality of care directed at individuals in the initial

stages of the progressive, advanced and incurable disease [1]. Palliative care in Brunei is a relatively new speciality that started in 2009 [2]. The primary focus of this speciality service is to relieve pain and control

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symptoms and to improve the quality of care for patients and their families, especially those suffering from advanced-stage cancer or other life-limiting illnesses. It is holistic, patient-centred, comprehensive, and multidimensional so that it addresses not only the physical aspect, but also the psychological, social, and spiritual dimensions [2]. Thus, this field includes palliative care dentistry, which has been defined as the study and management of palliative care patients whose oral cavity has been compromised either by the disease directly or by its treatment [3]. Dental care is often overlooked in palliative care due to the omission of the dentist as a member of the palliative care team [3, 4]. Despite this, oral health problems remain highly prevalent in palliative care patients and can have negative impacts on their quality of life, both physically and emotionally. Common oral problems include dry mouth, oral lesions, infections, bad breath, changes in taste, and drooling [3, 4]. Oral problems and damage may be temporary or permanent resulting in a significant health burden for the individual. If not managed properly it may affect a patient's self-esteem, ability to communicate properly, ability to socialize, ability to enjoy food and drinks, comfort, and even pain [5, 6]. The correct and consistent approach to managing multiple oral care problems that can arise remains a challenge [7]. There is much evidence to show that many clinical settings, rather than taking a proactive approach to this aspect of care, still simply react to oral complications once they occur with a sometimes inconsistent and anecdotal approach [7,8]. In addition, routine dental assessments may identify the dental disease and facilitate dental interventions for caries, periodontal disease, oral mucosal problems, and prosthetic needs [9].

Careful dental assessment and early intervention are vital to optimize patient comfort and prevent more serious problems and future complications. Lack of oral health leaves individuals highly prone to accumulation of oral pathogens, inflammation, and infection that can spread to the body, this can negatively affect overall health [10]. This is especially true for already vulnerable patients in palliative care. The need to screen patients for oral health status is not only important for diagnosing oral disease, but also for assessing systemic disease risk. This is particularly important in older individuals, who more often develop inflammatory chronic conditions [11].

Currently, there is no standardized tool used or data on the extent of oral health problems or patients in palliative care, as well as their oral hygiene in Brunei Darussalam. As it stands, knowledge deficiencies in oral care and practices in palliative care settings may potentially inhibit the quality of life. The acquiring of

competencies and broadening of knowledge in palliative care is of great importance due to a large number of people with diseases that threaten the continuity of life and who require care that goes beyond controlling the actual symptoms of the disease. Thus, this study creates a baseline knowledge of the extent of oral health problems and their oral hygiene practices among palliative care patients in Brunei Darussalam and the use of a newly developed oral assessment tool. Additionally, this will open opportunities for further research for improving the efficacy of oral prophylaxis referrals to dental clinics by non-dental professionals. The study will provide initial insight on the extent of oral health problems and oral care practices among palliative care patients in Brunei Darussalam and help to finalise the oral health assessment tool. The study aimed to estimate the prevalence of oral health problems among adult patients in palliative care in Brunei Darussalam through a newly developed oral assessment tool. In addition, to investigate oral hygiene practices of palliative care patients in Brunei Darussalam through a 15-item questionnaire. Whilst to identify limitations with regards to the newly developed assessment tool and to suggest any changes for improvement.

Patients and methods

Study design and population selection

The research was a descriptive cross-sectional study that utilized an interviewer-administered, self-designed (OPCAR) questionnaire (this tool was developed as part of a bigger study at PAPRSB IHS). A total of 90 palliative care patients admitted under internal medicine wards in The Brunei Cancer Centre (TBCC) and Raja Isteri Pengiran Anak Hajah Saleha (RIPAS) hospitals were interviewed and assessed. The study was approved by the ethics committees of the institute and ministry of health IHSREC-MHREC (UBD/PAPRSB-IHSREC/2020/75).

The eligibility criteria to participate in this study included, palliative care patients under TBCC or RIPAS hospital, age 18 years and above, able to communicate directly or through informed and consented patient's caregiver who was aware of their dental care. Exclusion criteria were paediatric palliative care patients, disoriented or comatose patients and patients who were in the isolation unit.

Considering the small study population of palliative care patients in Brunei (less than 100), all willing eligible participants who came to the palliative clinics during the study period were approached and explained. They were given a participant information sheet (PIS) and signed informed consent before the recruitment for this study.

Research instruments and data collection procedure

The study involved using two instruments. A questionnaire and an assessment tool (Oral Palliative Care Assessment and Referral [OPCAR]). The questionnaire consisted of 1) Sociodemographic questions 2) Oral hygiene practices 3) Oral health problems. The OPCAR instrument was administered to palliative care patients with informed consent. The OPCAR assessed 10 categories: saliva, lips, teeth, tongue, oral hygiene, gums, overall appearance, dental pain, the opening of the mouth, and if the patient was a denture wearer. Once the permission from the Director-General of Medical and Health Services and approval from the joint ethics committee (IHSREC-MHREC) was obtained, the researcher and clinical supervisors (also geriatricians at palliative clinics in TBCC and RIPAS) briefed the gatekeepers (palliative nurses) regarding the study, trained them on how to administer the OPCAR tool. The clinical gatekeepers' role was also to inform the principal researcher of any updates regarding clinical conditions (whether there were any new patients which could be approached), patient's condition (e.g. if patient's condition suddenly not fit to participate in the study).

The training was provided by a qualified periodontist, who was part of the team which developed the questionnaire. The training involved explaining the contents of the OPCAR tool and questionnaire as well as answering any doubts regarding the contents. A pre-test was conducted on 3 palliative care patients and 2 palliative care nurses before main data collection to ensure that the questionnaire was understandable to the patients and nurses. Participants (or caregivers) were required to read and understand the participant information sheet and give written informed consent before the study. No participant-identifying information was collected. The data collected was stored in a password-locked computer only accessible to the researchers. Participants were free not to participate and free to withdraw at any time by informing the administering nurse or by sending an email to the researcher informing their decision to withdraw from the study. The questionnaire, forms, and data files will be destroyed and deleted after five years of completion of the study.

Statistical analysis

Descriptive statistics were used to determine the prevalence of oral health problems and oral hygiene practices among palliative care patients. Sub-group analysis such as the Chi-square test for independence and one-way ANOVA was used to determine the association between demographic factors with study

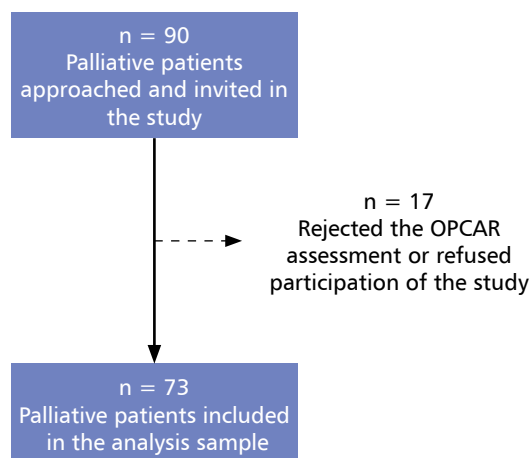


Figure 1. Flow chart depicting the selection of the study population from RIPAS and TBCC Hospital

variables, however, the results were insignificant (oral health problems and oral health practices). Cronbach's alpha and factor analysis were also conducted to determine the reliability and construct validity of the tool. A P-value of < 0.05 was considered statistically significant.

Results

Selection of study population

A total of 90 palliative care patients in the palliative care wards of RIPAS and TBCC were approached and invited to participate in the study. Based on the selection, the study omitted 17, which have either declined the OPCAR assessment or have rejected their full participation in the study. Hence, the analyses included 73 participants, ending the study with an overall response rate of 81.1% and a rejection rate of 18.9% (Insert Fig. 1).

Sample characteristics and demographics

The study included data from the done on 73 palliative care patients (Table 1), summarizing the demographic variables such as age, gender, presence of teeth, dentures and patients' tendencies such as frequency of dental visits which was categorized into does not visit, does not remember, once a year, twice a year, and more than twice a year. The mean age of the study group was 62 (range, 29–91 years old). There is a cut-off age at 60 years old, making patients younger than 60 be 37.0% and patients above 60 to be 63.0%. According to Table 1, almost all the study population had teeth (93.2%) while only 5% were reported to be edentulous. 53.0% of participants use dentures. In terms of frequency of dental visits, it is worth noting that 42.5% of patients answered they

Table 1. Sample demographics and characteristics of palliative care patients (n = 73)

| | n | % |
|-----------------------------------|----|------|
| Age | | |
| < 60 | 27 | 37.0 |
| ≥ 60 | 46 | 63.0 |
| Gender | | |
| Female | 47 | 64.4 |
| Male | 26 | 35.6 |
| Presence of Teeth | | |
| Yes | 68 | 93.2 |
| No | 5 | 6.9 |
| Use of dentures | | |
| No | 53 | 72.6 |
| Yes | 20 | 27.4 |
| Frequency of dental visits | | |
| Does not visit | 31 | 42.5 |
| Does not remember | 29 | 39.7 |
| Once a year | 7 | 9.6 |
| Twice a year | 4 | 5.5 |
| More than twice a year | 2 | 2.7 |
| Last dental visit | | |
| Does not remember | 28 | 38.4 |
| More than two years ago | 18 | 24.7 |
| One to two years ago | 10 | 13.7 |
| Does not visit | 9 | 12.3 |
| Within past year | 8 | 11.0 |

n Frequency; % Percentage

did not visit the dentist at all, while 39.7% had forgotten when their last visit was or that their visits were symptomatic oral related problems (e.g. pain) and not for check-ups. When it came to the patient’s last dental visit, the majority of patients responded with “does not remember” (38.4%). The second highest response for the last dental visit was more than two years ago (24.7%).

Association between gender and oral health problems is of very little significance from the analysis.

Oral hygiene practices of palliative care patients

The results of oral hygiene practices among 73 palliative care patients are presented in Table 2, which includes tools/cleaning agents used, frequency, duration, time of day of cleaning mouth, and brushing techniques of the patients. The most common tools used amongst the sample study were toothbrushes

followed by toothpaste use, at 91.8% and 87.7% accordingly. Upon closer inspection of the table shows a difference in the values of toothpaste use and toothbrush use. The use of mouth wash has been reported to make up approximately half (56.2%) of the palliative care patients (both denture wearers and non-denture wearers). Whereby only 41.1% of the participants who do use mouthwash use it daily.

The majority (83.6%) of respondents brushed at least two times per day and only 16.4% reported having brushed less than twice a day (Table 2). More than half (53.4%) of the respondents preferred brushing in the morning at night (twice daily) and 32.9% brushed 3 times daily brushed in the morning, afternoon and night. By far, the most brushed structure in the oral cavity among palliative care patients (both denture wearers and non-denture wearers) was the roof of the palate (71.2%) followed by the inner cheeks (68.5%), then tongue (67.1%), and lastly the alveolar ridges (56.2%). Aside from the tongue cleaning (67.1%), a minority of respondents (17.8%) indicated to have not cleaned the other 3 structures at all. In response to the brushing techniques question, the majority have used the “Up and down” and the “side to side” technique.

Oral health problems for patients

The final section of the questionnaire was concerned with the findings from the OPCAR assessment (Table 3). The 3 highest group scoring unhealthy (score = 1) in both denture wearers and non-denture wearers was found to be related to saliva (65.8%), lips (64.4%), and teeth (56.2%). The severity of teeth conditions (64.2%) was significantly higher in the group without dentures compared to the group with dentures (35.0%) (P = 0.025). It was found that 35.0% of denture wearing patients, who at the time of assessment were wearing dentures, had at least one problem in their prostheses. This may come in the form of a broken area in the prosthesis to ill-fitting dentures and redness under dentures (P < 0.001). However, the results did not differ much when it came to saliva and lips categories.

The tongue category falls just behind the teeth category at 50.7%, and with decreasing frequency, oral hygiene category (Food particles, tartar or plaque on teeth and oral tissues including any prosthetics present), Gum problems at 45.2% and 35.6% respectively. Dental pain was reported to be one of the lowest at only 20.7%. Table 4 indicates unanimous agreement that patients are eligible to be referred to the dental clinic or a dental practitioner. Whereby, 72 out of 73 patients scored at least 1 in the OPCAR assessment.

Table 2. Percentage distribution of self-reported oral hygiene practices among 73 palliative care patients (denture wearers, tools used, frequency, areas cleaned, techniques)

| | Dentures | | No | | Total | | P-value ^a |
|---|----------|-------|------|------|-------|------|----------------------|
| | Yes n | % | n | % | n | % | |
| a) Tools used | | | | | | | |
| Toothbrush | 19.0 | 95.0 | 48.0 | 90.6 | 67.0 | 91.8 | 0.538 |
| Toothpaste | 19.0 | 95.0 | 45.0 | 84.9 | 64.0 | 87.7 | 0.242 |
| Mouthwash | 13.0 | 65.0 | 28.0 | 52.8 | 41.0 | 56.2 | 0.350 |
| Floss | 5.0 | 25.0 | 11.0 | 20.8 | 16.0 | 21.9 | 0.696 |
| Interdental toothbrush | 2.0 | 10.0 | 6.0 | 11.3 | 8.0 | 11.0 | 0.872 |
| b) No. of brushing (times per day) | | | | | | | |
| 0.020 | | | | | | | |
| Less than 2 | 0.0 | 0.0 | 12.0 | 22.6 | 12.0 | 16.4 | |
| More than or equal to 2 | 20.0 | 100.0 | 41.0 | 77.4 | 61.0 | 83.6 | |
| c) No. of flossing (times per day) | | | | | | | |
| 0.063 | | | | | | | |
| Less than 2 | 16.0 | 80.0 | 50.0 | 94.3 | 66.0 | 90.4 | |
| More and equal to than 2 | 4.0 | 20.0 | 3.0 | 5.7 | 7.0 | 9.6 | |
| d) Time to brush | | | | | | | |
| 0.342 | | | | | | | |
| Morning and night | 13.0 | 65.0 | 26.0 | 49.1 | 39.0 | 53.4 | |
| Morning, afternoon and night | 7.0 | 35.0 | 17.0 | 32.1 | 24.0 | 32.9 | |
| Does not clean at all | 0.0 | 0.0 | 4.0 | 7.5 | 4.0 | 5.5 | |
| Morning only | 0.0 | 0.0 | 3.0 | 5.7 | 3.0 | 4.1 | |
| Afternoon only | 0.0 | 0.0 | 3.0 | 5.7 | 3.0 | 4.1 | |
| e) Oral hygiene (cleansing/brushing) of other oral structures in the mouth | | | | | | | |
| 0.763 | | | | | | | |
| Roof of palate | 15.0 | 75.0 | 37.0 | 69.8 | 52.0 | 71.2 | |
| Inner cheeks | 15.0 | 75.0 | 35.0 | 66.0 | 50.0 | 68.5 | |
| Alveolar | 8.0 | 40.0 | 33.0 | 62.3 | 41.0 | 56.2 | |
| Does not clean first 3 | 4.0 | 20.0 | 9.0 | 17.0 | 13.0 | 17.8 | |
| Tongue | 14.0 | 70.0 | 35.0 | 66.0 | 49.0 | 67.1 | |
| f) Brushing techniques | | | | | | | |
| 0.641 | | | | | | | |
| Up and down | 17.0 | 85.0 | 43.0 | 81.1 | 60.0 | 82.2 | |
| Side to side | 17.0 | 85.0 | 44.0 | 83.0 | 61.0 | 83.6 | |
| Circular motions | 3.0 | 15.0 | 13.0 | 24.5 | 16.0 | 21.9 | |
| not sure | 2.0 | 10.0 | 2.0 | 3.8 | 4.0 | 5.5 | |
| g) Mouth wash | | | | | | | |
| Daily use | 7.0 | 35.0 | 23.0 | 43.4 | 30.0 | 41.1 | 0.516 |

^a Fisher's exact test; n Frequency; % Percentage

Discussion

This study found that almost all palliative care patients had good oral hygiene in terms of brushing their teeth (Table 2), which was at least twice daily. This was in line with the Scottish Palliative Care Guidelines on Mouth Care (2019), which states to clean natural

teeth with fluoride toothpaste (1350 to 1500 ppm fluoride) at least twice daily if tolerated. Additionally, mechanical brushing of teeth and gums to remove plaque and debris is as important as the application of toothpaste [12]. The participants that brushed, most were aware of their brushing techniques which were side-to-side and up and down.

Table 3. Percentage distribution of clinical findings that scored unhealthy in 10 categories: saliva, lips, teeth, tongue, oral hygiene, gums, overall appearance, dental pain, the opening of the mouth, if the patient is a denture wearer, derived from Oral Palliative Care Assessment and Referral (OPCAR) Assessment. The subcategories the results between denture wearers, non-denture wearers, and the total sample (n = 73)

| OPCAR | Dentures | | | | Total | | P-value ^a |
|---|----------|------|----|------|-------|------|----------------------|
| | Yes | | No | | n | % | |
| | n | % | n | % | | | |
| Saliva Dry tissues parched and red, little or no saliva present, saliva is thick, bad breath | 14 | 70.0 | 34 | 64.2 | 48 | 65.8 | 0.639 |
| Lips Dry, red, swollen, ulcerated cracked, or ulcerated at corners | 12 | 60.0 | 35 | 66.0 | 47 | 64.4 | 0.631 |
| Teeth Teeth — caries, fracture, broken root stumps | 7 | 35.0 | 34 | 64.2 | 41 | 56.2 | 0.025 |
| Tongue Red and/or white patch, fissured/ cracked, coated | 11 | 55.0 | 26 | 49.1 | 37 | 50.7 | 0.651 |
| Oral hygiene Food particles, tartar or plaque on the teeth and oral mucosa, dentures, bad breath | 9 | 45.0 | 24 | 45.3 | 33 | 45.2 | 0.983 |
| Gums Gums — swollen, bleeding, white/ red patches, ulcers, redness under dentures | 5 | 25.0 | 21 | 39.6 | 26 | 35.6 | 0.245 |
| Overall appearance Red, dry, ulcerated and painful | 3 | 15.0 | 14 | 26.4 | 17 | 23.3 | 0.303 |
| Dental pain There are physical pain signs, swelling of cheek or gum, broken teeth, ulcers, as well as verbal and/or behavioral signs | 4 | 20.0 | 11 | 20.8 | 15 | 20.5 | 0.943 |
| Opening of mouth Painful and limited mouth opening | 2 | 10.0 | 11 | 20.8 | 13 | 17.8 | 0.284 |
| If the patient is a denture wearer Broken area, ill-fitting or not worn, loose and needs denture adhesive, redness under dentures | 7 | 35.0 | 3 | 5.7 | 10 | 13.7 | <0.001 |

^a Fisher's exact test; n Frequency; % Percentage

Table 4. Table showing the number of patients that are eligible for dental referrals among 73 patients

| OPCAR score | n | % | Lower limit | Upper limit |
|-------------|----|-------|-------------|-------------|
| < 1 | 1 | 0.013 | 0.072 | 8.427 |
| > 1 | 72 | 0.986 | 91.60 | 99.90 |

A normal sample approximation method

From this study, almost half of the sample did not visit the dentist at all, while 39.7% had forgotten about their last visit. The low rates of dental visits among palliative care patients suggest the possible results of lack of priority, knowledge, interest, and time of the participants; patients' perception of no dental problems or difficulty in getting an appointment [13–15]. Nonetheless, regular dental visits and a meticulous

oral hygiene regimen should be encouraged [16]. This statement is further supported by the 39th Asia Pacific Dental and Oral Health Congress in 2021, which affirmed that maintenance of proper oral hygiene will be a difficult task for sick and critical condition patients. Therefore, the main goal should focus on oral comfort which comprises of maintenance of oral hygiene, wiping out painful conditions like mucositis, infectious diseases, and ulcerative conditions of the oral cavity [17].

Additionally, in the case of palliative care patients undergoing chemotherapy, invasive and/or traumatic procedures should be abandoned [18]. Thus, minimally invasive procedures which involve any surgery or extraction should not be performed. Tooth scaling and root planning are also contraindicated due to the high risk of infection [18]. Therefore, patients undergoing chemotherapy and radiotherapy have

often been refused any dental treatment. However, the extent to which the refusal of dental treatments for palliative care patients by dental practitioners is unknown. An alternative argument may be due to the COVID-19 outbreak in Brunei Darussalam in the past year. Whereby, dental services were limited to immediate or emergency treatments; routine dental treatments and dental appointments had been postponed [19]. This may be a possible explanation for the low frequency of last dental visits within the past year in this study.

It is reported that patients in palliative care have a wide variety of oral health problems. The most common dry mouth symptoms reported included dehydration, thick, stringy saliva, sticky feeling in the mouth, halitosis, dry hoarseness of the throat, dry, irritable and scratchy tongue, burning or tingling sensation of the tongue, difficulty speaking, inability to chew, swallow, or taste food, dry nasal passages, painful sores of the mouth and tongue, chapped lips, increased plaque, tooth decay and gum disease [20].

This study found three common oral health problems that are shared among patients in palliative care, in descending order of frequencies: Saliva (65.8%), Lips (64.4%), and Teeth (56.2%). Salivary problems are the most common patient complaint (65.8%), among which is having a dry mouth. The findings provide support for the data derived from the studies in Norway and Turkey, which suggested 56% and 87.6% having dry mouth among patients from palliative care from each study respectively [21, 22]. As discussed by Bernardes, dehydration is a common problem among these individuals. As a consequence, it is not unexpected that the majority of participants experienced oral symptoms such as dry mouth, dry lips, and having difficulty in swallowing [23].

Lack of saliva can leave the mucous membrane of the mouth vulnerable to infections or decrease protection against other infections of the mouth such as thrush (yeast infection) [24]. In the terminal stage of cancer, patients are likely to develop oral problems, such as dry mouth, stomatitis, and oral candidiasis because of impairments of the immunity and self-care ability as well as influences of drugs (opioids, steroids, anticholinergic drugs, etc), reducing the quality of life (QOL) of patients. In the palliative care population, polypharmacy is a common phenomenon among patients in palliative care who are often taking medications for long-term conditions and potentially anti-cancer therapy, coupled with an increasing number of drugs for symptom management [26,27]. This may increase the risk of having a dry mouth as a side effect of the underlying medical conditions being treated [27].

In Brunei, most patients have been indicated with an oral mouthwash that has been designed to stimulate salivary production. This was in line with the study conducted by Jose et.al, which concluded that moisturising mouthwash provided greater relief than water only from dry mouth symptoms [28]. However, it was found that 41 out of 73 patients use mouthwash, just over half of the sample size (Table 2). On the other hand, for those patients that are using oral mouthwash, 30 have been found to be using daily showing a promising rate of adherence when prescribed.

As previously mentioned, the second-highest category that scored unhealthily was in the lips category (64.4%). Patients had reported having one or more of the following: Dry, red, swollen, ulcerated cracked, or ulcerated at the corners. This may be tightly related to the causes of dry mouth as well. Other than indicating oral mouth wash, patients were indicated petroleum jelly application on their lips. This helps retain moisture and acts as preventative oral care [29].

Despite having good oral hygiene practices, approximately half of the participants have scored unhealthy for the teeth category in the OPCAR assessment for both denture wearers and non-denture wearers. This further highlights the importance of having regular check-ups for individuals who need them, given the fact that there are no contraindications for dental referrals. Another remarkable comparison for the teeth category is the denture wearers scored lower (35.0%) incidence for unhealthy teeth conditions than non-denture wearers (64.2%) for the prevalence of teeth caries, fractures, and broken root stumps ($p = 0.025$). Regarding the limitations of this finding, it could be argued that the lower percentage may be because denture-wearing patients have fewer natural teeth or no natural teeth at all. However, results demonstrate that this is not necessarily true. Another finding is regarding the dentures themselves; it should be noted that 7 denture-wearing patients (35.0%) have scored unhealthy in the denture category. These can range from having broken areas in the prosthetics, ill-fitting, needs denture adhesive, having redness under the dentures, or simply not worn at all. These denture problems are common and appear frequently in palliative care patients [30]. This result ties well with a previous study done by Milward et.al wherein 15.4% of removable prosthetics denture wearers never visit the dentist for routine examinations. There is a common belief that once the prosthesis is provided, no further dental examinations are required. Individuals' rationale may be that the false teeth of their dentures are not as vulnerable to caries as their natural teeth would have faced [31].

Regarding oral health, hygiene, and denture care, these all lead to the knowledge and awareness of the individual. Multiple studies showed that weak beliefs in the importance of regular tooth brushing were identified as a possible risk factor for poor dental health status and poor oral health behaviour [32]. Health promotion has long established the ideas of equity, equality, empowerment, and advocacy. Therefore, having a health promotion approach is vital to improving oral health, by shifting the responsibility for health from the formal health care system to individuals, communities, and decision-makers at all levels of society [33].

In the present study, many intraoral and extraoral signs were investigated, and have encountered the most common oral hygiene practices among patients in palliative care. The study utilized a short 15-item questionnaire and a validated 10-item assessment tool (OPCAR) that was validated for palliative care patients in Brunei Darussalam. This study can be managed with a small staff. The validated OPCAR assessment successfully revealed the prevalence of common oral symptoms experienced by patients in palliative care for the 10 categories that were assessed. The strength of this assessment tool lies in the fact that it can be used by virtually any non-dental practitioner, due to the simplistic nature of the tool. It can be used routinely in less than 10 minutes, hence, an effective yet efficient tool to provide initial insight into the state of one's oral health, with this, it can be presented as a guide for future referrals. If done routinely, patients would not need to complain of oral-related pain before they can be referred to the dental clinic. It would be a more proactive approach in the prevention and maintenance of oral health leading to a more optimal quality of life.

Our study has several limitations. Firstly, the study only assessed patients from two healthcare settings and palliative care patients who were in care homes were not included in the study. This ultimately leads to the main limitation of the research, which was related to the number of participants in the research. In addition, due to the time constraints and limited placements to conduct the study, only 73 participants were acquired. As a result, the limitations may have influenced the analysis between denture-wearing patients and oral health was largely negligible. This is largely attributed to the small sample size in each group.

A bias that may have affected the results may have arisen from the fact that the examiner was not blinded regarding the case of the patients they examined or from the results from the previously interviewed oral hygiene questionnaire. This may have affected the result attaining in several ways, for example, if the examiner knew about a patient diagnosed with oral mucositis, the examiner would have been more

vigilant in terms of observing for any salivary or oral problems related to the problem. A complete blinding procedure was not possible in this study. In the future, examiners may be made unaware of the reported symptoms before the examination. A similar study was conducted by Johansson et.al, studied the link between eating disorders and oral health, although not entirely related, the methods in this study highlighted the importance of blinding of the main examiner in the study, and suggested that the knowledge of reported symptoms related the study could have otherwise biased the clinical investigation [34].

Patients scoring at least 1 for total score in the OPCAR assessment tool were virtually unanimous. Meant that almost all patients were eligible for dental referrals. It should be noted that the total score does not equate to the severity of the oral health or urgency of referral. Scoring a total of 4 does not mean the oral condition is better or worse than say, a patient scoring 7. Similarly, a patient scoring the same total score does not mean they have equal urgency for referrals or severity of oral health. This may be explicitly written in the tool as a future improvement to avoid any confusion. Since the OPCAR Instrument relies on a 0 or 1 scoring basis, participants are placed on both extreme ends. Scoring 0 asserts a healthy category while scoring 1 asserts an unhealthy category, which does not allow flexibility. For instance, in the lip category having healthy (score = 0) would mean lips being smooth, pink, moist; having unhealthy lips would entail dry, red, swollen, ulcerated, cracked or ulcerated at corners.

An issue arose when, for example, patient Y had only dry lips and whilst patient X presented with all the signs in the unhealthy category, both would still fall in the same category, i.e. unhealthy. Therefore, an addition of at least one category in between healthy and unhealthy would resolve this issue. A further ambiguity with the scoring system, in addition to that of polarity, is the ambiguity of whether the term or in the assessment instrument has an exclusive or inclusive disjunction for all the signs in each category, as it can mean either. If we take the lips category as an example again, dry, red, swollen, ulcerated, cracked or ulcerated at corners, a patient may have both cracked and ulcerated lips at the corners or may have one or the other, but in both cases, they are categorized as being the same. This is where the remark column would have filled the gap as individuals may differ tremendously from one another. A future suggestion is to have instructions to underline/circle the presenting sign/s during the assessment as indications. The last two categories in the OPCAR assessment tool overall appearance of the cavity and opening of the mouth

have overlapping descriptions with the other 8 categories. Being unhealthy in the overall appearance of the cavity means one has a red, dry, ulcerated, and painful cavity while scoring unhealthy in the opening of mouth indicates painful and limited mouth opening. A suggestion would be to put these signs under the same category as dental pain. Overall, the limitations to the OPCAR assessment tool are mostly related to the clarity of the instructions, which can be improved upon with the above suggestions.

With these limitations, the results obtained cannot be used to generalize the whole palliative care population. It should be noted that palliative care studies only have daytime coverage, thus, a longer data collection period would be ideal. Therefore, long-term studies with a large sample size that covers all clinical settings and home settings are needed for a more accurate representation of the palliative care population in Brunei.

Conclusions

In conclusion, the study provided valuable insight into the prevalence of oral health problems as well as patients' oral hygiene practices. Therefore, this tool (OPCAR) can be used successfully for the assessment of oral problems of palliative care patients. This study also offers a general baseline for future oral palliative research that may want to look further into denture wearing versus non-denture wearing patients.

Declaration of conflict of interests

The authors declare that there is no conflict of interest.

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