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Oral health matters for the nutritional status of older persons—A population-based study

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Aims and objectives: To explore the association between oral health and nutritional status in the context of daily care for older people.

Background: Oral problems often increase with age and affect a person's ability to chew and swallow. They might also influence the ability to maintain a satisfactory nutritional status. Oral health awareness is therefore of great importance in nursing care for older people.

Design: A retrospective cross-sectional study.

Methods: Data from the Swedish quality register, Senior Alert, were used, including structured assessments of both oral and nutritional status using the Revised Oral Assessment Guide—Jönköping and the Mini Nutritional Assessment. In total, 1,156 persons (mean age: 82.8 ± 7.9) had both oral and nutritional assessments registered by the nursing staff in daily care.

Results: Approximately 29% of participants had moderate oral health problems. Another 12% had severe problems. Over 60% of the persons were considered at risk of malnutrition or were malnourished. There was a weak correlation between poor nutritional status and poor oral health, and approximately one-third of the persons who were at risk or malnourished had simultaneous oral problems. A multivariate logistic regression revealed that when problems involving voice and swallowing were present, there was also a greater possibility of being assessed as at risk of malnourishment or being malnourished.

Conclusion: There is a relationship between oral health problems and nutritional status, indicating the importance of evaluating oral health status in older persons with nutritional problems.

Relevance to clinical practice: Nursing staff involved in care for older people should be aware of the importance of including regular oral health check-ups in their work. There is also a need for nursing staff members and oral health professionals to exchange knowledge.

KEYWORDS
assessment, elder care, nutrition, older people, oral care

1 | INTRODUCTION

Oral health is an integral part of general health, and the mouth cannot be viewed as a separate part of the body (World Health Organization [WHO], 2006). Healthy oral tissues (teeth, gum, mucosa and tongue) and good oral function have an important influence on general health and quality of life (Batchelor, 2015; Nitschke & Müller, 2004). For example, the ability to eat is necessary for healthy nutrition (Westergren, Unosson, Ohlsson, Lorefält, & Hallberg, 2002). However, in the ageing process, physical changes as well as general diseases and medications increase the risk of oral diseases, such as dental caries, periodontitis, oral candidosis and dry mouth (Andersson, Hallberg, Lorefält, Unosson, & Renvert, 2004; Murray Thomson, 2014; WHO, 2006). There is an ongoing "dental transition" from a dominance of edentulous to more people with their own teeth as well as a large number of people with advanced prosthetic constructions and dental implants (Norderyd et al., 2015; Nitsche & Müller, 2004). This involves increasing needs for dental care and prevention (Norderyd et al., 2015; Batchelor, 2015; Murray Thomson, 2014; Petersen & Yamamoto, 2005). Globally, oral health for older people is considered to be a public health issue, and the WHO recommends strategies as well as measurable goals for improving the oral health of older people (Petersen & Yamamoto, 2005).

2 | BACKGROUND

Malnutrition is common among older persons, especially those who are living in nursing homes (malnourished: 8.7%; at risk: 47.5%) and in hospitals (malnourished: 22.0%; at risk: 45.6%) (Cereda et al., 2016). Preventing malnutrition is important, as it is associated with severe consequences in older age, such as poor subjective health (Olin, Koochek, Ljungqvist, & Cederholm, 2005; Rasheed & Woods, 2014), decreased functional ability (Dent, Visvanathan, Piantadosi, & Chapman, 2012; Olin et al., 2005), morbidity (Green & Watson, 2006) and increased risk of earlier death (Dent et al., 2012; Söderström, Rosenblad, Adolfsson, Saletti, & Bergkvist, 2014). The association between oral health and nutrition has previously been described, such as the important prerequisite of the ability to chew and swallow for a healthy nutritional status in older persons (Andersson, Westergren, Karlsson, Rahm Hallberg, & Renvert, 2002; Batchelor, 2015; Cowan, Roberts, Fitzpatrick, While, & Baldwind, 2004; Nieuwenhuizen, Weenen, Rigby, & Hetherington, 2010; Pezzana et al., 2015; Pirlich & Lochs, 2001; Sheiham et al., 2001; Westergren et al., 2002). Healthy teeth and functional dentition in older people have been observed to play an important role in having a healthy diet that is rich in fruits and vegetables, a satisfactory nutritional status (Iwasaki et al., 2014; Sheiham et al., 2001) and an acceptable body mass index (BMI) (Marcenes, Steele, Sheiham, Willian, & Walls, 2003). Consequently, it is important to identify the causes of eating problems, and an oral problem is one important factor.

What does this paper contribute to the wider global clinical community?

- About 40% of the participants had one or more oral health problems with voice, lips, oral mucosa, tongue, gums, teeth, saliva and swallowing, and over 60% were considered at risk of malnutrition or were malnourished.
- Oral health problems and nutritional status are associated, as oral health problems such as voice and swallowing increased the risk of being malnourished.
- Nurses working with older people must be aware of the importance of oral health and daily oral health check-ups to prevent and detect risk of malnutrition.

Older persons are often dependent upon support from others regarding their oral hygiene and food intake. It is also the responsibility of health professionals to detect possible malnutrition and the reasons for it (Westergren et al., 2002). There are different assessment tools for nursing staff members to use while working with older people, focusing on oral health care, for example, the American Oral Health Assessment Tool, the Minimum Data Set Section 1 (MDS) (PCSC, 2016) and the Swedish Revised Oral Assessment Guide (ROAG) (Andersson, 2002). It has been suggested that oral health status should be viewed in conjunction with other assessments, such as nutritional assessments, and in a routine manner (Andersson, Hallberg, et al., 2002; Andersson, Westergren, et al., 2002). This is actually highlighted in the Swedish quality register, Senior Alert (SA), as two of the prioritised areas are oral health and nutrition (Senior Alert, 2005). In Sweden, SA is used routinely in care for older people and includes a preventive care model to detect and improve the care. SA, which is used by professionals in the municipal and county councils, can be understood as a model that aims to support nursing staff members to structure their care and work according to evidence-based practice. However, so far, ROAG and the Mini Nutritional Assessment (MNA) that are used in a routine manner in nursing care have not been studied in conjunction. To improve health in nursing care for older people, this study can contribute to increasing the knowledge about oral health and nutrition.

3 | AIM

The aim of this study was to explore the association between oral health and nutritional status in the context of daily care for older people.

4 | METHOD

4.1 | Design

A retrospective cross-sectional study including quality register data.

4.2 | Data collection

This study is part of a larger project entitled "Health development in later life." For that project, data from a Swedish twin project, Screening Across the Lifespan Study (SALT), were combined with data from several different Swedish quality registers. SALT includes data that were collected between 1998–2002 from approximately 45,000 twins who were born between 1911–1958. For each participant, the data were collected once in SALT. The study has been described further elsewhere (Lichtenstein et al., 2006). In 2014, the SALT participants were matched with a subsection of individuals in national health registers and quality registers, one of which was SA.

In SA, persons over 65 years of age with a care contact (municipal care or county council care) are registered. Contrary to other quality registers, SA is not disease specific. Instead, it focuses on a structured preventive care model to improve the quality of care. The register covers several risk areas, including malnutrition, pressure ulcers, falls, oral health and bladder dysfunction (Senior Alert, 2005). The preventive care model includes four steps: risk assessment using different valid and reliable instruments, analysis of causes when risk exists, planned and performed actions and evaluation. SA has been described further in Edvinsson, Rahm, Trinks, and Höglund (2015).

In total, 5,177 of those twins who were included in SALT also had at least one registration in SA. This study only includes those persons over 65 years of age who have an assessment relating to both their oral health status and their nutritional status using the Revised Oral Assessment Guide—Jönköping (ROAG-J) and Mini Nutritional Assessment—Short Form (MNA-SF), respectively. As SA focuses on the care process, a person can be assessed and registered several times in the quality register. In this study, the first registration in SA for each person was used. Another exclusion criterion was the presence of a twin. To control for any twin effect, one person from each of the 30 twin pairs was randomly excluded. Ultimately, the sample in this study consisted of 1,156 persons (Figure 1).

4.3 | Measurements

4.3.1 | Background variables

The background variables included age, sex, BMI and type of registration unit. Single items from other instruments that were included in SA were also included as background variables. From the Modified Norton Scale, which assesses the risk of developing pressure ulcers (Ek, 1987), items regarding subjective health and food and fluid intake were used. From the Downton Fall Risk Index, which assesses fall risk (Downton, 1993), the item on prescribed drugs was used.

4.3.2 | ROAG-J

Revised Oral Assessment Guide is an internationally used instrument that was developed for health professionals (nurses, registered nurses, physicians) to examine, detect and document illnesses or problems in the mouth on a regular basis. ROAG-J, which was used in the current study, is a modification of ROAG (Andersson, 2002) that includes recommendations regarding what actions that should be taken when oral problems are detected (Senior Alert, 2005). Briefly, ROAG-J evaluates oral health by assessing the condition of the voice, lips, oral mucosa, tongue, gums, teeth, saliva, swallowing and any dentures/implants. Each item is measured on the following
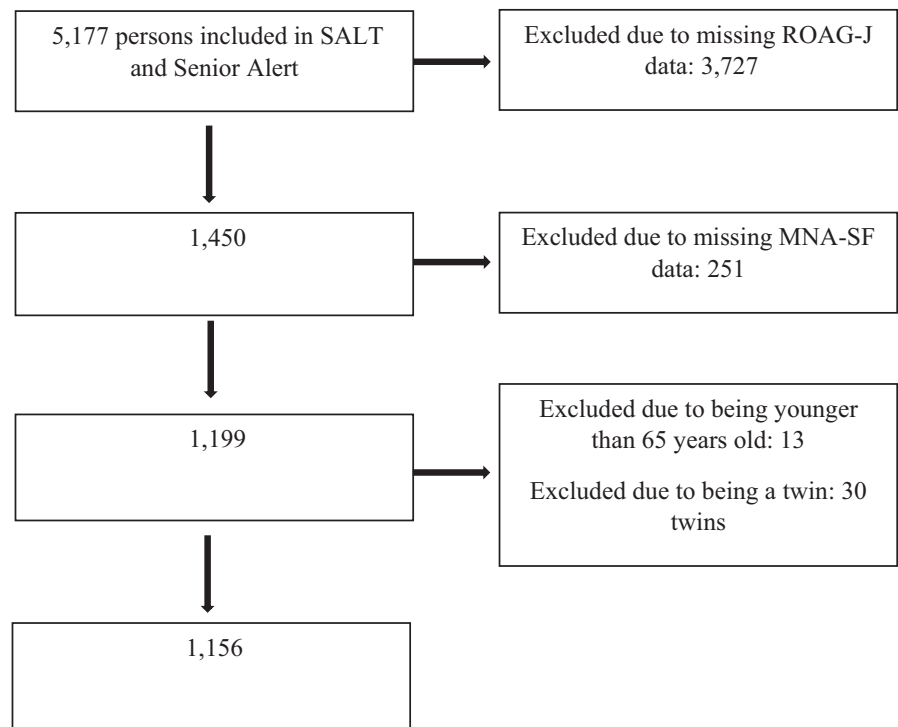

FIGURE 1 Flow chart showing the included participants

scale: 0: not relevant to assess; 1: healthy or normal condition; 2: moderate changes or deviations that can and must be treated by the nursing staff; and 3: severe changes or deviations that require contact with dental or medical professionals (Andersson, Rahm Hallberg, Lorefält, Unosson, & Renvert, 2004). Persons who score a 2 or 3 on at least one item on the ROAG-J are considered to have oral problems, with a 3 being more severe. The instrument has been shown to have good validity and reliability in previous studies (Andersson, Hallberg, et al., 2002; Andersson, Westergren, et al., 2002; Ribeiro, Ferreira, Vargas, & Ferreira, 2014). Additionally, it has been found to be a robust and useful tool for detecting oral health problems in a geriatric rehabilitation ward (Andersson, Hallberg, et al., 2002; Andersson, Westergren, et al., 2002) as well as for routine use (Johansson, Jansson & Lindmark, 2016). For this study, the internal consistency of ROAG-J, measured by Cronbach's alpha, was 0.59. In SA, there are also additional questions on the ROAG-J regarding implants and dentures (upper and lower jaw) and the number of one's own teeth (more or fewer than 12 teeth).

4.3.3 | MNA-SF

The MNA-SF, which is the short form of the MNA, is used worldwide to detect the risk of malnutrition or malnourishment among older persons. The instrument consists of six items that focus on food intake, estimated weight loss, mobility, acute disease or psychological stress, neuropsychological impairment and BMI. The total score is 14 points, where 12–14 points indicate no risk or well nourished, 8–11 points indicate a risk of malnutrition and 7 or fewer points indicate malnutrition. The MNA-SF has shown satisfying sensitivity, specificity as well as correlation with the full MNA (Kaiser et al., 2009; Rubenstein, Harker, Salva, Guigoz, & Vellas, 2001), which is also true for the Swedish version that was used here (Wikby, Ek, & Christensson, 2008). In this study, the Cronbach's alpha was 0.46.

4.4 | Ethical considerations

According to the Declaration of Helsinki (WMA, 1964), ethical guidelines for research related to register data were followed. The extradition of data was approved by the national registries. The material was decoded during the communication of the data and was not changed or altered afterwards. The project entitled "Health development in later life" was approved by the regional ethical review board in Linköping, Sweden (2014/25).

4.5 | Data analysis

Both descriptive and analytical statistics were performed. For categorical variables, chi-square tests were used, nonparametric testing was used with data at ordinal scale (Mann–Whitney U test and Kruskal–Wallis test) and parametric testing was used with all other data (t test and ANOVA). Correlations were measured using Spearman's rho. For the voice, swallowing, gum, teeth and dentures items

on the ROAG-J, a score of 0, that is, not relevant to assess, were marked as missing and not included, as this part was difficult to judge how to use and interpret in the analysis. Statistically significant variables according to the univariate analysis (voice, lips, mucous membrane, tongue, gums, saliva, swallowing, sex, age, food intake, fluid intake, unit of registration and general health) were included as independent variables for the multinomial logistic regression. However, the items teeth and dentures were not included in the multinomial logistic regression due to high proportion of missing values. The assessed nutritional status, according to MNA-SF, was the dependent variable. Well nourished (MNA-SF $\geq$ 12) was used as reference group. The SPSS, version 21 (PASW Statistics, IBM Corporation, Armonk, NY), was used for all testing. A p-value <.05 was considered to be statistically significant.

5 | RESULTS

In the study sample, the mean age was 82.8 $\pm$ 7.9 years, and 713 (61.7%) of the participants were women. Most persons were registered at a nursing home (56.6%), followed by a hospital (25.7%). Approximately 45% of all persons (n = 1,156) were at risk of malnutrition, and 17% were malnourished.

In the sample, 29% of participants were assessed as having moderate oral health problems, and another 12% had severe problems. Median for number of oral health problems was 2.0 (IQR 1.0–3.0), and the highest proportion of problems were found regarding teeth, dentures and swallowing. BMI, general health and food and fluid intake were lower among those who were assessed as having oral problems (Table 1). This was also true for those who were assessed as being at risk of malnutrition or malnourished. A comparison of the persons who were malnourished, at risk of malnutrition and the well-nourished persons on specific items on the ROAG-J revealed that there were significant differences in all the tested items. Those assessed as malnourished reported highest proportion of oral health problems according to the ROAG-J items and total ROAG-J score (Table 2).

Approximately one-third (30.9%) of the persons who were at risk of malnutrition or malnourished simultaneously had oral problems. There was a weak negative correlation between the ROAG-J total score and the MNA total score (r = −.241, p < .001). That is, those with oral health problems also had nutritional problems and vice versa.

Factors associated with being at risk for malnourishment or being malnourished, according to the multinomial logistic regression, are presented in Table 3. Problems related to voice and swallowing were significantly related to both being at risk and malnourished. The variables included in the model explained 29.4% of the variation according to the Nagelkerke's pseudo-R-square statistics.

6 | DISCUSSION

The main finding of the present study was that approximately 40% of all participants had moderate or severe oral health problems and

TABLE 1 Sample characteristics and comparisons between persons with and without oral health problems. Unless otherwise stated, *n* (%) is presented. *n* = 1,156

Characteristics	Without oral health problems[a] (*n* = 686)	With oral health problems[b] (*n* = 470)	*p*-Value*
Age, mean (*SD*)	82.6 (8.0)	83.1 (7.9)	.437[c]
BMI, mean (*SD*)	25.4 (5.3)	24.1 (5.2)	**<.001**[c]
Gender, *n* (%)			
Male	249 (36.3)	194 (41.3)	.096[d]
Female	437 (63.7)	276 (58.7)	
Type of unit for registration (*n* =1,149)			
Hospital department	201 (29.5)	94 (20.1)	**<.001**[d]
Special housing	354 (51.9)	296 (63.4)	
Primary care/home care	83 (12.2)	37 (7.9)	
Rehabilitation	44 (6.5)	40 (8.6)	
General health (*n* = 1,154)			
Very bad	3 (0.4)	9 (1.9)	**<.001**[e]
Bad	27 (3.9)	63 (13.5)	
Fairly good	309 (45.0)	238 (50.9)	
Good	347 (50.6)	158 (33.8)	
Food intake (*n* = 1,154)			
<Half a portion	19 (2.8)	55 (11.8)	**<.001**[e]
Half a portion	75 (10.9)	83 (17.7)	
¾ of a portion	103 (15.0)	84 (17.9)	
Normal portion	489 (71.3)	246 (52.6)	
Fluid intake (*n* = 1,154)			
<500 ml/day	5 (0.7)	16 (3.4)	**<.001**[e]
500–700 ml/day	60 (8.7)	69 (14.7)	
700—1,000 ml/day	238 (34.7)	184 (39.3)	
>1,000 ml/day	383 (55.8)	199 (42.5)	
Problems regarding ROAG items			
Voice (*n* = 1,132)		114 (24.7)	
Lips		78 (16.6)	
Mucous membrane		93 (19.8)	
Tongue		99 (21.1)	
Gums (*n* = 1,066)		88 (20.1)	
Saliva		106 (22.6)	
Swallowing (*n* = 1,092)		146 (32.4)	
Teeth (*n* = 913)		223 (57.2)	
Dentures (*n* = 416)		58 (33.9)	
Has dentures[f] (*n* = 1,156)	289 (42.1)	171 (36.4)	.050[d]
Fewer than 12 teeth[f] (*n* = 1,150)	266 (38.9)	193 (41.3)	.418[d]
Has dental implants[f] (*n* = 1,150)	75 (11.0)	59 (12.6)	.391[d]

[a]Persons scoring a 0 or 1 on all items on the ROAG-J.
[b]Persons scoring a 2 or 3 at least once on the ROAG-J.
[c]Comparison using the *t* test.
[d]Comparison using the chi-square test.
[e]Comparison using the Mann–Whitney test.
[f]Additional items in SA.
*Statistically significant set at *p* < .05. Bold number indicates statistical significance.

TABLE 2 Sample characteristics and comparisons between persons assessed as well nourished, those at risk of malnutrition or malnourished according to MNA-SF. Unless otherwise stated, n (%) is presented. n = 1,156

Characteristics	Well nourished (n = 443)	Risk of malnutrition (n = 516)	Malnourished (n = 197)	p-Value*
Age, mean (SD)	82.1 (8.0)	83.0 (8.0)	83.9 (7.8)	**.027**[a]
BMI, mean (SD)	27.5 (5.0)	24.1 (4.7)	21.0 (4.0)	**<.001**[a]
Gender, n (%)				
Male	170 (38.4)	190 (36.8)	83 (42.1)	.427[b]
Female	273 (61.6)	326 (63.2)	114 (57.9)	
Type of unit for registration (n = 1,149)				
Hospital department	107 (24.3)	135 (26.4)	53 (27.0)	**<.001**[b]
Special housing	261 (59.2)	336 (65.6)	134 (68.4)	
Primary care/home care/Rehabilitation	73 (16.6)	419 (8.0)	9 (4.6)	
General health (n = 1,154)				
Very bad	1 (0.2)	3 (0.6)	8 (4.1)	**<.001**[c]
Bad	8 (1.8)	42 (8.1)	40 (20.4)	
Fairly good	176 (39.8)	263 (51.0)	108 (55.1)	
Good	257 (58.1)	208 (40.3)	40 (20.4)	
Food intake (n = 1,154)				
<Half a portion	5 (1.1)	22 (4.3)	47 (24.0)	**<.001**[c]
Half a portion	25 (5.7)	84 (16.3)	49 (25.0)	
¾ of a portion	50 (11.3)	87 (16.9)	50 (25.5)	
Normal portion	362 (81.9)	323 (62.6)	50 (25.5)	
Fluid intake (n = 1,154)				
<500 ml/day	4 (0.9)	3 (0.6)	14 (7.1)	**<.001**[c]
500–700 ml/day	26 (5.9)	59 (11.4)	44 (22.4)	
700–1,000 ml/day	146 (33.0)	202 (39.1)	74 (37.8)	
>1,000 ml/day	266 (60.2)	252 (48.8)	64 (32.7)	
ROAG total score, median (IQR)	8.0 (8.0–9.0)	9.0 (8.0–10.0)	10.0 (8.0–11.5)	**<.001**[c]
Problems regarding ROAG items[d]:				
Voice (n = 1,132)	14 (3.2)	53 (10.5)	47 (24.7)	**<.001**[b]
Lips	17 (3.8)	26 (5.0)	35 (17.8)	**<.001**[b]
Mucous membrane	14 (3.2)	37 (7.2)	42 (21.3)	**<.001**[b]
Tongue	21 (4.7)	38 (7.4)	40 (20.3)	**<.001**[b]
Gums	20 (5.0)	42 (8.7)	26 (14.4)	**.001**[b]
Saliva	21 (4.7)	41 (7.9)	44 (22.3)	**<.001**[b]
Swallowing	21 (4.9)	63 (13.0)	62 (34.3)	**<.001**[b]
Teeth (n = 913)	60 (17.4)	100 (24.3)	63 (39.9)	**<.001**[b]
Dentures (n = 460)	16 (8.6)	28 (13.7)	14 (20.0)	**.043**[b]
Has dentures[e] (n = 1,156)	185 (41.8)	205 (39.7)	70 (35.5)	.331[b]
Fewer than 12 teeth[e] (n = 1,150)	175 (39.8)	209 (40.7)	75 (38.3)	.841[b]
Has dental implants[e] (n = 1,150)	47 (10.7)	67 (13.0)	20 (10.2)	.416[b]

[a]Comparison using the ANOVA.
[b]Comparison using the chi-square test.
[c]Comparison using the Kruskal–Wallis test.
[d]Dichotomised items from the ROAG-J, with cut-off score between 1–2 for each item.
[e]Additional items in SA.
*Statistically significant set at p < .05. Bold number indicates statistical significance.

TABLE 3 Oral health factors associated with poor nutritional status from the final multinomial logistic regression model[a]

Independent variables[b]	Risk of malnutrition (n = 445)			Malnourished (n = 161)		
	Exp(B)	p-Value*	CI	Exp(B)	p-Value*	CI
Voice	**2.51**	**.013**	**1.22–5.19**	**3.58**	**.003**	**1.56–8.19**
Lips	0.50	.082	0.23–1.09	1.24	.631	0.52–2.92
Mucous membrane	1.79	.182	0.76–4.19	2.15	.128	0.80–5.78
Tongue	1.07	.839	0.55–2.08	1.62	.245	0.72–3.65
Gums	1.42	.281	0.75–2.71	0.89	.785	0.38–2.08
Saliva	1.15	.685	0.60–2.20	1.47	.334	0.67–3.19
Swallowing	**1.91**	**.027**	**1.08–3.40**	**3.68**	**<.001**	**1.87–7.25**

[a]Reference category of dependent variable is well nourished. Models are adjusted for age, sex, food intake, fluid intake, general health and type of unit for registration.

[b]Dichotomised items from the ROAG-J, with the cut-off score between 1–2 for each item. No problems were set as a reference.

*Statistically significance set at $p < .05$. Bold number indicates statistical significance.

62% were assessed as being at risk of malnutrition or malnourished. Of those persons who were at risk of malnutrition or malnourished, one-third also had one or several oral health problems. Of the oral health problems, voice and swallowing were associated with the risk of being malnourished or malnourished. Those who were registered to have problem(s) with voice had over 3.5 times higher risk of being assessed as malnourished and 2.5 times higher risk for being assessed as at risk of malnutrition. Corresponding odds ratio for swallowing were 3.7 (malnourished) and 1.9 (at risk of malnutrition) even after controlling for other highly possible factors such as food intake, general health and age. These results confirm the relationship between nutritional status and oral problems found in other studies (Andersson et al., 2004; Batchelor, 2015; Cowan et al., 2004; Nieuwenhuizen et al., 2010; Pezzana et al., 2015; Pirlich & Lochs, 2001; Sheiham et al., 2001; Westergren et al., 2002). Westergren et al. (2002), for example, argued that it is important for nursing staff to detect oral problems in older persons at an early stage, in order to prevent malnutrition. Good oral health and function could decrease and/or eliminate the aetiology to eating problems. As shown in this study, oral diseases and functions are of great importance. Interestingly, neither the number of reaming teeth nor fixed or removable dental prosthesis influenced the risk of malnutrition or malnourishment. One reason for this could be that these parameters were imprecisely assessed. A more detailed oral examination would probably have some impact on the relationship between oral health and malnutrition.

With an increasing ageing population comprising individuals with more of their own natural teeth (Norderyd et al., 2015; Nitsche & Müller, 2004), there is a need for cooperation among professionals within dentistry and nursing care. However, when working with the older people, improvements in knowledge and strategies are needed (Batchelor, 2015; Lindqvist, Seleskog, Wårdh, & von Bültzingslöwen, 2013), which involves both nursing professionals, that is, knowledge about oral health and prevention, and dental professionals, that is, knowledge about older people (Batchelor, 2015; Murray Thomson, 2014). Assessment tools, such as the ROAG-J and the MNA-SF,

seem to be valuable in daily nursing care. The ROAG has been found to be a useful tool in detecting oral health problems in a geriatric rehabilitation ward (Andersson, Hallberg, et al., 2002; Andersson, Westergren, et al., 2002) as well as in routine practice (Johansson, Jansson & Lindmark, 2016). Although the associations in the current study are somehow weak and no causality is analysed, possessing knowledge about the assessment of oral health and function can increase the awareness of the relationship between eating ability and the cause of malnutrition. Moreover, even if each assessment is important, it is also important to be aware that it does not cover all the information relating to underlying causes that is valuable for planning actions (Lannering, Ernsth Bravell & Johansson, 2016). However, detecting oral problems at an early stage is one important part of nutritional preventive care. This study shows the importance of exploring existing quality register data for quality improvements in daily care for older people, as two assessments could be used as a complement from a nutritional perspective. To focus only on one aspect, such as the MNA-SF to detect the risk of malnutrition, for example, might not be sufficient (Beck, Holst, & Rasmussen, 2008). In Johansson, Wijk, and Christensson, (2017) several identified underlying causes of malnutrition were found in older people with dementia, as 16% were identified as having poor oral health based on clinical observations by the nursing staff. This figure is lower compared with that in the current study, reflecting the importance of using standardised instruments in combination.

Using clinical data is sometimes considered a limitation. In SA, for instance, it is known that approximately 45,000 users in several different health professions collect and register data (Senior Alert, 2005). Even though standardised instruments are employed, the users might interpret and use them differently (Lannering, Ernsth Bravell, and Johansson, (2016), which might have affected the results of this study. However, the instruments that were included in SA can be considered to be screening tools to detect problems for health professionals in a wide manner in daily care, without any expert competence needed. Johansson, Jansson, & Lindmark, (2016) highlighted the importance of ensuring high validity, which is

strongly related to the nursing staff's awareness of oral health and how to use the assessment aimed at preventing oral diseases. The MNA has also been shown to be associated with the risk of "overdiagnosing" malnutrition and malnourishment (Beck, Holst, & Rasmussen, 2008). Thus, there is always a risk of false-positive registrations. However, the distribution of persons who were assessed as being at risk of malnutrition or malnourished is in line with a recent review (Cereda et al., 2016). Regarding oral health problems that were assessed by the ROAG in a general population, Johansson, Jansson, and Lindmark, (2016) showed a lower figure (approximately 30%) compared with the one presented in the current study. An explanation could be that in their study, the ROAG was used in daily care for a longer time, which might have influenced the awareness of the importance of oral health. In Andersson et al. (2004), however, the figure was higher (71%), which might be explained by the population of geriatric rehabilitation patients. In their study, 39% of the patients who were at risk of malnutrition or malnourished also had oral problems, which is similar to our findings.

Another limitation is related to the representativeness of the population. To be registered in SA, one should be 65 years or older with a care need. The mean age of participants for this study was 82.8 ± 7.9 and most lived in a nursing home. In Sweden, there has been a decrease in the number of beds as well as time spent in nursing homes (Schön, Lagergren, & Kåreholt, 2016) and cognitive impairment is common (Bravell et al., 2011). This indicates that those living in nursing home are frail and this probably also applies to this study population. There are no other inclusion criteria or exclusion criteria for being included in SA and variables of importance to describe the population such as diagnoses and pharmaceutical treatment are not included. Earlier research has described this as a limitation when using data from the SA register (Lannering, Johansson, & Ernsth-Bravell, 2017).

Based on the current study, with respect to both strengths and limitations, the results show the importance of oral health to the nutritional status of older people in a nursing care context.

7 | CONCLUSION

Oral health problems, measured through ROAG, increase the risk of malnutrition, even after controlling for other possible factors related to nutritional status such as food intake, general health and age. It is important to evaluate oral health in older persons in order to detect and prevent nutritional problems. However, further research is needed to evaluate other possible factors, which also are associated with nutritional status.

8 | RELEVANCE TO CLINICAL PRACTICE

Nurses and other healthcare professionals who work with older people are responsible for their nutritional intake. This study shows that oral health is an important factor that is related to malnutrition and malnourishment. Therefore, it is important for nursing staff members who provide care for older people to increase their knowledge about this relationship and be aware of its importance to include continuous oral health check-ups in regular nursing care.

CONTRIBUTIONS

Study design: UL, HJ and LJ; data collection: CL and LJ; data analysis: LJ; responsible for preparation of the manuscript: UL and LJ; preparation of the manuscript: all the authors.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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