Received: 7 May 2024 | Revised: 25 June 2024 | Accepted: 30 June 2024

DOI: 10.1111/jgs.19103

RESEARCH LETTER

Journal of the American Geriatrics Society

The association between clinically evaluated cognitive function and oral health in Norwegian older adults: The HUNT Study

Marion Denos PhD[1,2] | **Ernest Obeng Asante MSc**[1,3] | **Rannveig Sakshaug Eldholm MD, PhD**[4,5] | **Geir Selbæk MD, PhD**[6,7,8] | **Håvard Kjesbu Skjellegrind MD, PhD**[9,10] | **Xiao-Mei Mai MD, PhD**[2] | **Yue Chen MD, PhD**[11] | **Yi-Qian Sun MD, PhD**[1,3,12]

[1]Center for Oral Health Services and Research Mid-Norway (TkMidt), Trondheim, Norway

[2]Department of Public Health and Nursing, Norwegian University of Science and Technology, Trondheim, Norway

[3]Department of Clinical and Molecular Medicine, NTNU, Norwegian University of Science and Technology, Trondheim, Norway

[4]Department of Neuromedicine and Movement Science, NTNU, Norwegian University of Science and Technology, Trondheim, Norway

[5]Department of Geriatrics, Clinic of Medicine, St. Olavs Hospital, Trondheim, Norway

[6]Norwegian National Centre for Ageing and Health, Vestfold Hospital Trust, Tønsberg, Norway

[7]Department of Geriatric Medicine, Oslo University Hospital, Oslo, Norway

[8]Institute of Clinical Medicine, Faculty of Medicine, University of Oslo, Oslo, Norway

[9]HUNT Research Centre, Department of Public Health and Nursing, NTNU, Norwegian University of Science and Technology, Levanger, Norway

[10]Levanger Hospital, Nord-Trøndelag Hospital Trust, Levanger, Norway

[11]School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada

[12]Department of Pathology, Clinic of Laboratory Medicine, St. Olavs Hospital, Trondheim, Norway

Correspondence
Marion Denos, Department of Public Health and Nursing, Norwegian University of Science and Technology, Trondheim, Norway.
Email: marion.denos@ntnu.no

Funding information
The Liaison Committee for Education, Research and Innovation in Central Norway, Grant/Award Number: 2018/42794; Stiftelsen Dam, Grant/Award Number: 2021/FO347301

INTRODUCTION

Poor oral health and neurocognitive disorders (NCDs) are both important public health challenges in the general older population.[1,2] Older adults with NCDs may have poorer oral health due to decline in self-care, medication side effects, and lower dietary quality.[3] Yet, the association between cognitive function and oral health is unclear.[4] Wu et al. advocated a standardized assessment of oral health and cognitive states to better evaluate their potential associations.[4]

The aim of this cross-sectional study was to explore the relationship between cognitive function and oral health, both thoroughly assessed by clinical experts, in a home-dwelling Norwegian older adult population.

METHODS

Our study population, derived from the Trøndelag Health Study Survey 4 (HUNT4), included 633 participants aged

70 years or older who attended both the HUNT4 Oral Health Study and HUNT4 70+.[5–7]

Clinical experts assessed the cognitive function of HUNT4 70+ participants after a comprehensive clinical evaluation, following the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria.[7] In the current study, mild cognitive impairment (MCI) and dementia were diagnosed and collectively categorized as NCDs.

Participants in the HUNT4 Oral Health Study underwent clinical and radiographic examinations conducted by trained and calibrated dentists. Decayed, missing, and filled teeth (DMFT) were calculated using the clinical and radiographic caries registration of dental status.[5] Decayed teeth were caries lesions confined in dentine (grades 3–5), secondary caries in dentine, and root caries with cavitation. Severe periodontitis was defined as periodontal Stage 3 or 4 based on radiographic bone loss and periodontal stage assessments.[6]

The relationships between cognitive function and the number of decayed teeth, DMFT or natural teeth were assessed using negative binomial regression models, computing ratios of means (RMs) with 95% confidence intervals (CIs). The relationship between cognitive function and the prevalence of severe periodontitis was estimated using Poisson regression with robust error variance, providing prevalence ratios (PRs) with 95% CIs. Covariates such as age, sex, education, marital status, body mass index (BMI), smoking status, and alcohol consumption were considered potential confounders based on the literature.[4,8,9] All statistical analyses were performed with STATA/MP 18.

RESULTS

Table 1 describes the baseline characteristics of the study population overall and by cognitive function (normal and NCDs). As shown in Figure 1A, the mean number of decayed teeth was higher for participants with NCDs compared to those with normal cognitive function (1.8 vs. 1.5). NCDs were associated with a 19% increase in the mean number of decayed teeth in the adjusted model (RM 1.19, 95% CI 0.98–1.46), although it was not statistically significant (p-value = 0.09). It appears that a dose–response association was demonstrated (p-value for trend = 0.09): participants with MCI had an 18% increase (RM 1.18, 95% CI 0.95–1.47) in the mean number of decayed teeth, while those with dementia had a 25% increase (RM 1.25, 95% CI 0.84–1.86). There was no association between NCDs and the number of DMFT (Supplementary Table S1).

TABLE 1 Baseline characteristics of participants in the study population of HUNT4.

Characteristics	Cognitive function		
	Normal (n = 408)	NCDs[a] (n = 225)	Total (n = 633)
Age (years)	75.4 ± 4.4	76.2 ± 4.9	75.7 ± 4.6
Sex			
Female	209 (51.2)	103 (45.8)	312 (49.3)
Male	199 (48.8)	122 (54.2)	321 (50.7)
Body mass index (kg/m^2)			
Underweight or normal (<25.0)	135 (33.1)	65 (28.9)	200 (31.6)
Overweight (25.0–29.9)	196 (48.0)	106 (47.1)	302 (47.7)
Obesity (≥30.0)	76 (18.6)	53 (23.6)	129 (20.4)
Unknown	1 (0.2)	1 (0.4)	2 (0.3)
Education (years)			
≤10	73 (17.9)	42 (18.7)	115 (18.2)
11–13	171 (41.9)	106 (47.1)	277 (43.8)
≥14	164 (40.2)	77 (34.2)	241 (38.1)
Marital status			
Unmarried[b]	128 (31.4)	78 (34.7)	206 (32.5)
Married[c]	280 (68.6)	147 (65.3)	427 (67.5)
Smoking status			
Never	167 (40.9)	79 (35.1)	246 (38.9)
Former	218 (53.4)	138 (61.3)	356 (56.2)
Current	21 (5.1)	7 (3.1)	28 (4.4)
Unknown	2 (0.5)	1 (0.4)	3 (0.5)
Alcohol consumption			
Never	62 (15.2)	33 (14.7)	95 (15.0)
1–4 times per month	222 (54.4)	129 (57.3)	351 (55.5)
≥5 times per month	117 (28.7)	59 (26.2)	176 (27.8)
Unknown	7 (1.7)	4 (1.8)	11 (1.7)

Note: Data are given as mean ± SD for age and number of participants (column percentage) for other variables.
Abbreviations: BMI, body mass index; HUNT, Trøndelag Health Study; NCDs, neurocognitive disorders.
[a]NCDs consisted of mild cognitive impairment (MCI) and dementia.
[b]Unmarried including single, widow/widower, divorced, or separated.
[c]Married including registered partner.

Participants with dementia had a 9% decrease in the mean number of natural teeth compared to those with normal cognitive function (RM 0.91, 95% CI 0.84–0.99, Supplementary Table S2). The prevalence of severe periodontitis was similar among participants with NCDs compared to those with normal cognitive function (Figure 1B: PR 1.02, 95% CI 0.85–1.21).

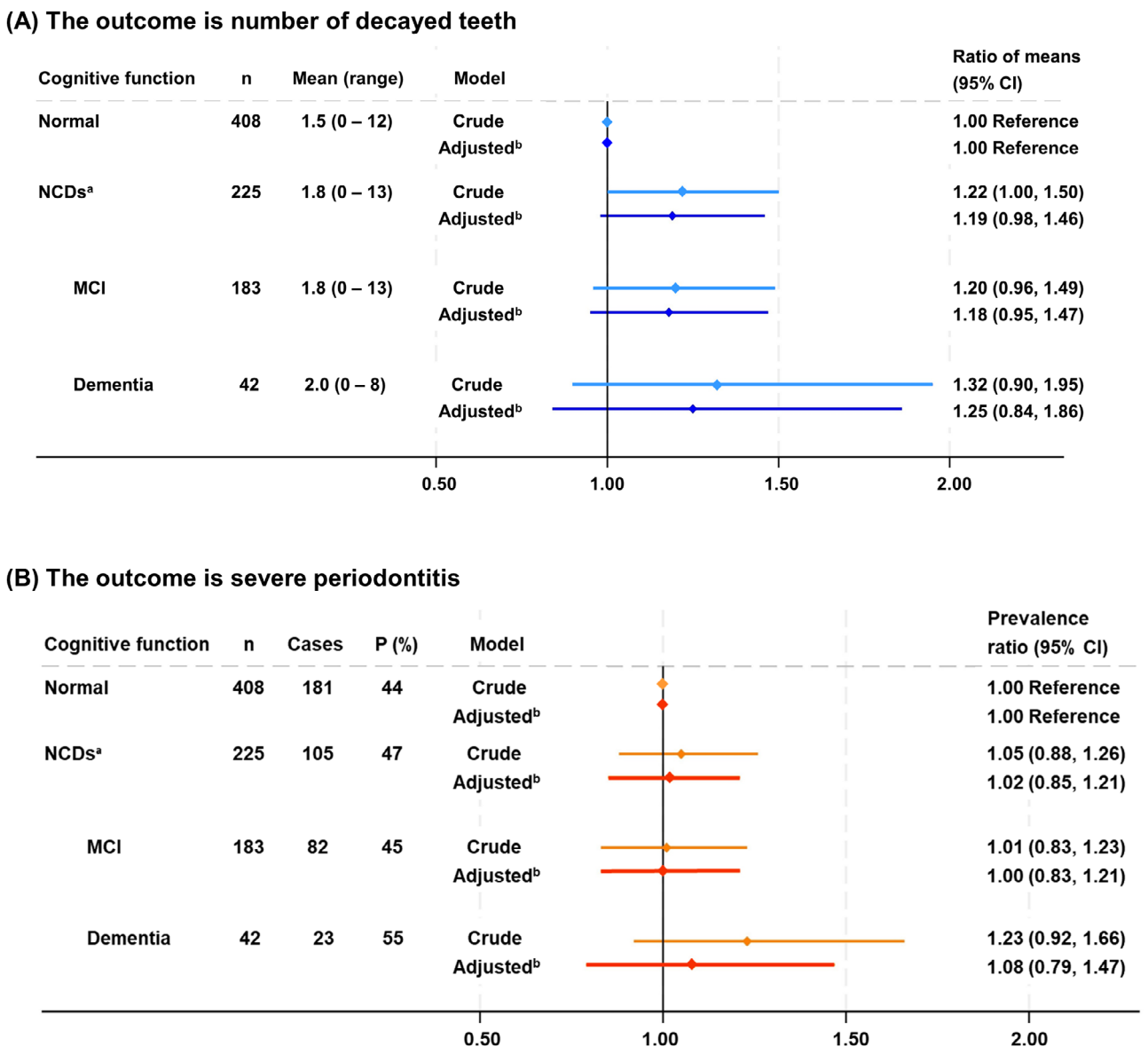

FIGURE 1 The relationships between cognitive function and (A) Number of decayed teeth ($n = 633$) (B) Prevalence of severe periodontitis ($n = 633$). CI, confidence interval; n, number of participants; NCDs, neurocognitive disorders; P, prevalence. [a]NCDs consisted of mild cognitive impairment (MCI) and dementia. [b]Adjusted for age, sex, education, marital status, BMI, smoking status, and alcohol consumption.

DISCUSSION

Few studies have explored the relationships between cognitive function and clinically measured oral health components. The available measures were often limited to self-rated oral health, questionnaires, or non-dental screening tool.[4,8,10] Our findings support the previous studies that reported an association between cognitive function and self-reported oral health.[8,10] Our study, along with previous research,[10] suggests that poor cognitive function may lead to neglected self-care, resulting in poorer oral hygiene and oral health in older people.

The current study is one of the first to investigate potential associations between cognitive function and detailed oral health components, both clinically evaluated. NCDs were diagnosed by clinical experts, and oral health evaluation was thoroughly conducted by trained specialists in dentistry, which makes this study unique.[5–7] However, the sample size was small, leading to relatively imprecise estimates with wider 95% CIs.

In conclusion, our results suggested that older adults with NCDs had a higher number of dental caries than those with normal cognitive function, and participants with dementia had fewer natural teeth. This highlights

the need to improve the oral health care of home-dwelling older adults with NCDs.

AUTHOR CONTRIBUTIONS

MD wrote the initial draft of the manuscript. XMM and YQS performed the literature search and contributed to the study design. GS, HKS, and YQS were responsible for data collection. MD, EOA, and YQS conducted statistical analyses and interpreted results. MD, EOA, RSE, GS, HKS, XMM, YC, and YQS participated in the data interpretation and the manuscript writing with important intellectual content and approved the final version.

ACKNOWLEDGMENTS

The Trøndelag Health Study is a collaboration between the HUNT Research Centre (Faculty of Medicine and Health Sciences, NTNU, Norwegian University of Science and Technology), Trøndelag County Council, Central Norway Regional Health Authority, and the Norwegian Institute of Public Health.

FUNDING INFORMATION

The project was supported by the Dam Foundation (Project ID: 2021/FO347301) through the Norwegian Health Association. YQS was supported by a Research grant from The Liaison Committee for Education, Research and Innovation in Central Norway (project ID 2018/42794).

CONFLICT OF INTEREST STATEMENT

There are no competing interests provided for any authors.

SPONSOR'S ROLE

The sponsors had no role in study design, data collection, analysis, decision to publish, or manuscript preparation.

DATA AVAILABILITY STATEMENT

Data from the HUNT Study used in research projects will, when reasonably requested by others, be made available on request to the HUNT Data Access Committee. The HUNT data access information describes the policy regarding data availability (https://www.ntnu.edu/hunt/data).

ETHICS STATEMENT

The study was approved by the Norwegian Regional Committees for Medical and Health Research Ethics (no. 31812). All HUNT participants have signed informed consent for participation and the use of data in research.

ORCID

Marion Denos https://orcid.org/0000-0003-4134-9156
Håvard Kjesbu Skjellegrind https://orcid.org/0000-0003-3067-0016
Yi-Qian Sun https://orcid.org/0000-0002-9634-9236

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplementary Table S1. The relationship between cognitive function and number of decayed missing and filled teeth (DMFT) ($n = 633$).
Supplementary Table S2. The relationship between cognitive function and number of natural teeth ($n = 633$).

How to cite this article: Denos M, Asante EO, Eldholm RS, et al. The association between clinically evaluated cognitive function and oral health in Norwegian older adults: The HUNT Study. *J Am Geriatr Soc*. 2024;1-4. doi:10.1111/jgs.19103