ZAHNMEDIZIN, FORSCHUNG UND VERSORGUNG
Das Online-Journal des Instituts der Deutschen Zahnärzte (IDZ)

Association between migration history and oral health – results of the 6th German Oral Health Study (DMS • 6) – Online Appendix

AUTHORS

Berit Lieske, University Medical Center Hamburg-Eppendorf
Prof. Dr. Liane Schenk, Charité Berlin & Humboldt-University Berlin
Dr. Kathrin Kuhr, Institut der Deutschen Zahnärzte (IDZ)
Dr. Vinay Pitchika, LMU Munich
Katrin Borof, University Medical Center Hamburg-Eppendorf
Prof. Dr. A. Rainer Jordan, Institut der Deutschen Zahnärzte (IDZ)
Priv.-Doz. Dr. Ghazal Aarabi, University Medical Center Hamburg-Eppendorf

ABSTRACT

Objectives: Studies have demonstrated a significant association between migration history and oral health. Even after adjusting for confounders, migration history remains an independent risk factor for poorer oral health. As part of the 6th German Oral Health Study (DMS • 6), disease and care prevalence among individuals with migration history was surveyed at the population level. This article aims to assess the relationship between migration history, education status, and oral health.

Method and Materials: The analyses of the relationship between migration history and various oral health outcomes were conducted separately for younger adolescents (12-year-olds), adults (20-year-olds, 35- to 44-year-olds, 43- to 52-year-olds), and seniors (65- to 74-year-olds, 73- to 82-yearolds).

Results: A significant association between migration history and poorer oral health outcomes, as well as less favorable oral health behaviors, was observed across all age groups. After adjusting for age, gender, and education, individuals with migration history exhibited higher levels of plaque, more bleeding sites, a higher prevalence of decayed teeth, insufficient tooth brushing frequency, and complaint-oriented dental service utilization.

Conclusion: Previous studies have consistently identified education as a risk factor for poorer oral health. In the present study, even after adjusting for education status in multivariate models, the association between migration history and oral health outcomes remained significant. This finding underscores migration history as an independent risk factor for poorer oral health outcomes. This is the first large-scale cohort study in Germany to analyze the relationship between migration history and multiple oral health outcomes across different age groups. Future research should focus on uncovering migration-related factors, health literacy, and health behaviors to better explain the observed differences and improve oral health for migrant populations.

KEYWORDS: cross-sectional studies, dental care, dentists, DMS 6, education, epidemiology, health behavior, human migration, oral health

Table of contents

Appendix 1

Statistical Analyses

In this study, we performed multiple association analyses across different age groups (younger adolescents, adults, and seniors) to evaluate the relationship between migration history and various oral health outcomes. The primary exposure of interest was migration history, a categorical variable that distinguished between migrant and non-migrant groups. The outcome variables were diverse and included both clinical and behavioral oral health indicators, specific to each age group:

1. Younger adolescents (Age group: 12-year-olds):
    a) Number of sound teeth (ST; continuous).
    b) Number of decayed teeth (DT; binary: DT ≥ 1 vs. DT = 0).
    c) Modified Marginal Plaque Index (mMPI; % segments with plaque).
    d) Self-assessment of oral health status (binary: moderate/poor/very poor vs. very good/good).
    e) Tooth brushing frequency (binary: < 2 times daily / ≥ 2 times daily).
    f) Interdental cleaning frequency (binary: < once daily / ≥ 2 once daily).
    g) Dental service utilization (binary: complaint-oriented vs. control-oriented).

2. Adults (Age groups: 20-year-olds, 35- to 44-year-olds, and 43- to 52-years-olds):
    a) Number of teeth (binary: < 28 teeth vs. 28 teeth).
    b) Number of decayed teeth (DT; binary: DT ≥ 1 vs. DT = 0).
    c) Mean probing depth (PD; continuous, in millimeters).
    d) Mean clinical attachment level (CAL; continuous, in millimeters).
    e) Bleeding on probing (BOP; % sites).
    f) Self-assessment of oral health status (binary: moderate/poor/very poor vs. very good/good).
    g) Tooth brushing frequency (binary: < 2 times daily / ≥ 2 times daily).
    h) Interdental cleaning frequency (binary: < once daily / ≥ 2 once daily).
    i) Dental service utilization (binary: complaint-oriented vs. control-oriented).

3. Seniors (Age groups: 65- to 74-year-olds and 73- to 82-year-olds):
    a) Number of teeth (binary: < 20 vs. ≥ 20).
    b) Number of decayed teeth (DT; binary: DT ≥ 1 vs. DT = 0).
    c) Mean probing depth (PD; continuous, in millimeters).
    d) Mean clinical attachment level (CAL; continuous, in millimeters).

e) Bleeding on probing (BOP; % sites).
f) Root caries (binary: yes vs. no).
g) Self-assessment of oral health status (binary: moderate/poor/very poor vs. very good/good).
h) Tooth brushing frequency (binary: < 2 times daily / ≥ 2 times daily).
i) Interdental cleaning frequency (binary: < once daily / ≥ 2 once daily).
j) Dental service utilization (binary: complaint-oriented vs. control-oriented).

Data Preparation

Because the gamma-distribution model does not accept observations with zero values, we added a minor constant value (0.01) to all mean CAL values as a part of the data preparation step. Similarly, the percentage of bleeding on probing values were converted to fractions ranging between 0 and 1; to be able to perform a fractional probit regression. Furthermore, due to the extensive data collection in study, there were 90 sample points; which were distributed along different regions (north-, south-, west- and east Germany) and community sizes (rural, urban, metropolitan area). Because the models could not be adjusted for 90 sample points, a composite region variable was developed using the regions and community sizes; resulting in 12 groups of regions (North Germany – Rural, North Germany – Urban, North Germany – Metro, South Germany – Rural, South Germany – Urban, South Germany – Metro, West Germany – Rural, West Germany – Urban, West Germany – Metro, East Germany – Rural, East Germany – Urban, and East Germany – Metro). This composite region variable was then used as a random effect variable in all models.

Modeling Approach

Appropriate models, such as generalized linear model with Gaussian or gamma distribution, Poisson regression with robust standard errors, and fractional probit regressions were selected based on the distribution of the outcome variables. We utilized mixed-effects regression models to estimate the associations between migration history and the aforementioned oral health outcomes. The models incorporated covariates such as age, gender and education as fixed effects and a composite region variable as a random effect, in a stepwise manner. All models were performed in a stepwise manner:

- Step 1: Basic models assessing the association between migration history (exposure) and the oral health outcome without any adjustments.
- Step 2: The models were adjusted for age (adults and seniors only) and gender.
- Step 3: Further adjustment was made by including education status in the model to account for socioeconomic differences.

The results from the models were presented as unstandardized coefficients (b) for generalized linear models and fractional probit regression models, and prevalence ratios (PR) for Poisson regression models along with their 95% confidence intervals and *P* values.

AUTHORS

Berit Lieske, M.Sc.
Department of Periodontics, Preventive and Restorative Dentistry, Center for Dental and Oral Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

Prof. Dr. phil. Liane Schenk
Charité – Universitätsmedizin Berlin, corporate member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Institute of Medical Sociology and Rehabilitation Science, Berlin, Germany

Dr. rer. medic. Kathrin Kuhr
Institut der Deutschen Zahnärzte (IDZ), Cologne, Germany

Vinay Pitchika, Ph.D.
Department of Conservative Dentistry and Periodontology, LMU Hospital, Munich, Germany

Katrin Borof, M.Sc.
Department of Periodontics, Preventive and Restorative Dentistry, Center for Dental and Oral Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

Prof. Dr. med. dent. A. Rainer Jordan, M.Sc.
Institut der Deutschen Zahnärzte (IDZ), Cologne, Germany

Priv.-Doz. Dr. med. dent. Ghazal Aarabi, M.Sc.
Department of Periodontics, Preventive and Restorative Dentistry, Center for Dental and Oral Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

CITATION

Lieske, B., Schenk, L., Kuhr, K., Pitchika, V., Borof, K., Jordan, A. R., Aarabi, G.: Association between migration history and oral health: results of the 6th German Oral Health Study (DMS • 6) – Online Appendix. Zahnmed Forsch Versorg 2025, 5: 14, http://dx.doi.org/10.23786/2025-5-14

PUBLICATION DATE

17.03.2025

IMPRESSUM

ZAHNMEDIZIN, FORSCHUNG UND VERSORGUNG

Das Online-Journal des Instituts der Deutschen Zahnärzte (IDZ)

ISSN

0931-9816

PUBLISHER

Institute of German Dentists (Institut der Deutschen Zahnärzte (IDZ)),
Universitätsstraße 73, 50931 Cologne
Funded by
German Dental Association (Bundeszahnärztekammer – Arbeitsgemeinschaft der deutschen Zahnärztekammern e. V. (BZÄK))
and National Association of Statutory Health Insurance Dentists (Kassenzahnärztliche Bundesvereinigung K. d. ö. R.)

EDITORIAL OFFICE

Prof. Dr. A. Rainer Jordan
Institute of German Dentists
Universitätsstraße 73
50931 Cologne

Phone: +49 221 4001-142
Fax: +49 221 4001-152
Web: www.idz.institute
E-Mail: dms6@idz.institute