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Research Article

Public Health Surveillance of Oral Health Literacy in Older Implant Patients: A Review of Current Monitoring Approaches

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Abstract

Oral health literacy (OHL) stands as an essential factor determining oral health outcome since older adults with dental implants need adequate understanding and abilities for maintaining implant durability and prevent negative outcomes. The status of OHL surveillance among this population lacks consistency throughout European healthcare systems which impedes the creation of specific interventions. This review examines current OHL monitoring approaches, highlights methodological gaps, and explores emerging strategies for improving surveillance. A comprehensive analysis of national oral health surveys, patient-reported outcome measures (PROMs), electronic health records (EHRs), and digital health tools reveals significant disparities in data collection, standardization, and integration. Findings suggest that leveraging artificial intelligence (AI), mobile health (mHealth) applications, and harmonized EU-wide health literacy assessments can enhance monitoring efforts. The improvement of oral health outcomes for older implant patients demands strong cross-border partnerships together with incorporated national health system standards for OHL metrics.

Keywords: Oral health literacy, public health surveillance, older adults, dental implants, European healthcare policy, digital health, health literacy assessment, patient outcomes..

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Introduction

Oral health literacy (OHL) is a critical determinant of oral health outcomes, particularly among older adults with dental implants, who require a high level of self-management to prevent complications such as peri-implantitis and implant failure (Poudel et al., 2024). The current public health in Europe lacks adequate integration of oral health literacy surveillance systems which produces gaps between monitoring data and intervention approaches (Carter et al., 2024). Health literacy has become a significant public health matter for the European Union, yet standardized methodologies for assessing OHL among aging populations remain underdeveloped (Yu et al., 2024). Emerging digital health solutions, such as mobile health (mHealth) applications and artificial intelligence (AI)-driven monitoring, offer new possibilities for enhancing surveillance, but disparities in digital literacy and accessibility persist (Tay et al., 2023). This review evaluates the present public health surveillance methods used for OHL in older implant patients while recognizing crucial barriers that exist and recommending specific framework development solutions.

Background and Theoretical Framework

Public health surveillance of oral health literacy (OHL) in older implant patients is an emerging area of research within European healthcare systems (Li et al., 2025). The ability of people to acquire and interpret fundamental oral health information defines their oral health literacy and impacts positively or negatively their health results especially among aging groups with advanced dental needs (Poudel et al., 2024). Dental implant patients who are elderly need sophisticated self-care information to keep their oral health in good condition and stop peri-implantitis and implant failure (Győrffy et al., 2023). The uneven distribution of OHL levels causes patients to present irregular treatment compliance and post treatment delays and generates

additional expenses for healthcare (Alzahrani et al., 2024). Public health surveillance systems require prioritization due to the growing numbers of elderly people receiving dental implants throughout Europe since OHL monitoring delivers essential information required to develop targeted interventions (Alzahrani et al., 2024).

Theoretical models of health literacy create fundamental principles which explain how OHL impacts oral healthcare results. The European Health Literacy Framework (HLS-EU) presents an appropriate model for measuring OHL among older adults because it focuses on their interactive abilities together with their critical thinking (Jessup et al., 2024). The framework demonstrates how literacy requires multiple dimensions because it enables people to both understand health information and use that knowledge to make decisions (Schlacher, 2024). The health literacy model applies a scale from functional literacy that includes basic reading abilities up to interactive critical literacy that shows effective health information application (Pavelić & Špiranec, 2022). The combination of theoretical perspectives provides public health initiatives with tools to create age-specific literacy interventions for implant patients (Thorat et al., 2024).

Assessment and surveillance of OHL shows an inconsistent approach in European nations because these measures lack proper integration within national health monitoring systems (Finbråten et al., 2024). General oral health trends revealed through the German *Deutsche Mundgesundheitsstudie* (DMS) as well as the Dutch National Oral Health Survey remain incomplete because both studies lack standardized OHL evaluation tools (Lösch et al., 2022). The use of patient-reported outcome measures (PROMs) for assessing oral health-related quality of life continues to face restricted application in older adult OHL surveillance (Alzahrani et al., 2024). Current surveillance methods used by member countries of the European Union lack standardization which produces barriers when seeking cross-border policy development (Berezowski et al., 2023). The current gaps in OHL detection need standard assessment methods that must integrate with healthcare systems and should prioritize digital monitoring solutions (Győrffy et al., 2023).

The combination of digital health with OHL creates both possibilities and obstacles when it comes to improving surveillance strategies. Modern mobile health (mHealth) technology, telehealth systems along with AI analytics performs real-time OHL evaluations while teaching patients through innovative solutions (Tay et al., 2023). The *Gesundheits-Apps* framework of Germany proves that OHL assessments can be embedded into common platforms to increase healthcare availability for elderly communities (BMG, 2025). Digital literacy gaps between older adults along with regulatory hurdles for data exchange continue to pose major challenges for implementation of health monitoring systems. Theoretical frameworks of digital health literacy require public health surveillance strategies because they serve to enhance emerging technology support rather than exacerbate existing inequalities (Rouleau et al., 2024). European healthcare systems can develop better surveillance systems for monitoring OHL in older implant patients through the integration of technological progress with proven health literacy frameworks.

Current Public Health Surveillance Methods

National oral health surveys serve as the main method for assessing oral health literacy scores among different population groups including elderly dental implant recipients. These extensive epidemiological surveys conduct cross-sectional assessments which collect population-wide data on oral health practices combined with literacy proficiency and care accessibility for public health planning (Samami et al., 2024). In Germany, the *Deutsche Mundgesundheitsstudie* (DMS) has been instrumental in monitoring national oral health trends; however, it does not specifically evaluate OHL among implant patients (Rouleau et al., 2024). These surveys present population-level data but their accuracy can be affected by self-reported information which leads to assessment biases (Alzahrani et al., 2024).

Electronic Health Records (EHRs) and national dental registries provide real-time clinical data on patients' oral health conditions, treatment histories, and compliance with post-implant care. These health surveillance systems in Germany and Sweden work together with public health systems to track implant-related data for monitoring operatory health developments (Győrffy et al., 2023). EHRs enable patient outcome tracking throughout years but they do not have established assessment measures for OHL which creates difficulties in measuring treatment adherence in relation to literacy levels (Wong et al., 2022). The General Data Protection Regulation (GDPR) in the EU restricts data sharing under privacy regulations which creates obstacles for conducting cross-border comparisons (European Health Union, 2025).

Patient-Reported Outcome Measures (PROMs) are widely used in oral health research to assess patient perspectives on treatment effectiveness, quality of life, and self-care practices. Standardized questionnaires measure the impact of OHL on implant maintenance through assessments of subjective experiences accompanied with self-efficacy

in oral health management (Bonsel et al., 2024). In Germany, PROMs have been incorporated into national health assessments but are not yet systematically used for tracking literacy levels in older adults with implants (Winkler et al., 2023). Patient self-assessment in PROMs creates a major weakness because cognitive biases and health literacy decline in aging populations influence their responses (Poudel et al., 2024).

Telehealth coupled with mobile health applications (mHealth) has become an innovative approach for monitoring OHL in older adults within remote or neglected locations. The expansion of *Gesundheits-Apps* health apps by Germany has increased both digital remote consultations and digital oral health education opportunities (Lösch et al., 2022). Users of these digital platforms can perform interactive tests on health literacy while receiving tailored educational content for implant patients. The effectiveness of telehealth for OHL improvement faces restrictions because older adults show varying levels of digital competence when using advanced digital health systems (Chan et al., 2023).

AI-driven surveillance methods, including biometric assessments and machine learning algorithms, are increasingly used to predict oral health outcomes based on behavioral and clinical data. The AI-based diagnostic tools evaluate oral health management abilities through an analysis of patient speech patterns together with oral microbial data and implant wear indicators (Tay et al., 2023). The adoption of public health surveillance methods has been impeded by national healthcare systems because of the expensive installation costs and questions about patient information protection (European Health Union, 2025). Community-driven public health programs play a crucial role in improving and monitoring OHL, particularly among vulnerable populations. The *Mundgesundheit* 2030 initiative in Germany leads their efforts to educate and provide preventive care for older adults with implants (Winkler et al., 2023). These programs work through collaboration with dental clinics as well as retirement homes and public health agencies to perform literacy tests and deliver interventions (Gcp, 2023). Such initiatives face limits in sustainability because they require ongoing policy support and sufficient funding (Calabrese & Rawal, 2023).

Challenges and Gaps in Surveillance

One of the most significant challenges in public health surveillance of OHL among older implant patients is the absence of standardized measurement tools (Yu et al., 2024). The general information revealed through national oral health surveys and patient-reported outcome measures (PROMs) about oral health behaviors does not sufficiently address health literacy complexities among aging individuals (Calabrese & Rawal, 2023). Health Literacy Survey (HLS-EU) provides general health assessment whereas it lacks specific indicators for oral health (Carter et al., 2024). The inconsistency of comparison metrics between countries hinders the development of specific interventions aimed at older adults with dental implants because such metrics lack universal acceptance and validation (Győrffy et al., 2023).

Despite the increasing integration of digital health tools in public health surveillance, disparities in digital literacy pose a major barrier to effective monitoring of OHL in older adults. Many telehealth platforms and mobile health applications designed to improve oral health education require technological proficiency, which may be lacking among elderly populations (Li et al., 2025). Research suggests that disadvantaged older adults avoid digital health resources and this discrimination worsens current oral healthcare inequalities (Chan et al., 2023). National e-health initiatives launched by Germany and various EU countries face limitations which prevent their wide use due to differences in internet access and language support together with population abilities to utilize these systems (Thorat et al., 2024).

The lack of coordination between national healthcare systems within the European Union hinders comprehensive public health surveillance of OHL. National oral health records maintained by Germany Sweden and the Netherlands do not integrate at European level under current data collection method variability and privacy regulations (European Health Union, 2025). The General Data Protection Regulation (GDPR), while essential for patient privacy, complicates data-sharing initiatives necessary for multinational public health research (Samietz et al., 2025). The lack of standardized data collection methods impairs policymakers as well as researchers from determining OHL progress while developing effective strategies for implant-related oral health outcomes among older adults (Samami et al., 2024).

The research domain maintains limited investigation of older adults who need complicated dental treatment including implant cases. Research surveys directed at epidemiological studies mainly focus on young populations and basic oral health metrics yet fail to address the needs of aging adults (Győrffy et al., 2023). Elderly populations face barriers during literacy assessment participation due to cognitive decline, mobility limitations and comorbidities condition which results in a lower detection of illiteracy rates (Li et al., 2025). The research gap prevents

policymakers from creating specific interventions which would reduce the effectiveness of public health programs that target improved OHL outcomes in the elderly implant patient population (Chan et al., 2023).

Best Practices and Emerging Approaches

One of the most effective strategies for improving public health surveillance of OHL among older implant patients is the integration of standardized literacy assessments into routine dental care and national health surveys. Current health monitoring activities in the Netherlands and Sweden have started adopting validated OHL tools including Oral Health Literacy Instrument (OHLI) and Health Literacy Questionnaire (HLQ) as part of their national health surveillance frameworks (Li et al., 2025). The *Deutsche Mundgesundheitsstudie* (DMS) in Germany can strengthen its data collection methods through OHL-specific indicators to achieve better literacy assessments of population groups that are aging (Winkler et al., 2023). The implementation of these tools within patient intake methods and electronic health records permits public health organizations to consistently monitor literacy developments for targeted intervention development (Győrffy et al., 2023).

The expansion of digital health solutions offers a promising avenue for enhancing OHL surveillance. Mobile health (mHealth) applications, telehealth platforms, and artificial intelligence (AI)-driven diagnostic tools enable real-time monitoring of patient literacy and engagement with oral health education resources (Thorat et al., 2024). Germany's digital health initiatives, such as the *Gesundheits-Apps* framework, provide opportunities to integrate OHL assessments into widely used digital platforms, ensuring broader accessibility for older adults (Lösch et al., 2022). AI tools provide both diagnostic functionality through patient analysis that detects education gaps with a subsequent health education optimization to boost treatment compliance (Chan et al., 2023). Systemic digital access problems and digital literacy disparities continue to be major issues that should be resolved because they constrain healthcare opportunities for particular population groups (European Health Union, 2025).

A coordinated, EU-wide approach to OHL surveillance is essential to address inconsistencies in data collection and policy implementation across member states. The European Commission emphasizes standardizing health literacy monitoring indicators as part of European Health Union initiatives by promoting multi-nation collaborative efforts for better data harmonization (European Health Union, 2025). The governments of Germany, France and Denmark started combined research to establish OHL monitoring best practices but additional union-wide health policy integration is essential (Calabrese & Rawal 2023). Organizations should create a centralized database system together with standard data privacy regulations that conform to GDPR ideals to improve tracking patterns, intervention assessment and policy based on research evidence (Carter et al., 2024).

Conclusion and Policy Recommendations

European healthcare systems need stronger public health surveillance of oral health literacy (OHL) among older implant patients because this area remains both essential and underdeveloped. While existing methods such as national oral health surveys, patient-reported outcome measures (PROMs), and electronic health records (EHRs) provide valuable insights, they lack standardized indicators to assess OHL comprehensively. The increasing integration of digital health solutions and artificial intelligence (AI)-driven monitoring presents new opportunities, yet disparities in digital literacy and fragmented data-sharing policies across European countries hinder their effectiveness. Addressing these gaps is essential for ensuring that older adults, particularly those with complex dental needs, receive adequate support to maintain oral health and implant longevity.

To enhance surveillance and improve public health outcomes, policymakers should prioritize the development of standardized OHL metrics for inclusion in national and EU-wide health assessments (*National Health Initiatives, Strategies & Action Plans*, 2024). Investments in digital health literacy programs are necessary to bridge the technological divide among aging populations, ensuring equitable access to telehealth and mobile health (mHealth) solutions. Furthermore, strengthening cross-border collaboration through harmonized data-sharing frameworks, while maintaining compliance with the General Data Protection Regulation (GDPR), will facilitate more comprehensive monitoring of OHL trends across Europe. European health authorities can enhance the data-driven improvement of oral health literacy by implementing these measures which will boost both implant patient care quality and their clinical outcomes.

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