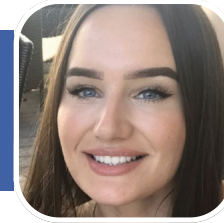




Investigating a correlation between poor oral health in the hospitalised geriatric population and an increased risk of mortality: what can we do?



Amelia Davidge is a third year student at the

University of the Highlands and Islands (UHI). This article is a condensed version of the research she conducted as part of her course.

Abstract

Objective To review existing literature on oral health status (OHS) and its correlation with an increased mortality risk within the hospitalised geriatric population, to determine suitable guidance and protocols.

Methodology A search using several databases was undertaken for available publications. Medical subject headings (MeSH) search terms, Boolean operators and truncators were applied. Exclusion and inclusion criteria were utilised to screen the 303 results, and five papers were critically appraised.

Results Two papers assessed oral health (OH) interventions and their relationship with mortality outcomes; the remaining three were observational only. The three observational studies assessed OH using various validated tools and indices against hospital records or phone call follow-ups for mortality outcome comparisons. Except for the systematic review, all studies found a correlation between OH and an increased mortality risk.

Conclusion Evidence for mortality outcomes among hospitalised geriatrics with an OH assessment for comparisons is limited. A correlation can be made with caution, but the current evidence cannot determine a causal relationship, highlighting the need for advanced interventional multi-centred studies.

Introduction

The percentage of the elderly population in the UK is increasing; 11 million people are aged 65 and over, accounting for 19% of the total population.¹ The average life expectancy is now 79.0 years for males and 82.9 years for females.² Although, in the UK, the number of years an individual can expect to have good health without a disabling illness is 62.0 years for males and 60.7 years for females.³ Advancing age is associated with many comorbidities making the geriatric population more likely to suffer from health conditions and more likely to require hospital admission; two-thirds of all hospital admissions are by people aged 65 years and over.⁴

Elderly patients are also at an increased risk of oral diseases such as dental caries (DC) and periodontal disease (PD) as dental trends demonstrate the elderly retain a fuller natural dentition for longer, with restorations and prosthetics.⁵ Dentition retention poses an increased risk of poor general health as there is a breadth of evidence proving the directional relationship between OH and systemic diseases such as cardiovascular disease (CD) and diabetes by Kane,⁶ and rheumatoid arthritis by Detert *et al.*⁷ Therefore, complications arising from OH neglect pose an increased risk of mortality due to dental plaque bacteria aggravating existing chronic disease.^{8,9} For this literature review, increased mortality risk can be defined as a death occurring, a decline in general health or poorer prognostic outcomes.

Poor OH causing increased mortality risk is identified from a causal link between PD and respiratory disease, including exacerbation of chronic obstructive pulmonary disease (COPD)¹⁰ and aspiration pneumonia.¹¹ Accordingly, the Department of Health¹² advised mouth hygiene as a benchmark in the NHS Essence of Care best practice guidance, and The World Health Organisation¹³ (WHO) stated, 'OH as an essential determinant of quality of life, overall health, and happiness'.

Despite this, policies for preventative oral care (OC) measures in hospitals are found wanting,¹⁴ and government-funded oral health programmes no longer extend to hospitals.^{15,16}

During hospitalisation, the patient is often removed from a setting where a carer delivers OC if the patient lacks competency in self-care or if they are independent, their routine for self-care becomes disrupted, resulting in a decline in OHS for the patient.¹⁷ Hospital admission alone poses the risk of rendering a patient reliant

on support for OC due to the increased risk of delirium in over 65s in the acute medical setting.¹⁸ Nurses and healthcare assistants are immeasurable in a patient's general health. However, the current nursing curriculum lacks sufficient education on OC for complex restored dentition and prostheses.^{19,20} Additionally, healthcare assistants (HCA) receive no training in OC during their certification, despite being the primary providers of mouth care for in-patients within hospitals.¹⁴ Without training, nurses and HCAs cannot deliver proper oral care. Furthermore, most hospital trusts do not have established referral pathways for dental services, and failure to provide dental services for in-patients can lead to longer hospital admissions and increased mortality risk.²¹

This literature review aims to investigate current evidence relating to the role of poor OH in mortality risk for hospitalised geriatric (>65 aged) patients. Identifying needs in care delivery is one of the first steps to implementing changes and removing disparities in OH among the elderly. Furthermore, investigating a correlation identifies a need for future research to be conducted to formulate or utilise preventative guidance for an improved prognostic outcome.

Methodology

A provisional search was conducted in September 2022, using the advanced search option in Google Scholar with the following key terms: geriatric, elderly, oral health, DMFT, mortality and death. This generated 238 results

'A personal driver for this review is witnessing an unsatisfactory level of OC delivered to my grandmother while in hospital. Education and exercise of oral and denture care appeared to be a low priority.'

Part of a dental therapist's (DT) role is the education on oral and overall health; this is mostly within the general dental setting or public dental services (PDS), but they can provide treatment in the community (NHS). In addition, a DT's role concerning geriatric dental care can include domiciliary visits to care homes for dental treatment and care staff education. However, a study by Monaghan and Morgan²² expressed that DTs are underutilised within this setting. Therefore, I believe there is a need to fully utilise a DT's scope of practice within PDS, with their remit extending to OC and education within the hospital setting.

A personal driver for this review is witnessing an unsatisfactory level of OC delivered to my grandmother while in hospital. Education and exercise of oral and denture care appeared to be a low priority. During admission, her COPD rapidly accelerated to end-stage, which was cited as the cause of death. I have often thought about the role OH played in her passing.

published between 2012–2022.

Following the provisional search, an improved strategy was implemented for a focused and more comprehensive search. Several databases were utilised: PubMed, UHI Multisearch and EBSCO. For a more refined search in line with the focused PICO question, the key terms were expanded from the provisional search with Boolean logic, MeSH terms and truncators applied. The search terms were used within [title] and [abstract], which yielded 515 publications. Duplicates and results where access to the full text was unavailable were removed, and 303 publications were screened resulting in the exclusion of 296 publications, leaving six papers remaining for the critical appraisal process. Before the critical appraisal, it was noted that the lead author of two papers had used the same cohort of participants within the separate studies. In addition, an intervention used in the non-randomised control trial was not declared within the cohort paper. Posing a high risk of concurrent intervention bias, it was

decided to keep only the publication containing the intervention. A total of five papers were critically appraised using the Critical Appraisal Skills Programme (CASP) checklists²³ and the *BMJ* cross-sectional analysis appraisal tool.²⁴ This included two cohort studies, one cross-sectional, one non-randomised control trial and one systematic review.

Results

Amongst the results, a range of study methodologies was used, measuring different outcomes and exposures with a large sample of diagnostic and OH indices utilised; therefore, a direct 1-1 comparison of the results cannot be made.

All three observational papers displayed a link between poor OH and an increased risk of mortality, Maeda and Mori,²⁵ Noetzel *et al.*²⁶ and Bartoli *et al.*²⁷ The non-randomised control trial by Shiraishi *et al.*²⁸ showed that OH interventions by a dental hygienist (DH) were associated with lower in-hospital mortality. These results were echoed in the systematic review by Sjögren *et al.*,²⁹ where it was found that the mortality risk from hospital-acquired pneumonia (HAP) improved with dental personnel OC interventions but did not improve when nursing personnel provided OC.

Maeda and Mori²⁵ reported that poor OH in older patients at the time of hospitalisation was associated with an increased risk of in-hospital mortality. Eighteen percent of oral health assessment tool (OHAT) >3 group patients died compared to 6.3% of OHAT 1–2 and 5.2% of OHAT 0. Following post-hoc Bonferroni correction ($P = 0.001$) was observed for all three OHAT groups.

Noetzel *et al.*²⁶ found that poorer OH and the multidimensional prognostic index (MPI) were independently associated. Fifty percent of MPI 3 patients had died at the six-month follow-up, 23% of MPI 2 and 12.5% of MPI 1. However, the brief oral health status examination (BOHSE), geriatric oral health assessment index (GOHAI) and decayed, missing, filled teeth index (DMFT) had no significant association with direct mortality; however, MPI is used as a mortality risk predictor.

Bartoli *et al.*²⁷ demonstrated that PD was an independent one-year mortality predictor; 96.7% of patients who died within one year had PD. Bartoli *et al.*²⁷ also found that plaque indices (PI) were an indicator of mortality in the MPI model but not in the model of comprehensive geriatric assessment (CGA) comprising all

variables; however, it was recognised that hospitalisation may have impacted PI due to interference with normal OH regime.

Shiraishi *et al.*²⁸ stated in their findings that DH care was independently associated with lower in-hospital mortality after adjusting for covariates, evidenced by a 2% mortality rate with DH care vs 11% without DH care.

Meta-analysis of five RCTs in the systematic review by Sjögren *et al.*²⁹ found that OC interventions provided by professional dental personnel such as dentists, dental hygienists or other dental personnel reduced the HAP mortality risk with a 95% confidence interval. However, OC interventions provided by nursing personnel resulted in only a slight statistical difference in the mortality risks of HAP compared to usual oral care, a mortality range of 1.7% to 28.1% in the intervention group compared to 1.6% to 20.0% in the control group, with a moderate certainty of the evidence.

measurement is objective and absolute, which aids in reducing the risk of detection and performance bias. Three of the five studies were observational studies.

A clear theme throughout the literature was that poor OH was positively and independently associated with a higher mortality outcome or risk. However, despite this evidence, hospital OH policies lack clear guidance for healthcare staff.¹⁴

There were many limitations to this literature review; the word count is limited to 3,520, with a restricted time frame; therefore, critical appraisal of the evidence included was condensed. Secondly, the available research was a heterogenous mixture, making it difficult to perform direct 1-1 comparisons, adding to limitations in directly answering the PICO question. Finally, the lack of RCTs within the literature can be explained by ethical restrictions within that study type when measuring mortality as an outcome.

‘It is anticipated that studies will continue to raise recognition of the importance of OH within geriatric patient care, such as daily toothbrushing and manual cleaning of dentures aiming to reduce the risk of oral diseases.’

Discussion

This literature review investigated a correlation between poor OH in the hospitalised geriatric population and increased mortality risk. The review has highlighted the need for further research. Despite the breadth of evidence concerning OHS, general health and mortality outcomes, there is a lack of evidence specifically about geriatrics in a hospital setting. The geriatric patient demographic is likely to have multiple confounding factors, making the results of previous studies, where participants are not specific to this focused demographic, less transferrable.

All five studies measure death as either the primary or secondary outcome; this

Conclusions

The present literature suggests a correlation between poor OHS and mortality risk may exist within the hospitalised geriatric patient. However, this must be engaged with caution as much of the evidence is only observational, which limits identifying a causal relationship. To conclude, the question has not fully been answered; without establishing a causal relationship by manipulation of the variables, determining recommendations for practice in ‘what can we do scenarios’ is limited.

Recommendations

Further research is warranted, and it would be beneficial if future observational studies

were multi-centred and interventional, where ethical restrictions allow. A standardised methodological process should be conducted so that a direct 1-1 comparison can be made. The results can then be pooled together for meta-analysis. Acute trusts can then utilise that research and formulate evidence-based guidelines for in-hospital oral healthcare services to eliminate inequalities in geriatric oral healthcare for an improved prognosis.

In the interim, it is anticipated that studies such as the ones within this literature review will continue to raise recognition of the importance of OH within geriatric patient care, such as daily toothbrushing and manual cleaning of dentures aiming to reduce the risk of oral diseases.

References

1. Centre for Ageing Better. *Summary. The State of Ageing 2022*. Available at: <https://ageing-better.org.uk/summary-state-ageing-2022> (accessed 14 October 2022).
2. Office for National Statistics. *Health state life expectancies, UK: 2018 to 2020*. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/healthstatelifeexpectanciesuk/2018to2020> (accessed 18 October 2022).
3. Office for National Statistics. *National life tables – life expectancy in the UK: 2018 to 2020*. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/nationallifetablesunitedkingdom/2018to2020> (accessed 18 October 2022).
4. Nuffield Department of Population Health. *Hospital or 'hospital at home' – what's best for older people?* Available at: <https://www.ndph.ox.ac.uk/longer-reads/hospital-or-2018hospital-at-home2019-2013-what2019s-best-for-older-people> (accessed 15 October 2022).
5. Watt R, Steele J, Treasure E, White D A, Pitts N B, Murray J J. Adult Dental Health Survey 2009: implications of findings for clinical practice and oral health policy. *Br Dent J* 2013; **214**: 71–75.
6. Kane S F. The effects of oral health on systemic health. *Gen Dent* 2017; **65**: 30–34.
7. Detert J, Pischon N, Burmester G R, Buttgerit F. The association between rheumatoid arthritis and periodontal disease. *Arthritis Res Ther* 2010; doi: doi: 10.1186/ar3106.
8. Paganini-Hill A, White S C, Atchison K A. Dental health behaviors, dentition, and mortality in the elderly: the leisure world cohort study. *J Aging Res* 2011; doi: 10.4061/2011/156061.
9. Klotz A L, Hassel A J, Schröder J, Rammelsberg P, Zenthöfer A. Is compromised oral health associated with a greater risk of mortality among nursing home residents? A controlled clinical study. *Aging Clin Exp Res* 2018; **30**: 581–588.
10. Cullinan M P, Seymour G J. Periodontal disease and systemic illness: will the evidence ever be enough? *Periodontol* 2000; 2013; **62**: 271–286.
11. Müller F. Oral hygiene reduces the mortality from aspiration pneumonia in frail elders. *J Dent Res* 2015; **94**: 14S–16S.
12. Department of Health. *Essence of Care 2010. Benchmarks for Personal Hygiene*. Norwich: The Stationery Office, 2010. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/216697/dh_119976.pdf (accessed 28 October 2022).
13. World Health Organization. *Oral health*. Available at: https://www.who.int/westernpacific/health-topics/oral-health#tab=tab_1 (accessed 25 October 2022).
14. Binks C, Doshi M, Mann J. Standardising the delivery of oral health care practice in hospitals. *Nursing Times* 2017; **113**: 18–21.
15. NICE. *Oral health in care homes and hospitals NICE quality standard. Draft for consultation*. 2017. Available at: <https://www.nice.org.uk/guidance/qs151/documents/draft-quality-standard> (accessed April 2023).
16. Mouth Care Matters. *The Mouth Care Matters programme has now closed*. 14 February 2020. Available at: <https://mouthcarematters.hee.nhs.uk/2020/02/14/the-mouth-care-matters-programme-has-now-closed/index.html> (accessed 18 October 2022).
17. Terezakis E, Needleman I, Kumar N, Moles D, Agudo E. The impact of hospitalization on oral health: a systematic review. *J Clin Periodontol* 2011; **38**: 628–636.
18. Wand A P, Thoo W, Ting V, Baker J, Sciuriaga H, Hunt G E. Identification and rates of delirium in elderly medical in-patients from diverse language groups. *Geriatr Nurs* 2013; **34**: 355–360.
19. Salamone K, Yavoub E, Mahoney A, Edward K. Oral care of hospitalised older patients in the acute medical setting. *Nurs Res Pract* 2013; doi: 10.1155/2013/827670.
20. Doshi M, Mann J, Quentin L, Morton-Holtham L, Eaton K A. Mouth care training and practice: a survey of nursing staff working in National Health Service hospitals in England. *J Res Nurs* 2021; **26**: 574–590.
21. Hashem I, Gillway D, Doshi M. Dental care pathways for adult in-patients in an acute hospital: a five-year service evaluation. *Br Dent J* 2020; **228**: 687–692.
22. Monaghan N P, Morgan M Z. What proportion of dental care in care homes could be met by direct access to dental therapists or dental hygienists? *Br Dent J* 2015; **219**: 531–534.
23. CASP. *CASP Checklists*. Available at: <https://casp-uk.net/casp-tools-checklists/> (accessed 20 October 2022).
24. Downes M J, Brennan M L, Williams H C, Dean R S. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open* 2016; doi: 10.1136/bmjopen-2016-011458.
25. Maeda K, Mori N. Poor oral health and mortality in geriatric patients admitted to an acute hospital: an observational study. *BMC Geriatr* 2020; doi: 10.1186/s12877-020-1429-z.
26. Noetzel N, Meyer A M, Siri G *et al*. The impact of oral health on prognosis of older multimorbid in-patients: the 6-month follow up MPI oral health study (MPIOH). *Eur Geriatr Med* 2021; **12**: 263–273.
27. Bartoli G, Omicciolo C, Fiorenzato F *et al*. Oral health status as predictor of 1-year mortality after discharge from an acute geriatric unit. *Eur Geriatr Med* 2019; **10**: 889–897.
28. Shiraishi A, Yoshimura Y, Wakabayashi H, Tsuji Y, Yamaga M, Koga H. Hospital dental hygienist intervention improves activities of daily living, home discharge and mortality in post-acute rehabilitation. *Geriatr Gerontol Int* 2019; **19**: 189–196.
29. Sjögren P, Wårdh I, Zimmerman M, Almstahl A, Wikström M. Oral care and mortality in older adults with pneumonia in hospitals or nursing homes: systematic review and meta-analysis. *J Am Geriatr Soc* 2016; **64**: 2109–2115.

<https://doi.org/10.1038/s41407-023-1815-4>