

## APPENDIX

### SUMMARY OF INCLUDED STUDIES

| ARTICLE                     | DESIGN  | SUBJECTS   | AGE GROUP | SETTINGS  | AIM  | OUTCOME/CONCLUSION  |
|-----------------------------|---|------------|-----------|---|--|---|
| Wu <i>et al.</i> 2018       | CSS   | 195        | ≥65years  | Five Community Centres in Hong Kong                               | Identified oral health indicators for malnutrition risk among elderly  | Subjective oral health measure (GOHAI) is a better useful indicator for risk of malnutrition in the elderly compared with clinical parameters.<br>60% of subjects reported negative impact of oral health on their quality of life.<br>30 % were malnourished or at risk.   |
| Burks <i>et al.</i> 2017    | Prospective cross sectional multicentre study | 252        | ≥65years  | Three Emergency Depts in the South, Northeast And Midwest of USA. | Identified the modifiable risk factors associated with malnutrition in elderly patients.   | Poor oral health (54%; 95% CI 16%, 78%) accounts for the highest risk factor [population attributable risk proportion (PARP)] for malnutrition. Other identified risk factors for malnutrition were: food insecurity, depressive symptoms, lack of transportation, and drugs side effects. Malnutrition prevalence was 12%. |
| DeMarchi <i>et al.</i> 2008 | CSS with simple random sampling.              | 471        | ≥60years  | Subjects from municipality registers in Brazil.                   | Evaluated whether poor oral status was associated with malnutrition/ malnutrition risk.  | MNA finding showed that subjects with poor oral status and unhappiness with their gingival health ( $OR=1.76$ ; $95\ CI=1.10-2.83$ ) had increased chance of malnutrition risk.<br>125(26.5%) subjects had risk of malnutrition while 6 (1.3%) subjects were malnourished.  |
| Toniazzo <i>et al.</i> 2017 | Systematic review and Meta-analysis           | 26 studies | ≥60years  | Review and analysis of primary data.                              | Assessed if malnutrition/ malnutrition-risk determined by MNA or SGA is related to oral health status in older adults.               | Analysis of mean number of teeth present indicated that the participants who were malnourished or at risk of malnutrition had significantly fewer teeth ( $SMD: -0.141$ ; $95\%CI -0.278\ to\ -0.00502$ ) compared with subjects who had normal nutrition.  |
| Cousson <i>et al.</i> 2012  | Prospective survey study                      | 97         | ≥60years  | Elderly patients visiting dental hospital in France               | Determined whether elderly complete denture wearers have greater risk of malnutrition compared with the fully dentate control group. | Mean MNA scores was $25.86 \pm 2.89$ for the complete denture wearers and $28.21 \pm 1.53$ for the control group.<br>MNA scores indicated that more people in the edentulous group (21.3%) were at risk of malnutrition compared to the fully dentate control group (0%).   |

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| Dharma <i>et al.</i> 2017      | CSS   | 340   | >60years                      | community-dwelling older population group in India   | Evaluated the behaviour of GOHAI and OIDPs as potent measures in oral health related to quality of life in elderly.                         | GOHAI score shows that most of the subjects with a lowest mean score of 2.12 and 2.13 had difficulty in chewing food and were unhappy with their condition of mouth and teeth. OIDP scores indicate that most subjects had problems with eating food (57.74) and speaking clearly (45.96). |
| Gil-Montoya <i>et al.</i> 2013 | CSS   | 250   | Mean age was 82.7 ± 8.2 years | institutionalized Spanish elders.  | Assessed for any association between oral health-related quality of life and malnutrition risk using the oral health impact profile (OHIP). | Malnutrition/risk was 3.43-fold more probable in subjects with OHIP-reported "problems" compared to those with none. After adjustment for age, sex, functional status, and mild dementia diagnosis, OHIP was associated with malnutrition/risk   |
| deAndrade <i>et al.</i> 2013   | Population-based cohort study               | 1,374 | ≥60years                      | community-dwelling adults in São Paulo, Brazil.  | Evaluated the theory that oral health conditions are associated with frailty independent of socioeconomic and general health status.        | Subjects requiring dental prostheses had a 46% greater chance of being prefrail than those without such a need, independent of socioeconomic and general health status. Elderly individuals with 21 or more teeth had 75% lower odds of being frail than those who were edentulous.        |
| Ramsay <i>et al.</i> 2017      | CSS and Cohort study with 3-year follow-up. | 1,622 | 71 to 92 years                | community-dwelling elderly population in 24 British towns.                                       | Investigated whether objective and subjective oral health measures have any association on physical frailty.                                | Occurrence of frailty was significantly higher in the older people who had complete tooth loss (OR=1.90 95% CI=1.03-3.52) as well as on those with more oral health problems such as dry mouth, gum problems and difficulty with eating (OR=2.71, CI= 1.11-6.62)                           |
| Huppertz <i>et al.</i> 2017    | CSS   | 3,220 | ≥65years                      | Data from the elderly people living in somatic and psychogeriatric wards of Dutch nursing homes. | Evaluated the association between range of oral health-related problems and malnutrition.   | Showed that subjects with poor oral health, mostly from poor eating due to artificial teeth problems were nearly twice to be malnourished (PR 1.8, 95% CI 1.5-2.2) compared with subjects who never had oral health problems.  |

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| Tanaka <i>et al.</i> 2012   | Baseline Survey and Follow-up  | 2,011            | ≥65years                       | Japanese community-dwelling elderly population   | Investigated whether poor oral status can predict future physical frailty  | Aggregated poor oral status, determined by number of natural teeth, oral motor skill, chewing and swallowing capability, over a period of time clearly increases the risk of developing unfavourable health outcomes, physical frailty, and mortality.                                     |
| El Helou <i>et al.</i> 2014 | CSS                            | 115              | ≥70years                       | Hospitalised patients at Lebanese public hospital.   | Assessed the relationship between oral health and nutritional status in a population of hospitalised elderly patients. | Results showed that 55.6% of the participants in need of dental care (GOHAI score >14) had risk of nutritional deficit (p = 0.019). Prevalence of malnutrition and malnutrition risk were 6.1% and 37.4% respectively.   |
| Guigoz 2006                 | Literature (systematic) Review | >30,000 subjects | Age range from 51 to 97 years. | Various settings (community, Home care, Outpatient, Hospital, and care facility) from different countries. | Investigated what the use of MNA as a screening and assessment tool tell us about malnutrition or malnutrition risk.   | MNA can detect malnutrition risk particularly when the BMI and other parameters are within normal range. MNA showed mean prevalence of malnutrition to be 1% in healthy community-dwelling elders, 20% in hospitalised elderly, and 37% among elderly in institution                       |
| Pereira <i>et al.</i> 2015  | CSS                            | 138              | ≥65years                       | ED patients in the southeast United States serving a racially and socioeconomically diverse population.    | Estimated the prevalence of malnutrition among older patients presenting to an emergency department (ED).              | 16% (95% CI 10%–22%) were malnourished and 60% (95% CI 52%–69%) were either malnourished or had malnutrition risk. Prevalence of malnutrition was higher among patients with depressive symptoms (52%), 50% in those residing in assisted living, and 38% in those with difficulty eating. |

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| Samnieng<br><i>et al.</i><br>2011 | CSS | 612 | Mean<br>age of<br>68.8                         | community-<br>dwelling adults<br>population in<br>Thailand | Evaluated the relationship of<br>Mini-Nutrition Assessment<br>(MNA) results with chewing<br>ability tests and oral health<br>status- number of teeth present<br>and functional tooth units<br>(FTUs).   | MNA scores indicate, 25.1% of participants had normal nutrition,<br>67.2% were at risk of malnutrition and 7.7% were grouped as<br>having malnutrition. The ANCOVA analyses adjusted for age and<br>gender showed that subjects with malnutrition had lower numbers<br>of teeth present (8.8), FTUs (8.4), and chewing ability (6.8)<br>compared to those with normal nutrition (13.3, 10.4 and 7.8) ( $p < 0.05$ ).  |
| Rodrigues<br><i>et al.</i> 2012   | CSS | 33  | ≥60years<br>Mean<br>age of<br>71.7±5<br>years. | Non-<br>institutionalized<br>elderly                       | Investigated the relationship<br>between oral health status and<br>nutritional status in the older<br>adults.<br>The oral health assessment was<br>done using the index for<br>decayed, missing and filled<br>teeth (DMFT), while the<br>nutritional status was assessed<br>using biochemical markers and<br>anthropometric values. | Tooth loss was the biggest problem to the participants (57.6%),<br>followed by the use of dentures (30.3%) and ill-fitting dentures<br>(33.3%).<br>66.6% of the subjects had difficulty in chewing, and 54.5% of them<br>reported prostheses as the cause, and 13.6% claimed it was due to<br>the absence of teeth.<br>A significant association was found between DMFT and the value<br>of suprailiac skinfold thickness ( $\rho=0.380$ , $p=0.029$ ). Findings<br>support temporal association between tooth loss and detrimental<br>changes in nutritional status assessment, which might increase<br>susceptibility to developing chronic diseases. |

#### **KEY:**

**CSS:** Cross-sectional study

**OR:** Odd Ratio

**CI:** Confidence Interval

**SMD:** Standard Mean Difference

**OIDP:** Oral Impact on Daily Living

**GOHAI:** Geriatrics Oral Health Assessment Index

**MNA:** Mini-nutrition Assessment

**PR:** Prevalence Ratios