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LETTER

Expanding the clinical implications of biomarkers and physiological indicators in geriatric institutionalization

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Abstract

The recent study by Maeda (2025) provides a multifaceted investigation of geriatric health through estimated telomere length (eTL), oral status, body temperature and disease history among institutionalized aged individuals. Capitalizing on this significant research, our letter examines understated inferences and suggests new applications of these data to aging research and geriatric care planning. We emphasize eTL as a promising non-invasive biomarker for the prediction of loss of independent living, suggesting its incorporation into frailty tests and screening tools at the population level. The observation by this study of asymmetric, left-dominant tooth loss prompts questions regarding neuromuscular aging and hemispheric control of oral function, and a new "tooth loss laterality" index is proposed for clinical application. Moreover, we further explore body temperature as a disease-specific marker, highlighting its particular significance in cancer survivorship and stroke outcome. These temperature signatures potentially could act as early indicators of metabolic or inflammatory dysregulation. Furthermore, we explore the disproportionate care requirements in post-COVID-19 female patients in accordance with global trends in long COVID and highlight the necessity for gender-sensitive geriatric guidelines. Ultimately, we suggest that disease-specific patterns of telomere shortening particularly in stroke, cancer and fracture, capture distinct biological aging processes that are worthy of longitudinal genomic and epigenetic investigation. Taken as a whole, these findings extend Maeda's work through encouraging a systems biology perspective toward aging that emphasizes predictive biomarkers, asymmetrical decline, and sex-differentiated vulnerabilities. This vision can contribute to preventive intervention and personalized care planning in the super-aged society of Japan.

Keywords: Telomere length, geriatric care, tooth loss asymmetry, body temperature biomarkers, post-covid syndrome, institutionalization risk, biological aging

Introduction

We read with much interest the report by Maeda entitled "The estimation of the clinical status of the residents in a geriatric health service facility in Japan,"[1] which presents insightful arguments for multifactorial determinants of care dependency among older residents. The integration of calculated telomere length (eTL), quadrant-specific tooth loss, body temperature, and post-COVID sequelae in this study provides an important model for assessing aging beyond chronological measures. In this letter, we seek to elaborate on some underexamined features of the initial investigation and suggest extensions that may allow for increased clinical usefulness and translational applicability.

Estimated telomere length (eTL) as a marker for institutionalization

Maeda's application of a blood-test-derived eTL equation [2] is a new, non-invasive aging assessment tool. The coincidence of eTL at 5.8 kb in both sexes in the study population suggests consideration of this measure as a threshold for loss of independent living. While the rela-

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tionship between telomere length and functional capacity is established [3, 4], its application to predict the tipping point to care dependency has not been systematically tested.

We recommend that eTL in institutionalized patients and community-dwelling older persons of comparable age ranges be compared to determine predictive validity. Additionally, the addition of eTL to frailty indexes can provide increased sensitivity. Telomere-measured biological age calculators (*e.g.*, applied to population-based cohorts [5]) could augment eTL in providing better predictions for care transitions.

Asymmetric tooth loss as a geriatric biomarker

The research's observation of left-dominant tooth loss among men and women raises an unexamined anatomical indicator of aging. Prior work highlighted tooth loss as a proxy measure for frailty, malnourishment, and sarcopenia [6]. Nonetheless, the quadrant-differentiated pattern, especially in the maxillary left, deserves closer examination.

This asymmetry can be due to neuromuscular impairments or hemispheric cortical dominance over masticatory function. To illustrate, right-hemispheric stroke-induced left-sided neglect can cause disuse and degeneration [7]. As a substitute, handedness-independent feeding biases may affect plaque formation and caries progression. We encourage studies involving correlation between laterality of tooth loss and neurological evaluation as well as stroke laterality to explore causality.

Body temperature as a disease-specific and prognostic indicator

Maeda's finding that cancer survivors always have lower body temperatures, whereas stroke survivors have elevated temperatures, brings in thermoregulation as a disease-specific biomarker candidate. Hypothermia among cancer patients might be indicative of systemic metabolic suppression, cachexia, or hypofunction of the hypothalamus [8]. However, hyperthermia among stroke could be suggestive of continued neuroinflammation or autonomic imbalance.

While previous research has investigated febrile responses after stroke as prognostic indicators [9], the chronic thermal abnormalities in survivors are not well-characterized. Therapeutic targeting of body temperature patterns with longitudinal monitoring may facilitate relapse prediction and rehabilitation strategies. Additionally, the purported association between repeated hot spring bathing and enhanced cancer outcome [10] provokes intriguing hypotheses regarding temperature manipulation as therapy, possibly through increased heat shock proteins or immune monitoring.

Post-COVID syndrome and gender-specific care needs

The high-care needs among post-COVID-19 female residents, as identified in the study, reflect worldwide observations of sex-specific long COVID sequelae. Growing evidence suggests women are more likely to develop chronic fatigue, cognitive impairment, and autonomic abnormalities following SARS-CoV-2 infection [11]. This gender difference may be hormonally mediated or represent differential immune responses.

Considering Japan's quickly expanding elderly population and the compounding impact of COVID-19, we suggest adding post-COVID screening instruments into geriatric evaluations. The Clinical Frailty Scale and Edmonton Frailty Scale can be post-pandemic-rebalanced for the inclusion of new-onset disability due to viral sequelae.

Telomere-length and disease-specific aging pathways

Lastly, Maeda's differential eTL correlations with stroke, lumbar fracture, and cancer highlight the principle of disease-specific aging trajectories. Telomere shortening is not only an indicator of chronological aging but could be an indicator of cumulative oxidative stress burden, inflammation, and DNA damage [12]. Cerebrovascular disease, for example, has been emphatically associated with reduced telomere length irrespective of age [13].

Future studies need to chart telomere loss rates in individual chronic diseases, preferably with longitudinal eTL monitoring. Coupling this with epigenetic clocks (*e.g.*, DNAmAge, PhenoAge) might provide more elaborate explanations of how different pathologies speed up biological aging.

Maeda's paper offers a multidimensional perspective of geriatric dependency based in pragmatic biomarkers. We suggest that approximated telomere length, skewed tooth loss, and temperature profiles of the body, and consideration of post-COVID and disease-specific patterns of aging, can add depth to our risk models of institutionalization. Interdisciplinary studies that bring together dental, metabolic, neurological, and genomic data are necessary in order to construct an integrated picture of aging in place versus aging in care.

Declarations

Author contributions: Made substantial contributions to conception and design of the study and performed data analysis and interpretation: Ghosh S, Singh KK, Sinha JK; Performed data acquisition, as well as provided administrative, technical, and material support: Sinha JK.

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