Revitalizing Oral Health: Effects of Oral Exercise and Salivary Gland Massage on Oral Function among Elderly

Eman Mohamed Ebrahim Abd-Elraziek[1,2] , Sahar Mahmoud S. El Awady[3], Shimaa Hassan Abd El-fatah[4]

[1] Assistant Professor of Geriatric Nursing Department, Faculty of Nursing, Aswan University, Egypt.

[2] College of Nursing and Health Sciences, Jazan University, Saudi Arabia

[3] Assistant Professor of Community Health Nursing Department, Faculty of Nursing, Helwan University, Egypt

[4] Assistant Professor, Geriatric Nursing Department, Faculty of Nursing, Sohag University, Egypt

drsaharmahmud@gmail.com

Abstract

Background: Oral exercises and salivary gland massage benefit oral function among the elderly, particularly in enhancing saliva production and overall oral health. **Aim:** This study aimed to appraise the effects of revitalizing oral health **by** oral exercise and salivary gland massage on oral function among the elderly. **Research design:** A quasi-experimental research design was used. **Sample**: A purposive sample of 90 elderly people. **Setting:** This study was conducted at the Hoda Talaat Harb Specialized Center for the Treatment and Rehabilitation of the Elderly in Helwan City in Cairo Governorate, Egypt. **Tool for data collection:** Three tools used in study, **tool 1:** Structure interview sheet composed of three parts; **part 1:** Socio-demographic characteristic, **2nd part:** Medical health history, **3rd part:** Knowledge of elderly about oral exercises and salivary gland massage. **Tool II:** Observation checklist for Elderly's practices. **Tool III:** Assessment of oral health function**. Results:** Studied elderly's Knowledge and reported practices regarding oral health revealed statistically significant improvements post implementation an intervention than pre. Also, there was a statistically significant enhancement in oral function tests post-implementation of the interventions, with p-values indicating strong significance. **Conclusion:** The study concluded that revitalizing oral health for studied elderly was an appropriate way of improving oral function. **Recommendation:** A continuous educational program for older adults about oral exercise, saliva gland massage, and oral hygiene practices.

Key words: *Elderly People, Oral Exercise, Oral Function & Salivary Gland Massage*

Introduction

The quality of life for older adults has gained more attention due to the global acceleration of population aging. Physiological resilience declines with age, resulting in adverse health consequences of these; dental health has become a vital component of general health. Elderly people who have poor oral health are much more likely to become frail. Oral frailty includes age-related changes, such as tooth loss, decreased oral function, and declining hygiene. This frequently leads to poorer oral hygiene, trouble eating, and a subsequent decline in cognitive and physical functioning in older adults **(Zhou, et al., 2024)**

Xerostomia, or dry mouth, is common among older adults, affecting around 30% of individuals over 65 and up to 40% of those aged 80 and above. It is primarily associated with the side effects of medications, particularly in those taking more than four prescription drugs daily. Additionally, xerostomia may be linked to underlying health conditions such as diabetes, Alzheimer's disease, and Parkinson's disease. The condition can result in various oral health issues, including mucosal inflammation (mucositis), dental caries, cracked lips, and a fissured tongue, significantly impacting the quality of life and oral functionality in the elderly (**American Dental Aging, 2025**).

Saliva is vital in multiple physiological functions and holds considerable clinical significance. Produced by the three major salivary glands and numerous minor glands, it is essential for maintaining oral homeostasis. Saliva initiates the digestive process through the enzymatic breakdown of starch, regulates oral pH to prevent dental caries, and contains antimicrobial proteins that help defend against pathogens. Additionally, it contributes to oral wound healing and tissue regeneration. A reduction in salivary flow below the normal range of 0.3–0.4 mL/min results in a condition known as hypo salivation **(Cong, Mao, Wu, & Yu, 2024)**.

The term "dry mouth" is often broadly used to refer to both xerostomia and hypo salivation, although these represent distinct concepts. Xerostomia refers to the subjective sensation of oral dryness, while hyposalivation denotes an objective reduction in salivary flow. Despite these differences, the terms are frequently used interchangeably in clinical and research contexts. In older adults, dry mouth is commonly regarded as a symptom associated with aging, with approximately 30% of the elderly reporting this condition. It can interfere with essential functions as swallowing and eating, contribute to oral discomfort, and lead to poor oral hygiene practices (**Seo & Kim, 2020**).

Older adults are particularly vulnerable to poor oral health due to age-related reductions in salivary flow, compounded by factors such as limited self-care capacity, multiple comorbidities, polypharmacy, compromised immune function, and inadequate oral hygiene practices (**Schoppmeier, et al., 2024**). Typical oral health problems among the elderly include tooth loss, diminished periodontal support, decreased salivary secretion, periodontitis, and poor oral hygiene. One of the primary contributors to these issues, particularly in geriatric care settings, is the lack of awareness and education regarding oral health. Recent studies indicate that only 47.6% of older adults possess adequate oral health knowledge, 42.1% brush their teeth less than twice daily, 27.7% fail to brush correctly, and a mere 0.8% report consistent use of dental floss (**Li & Yao, 2021**).

Various approaches are available for treating and managing dry mouth symptoms, including salivary stimulants, topical agents, systemic sialogogues, and saliva substitutes. However, research on the effectiveness of salivary gland massage remains limited. Two studies in Japan demonstrated that an oral function enhancement program, including facial and tongue exercises and salivary gland massage, significantly improved salivary flow rates among independent older adults (**Jeamanukulkit, Vichayanrat, & Samnieng, 2023**). A basic oral exercise program conducted in Korea, which included mastication, salivation, and swallowing activities, demonstrated that performing the 2-minute routine twice daily significantly enhanced un stimulated salivary flow and swallowing function both immediately after the intervention and one week later (**Jiang, et al., 2022**).

Revitalization is a strategy to improve oral health and wellness. Strategic measurements must be taken to deal with dental health problems through shaping behavior. An innovative model is needed to foster the elderly's oral and dental hygiene habits. The model is created by establishing older adults' habits of choosing oral and dental hygiene, 2 minutes of tooth brushing, and tooth brushing at least twice a day (**Santoso, Susanto, Widyawati, Rahman, & Rajiani, 2020)**.

One of the most pressing public health concerns is improving the health of older people, which leads to a higher quality of life for them. Evidence indicates that oral and dental health issues among the elderly have historically received less attention compared to conditions such as cardiovascular diseases or malignancies. Oral and dental health encompasses the well-being of the oral cavity and its surrounding structures, playing a vital role in enabling individuals to eat, speak, and socially interact. Among older adults, compromised oral health is associated

with increased psychological distress, reduced mood, and diminished quality of life. A range of oral and dental problems, such as tooth loss, periodontal disease, and oral discomfort, can negatively influence both the physical and psychosocial well-being of elderly individuals (**Bashirian, et al., 2023**).

Nurses play a crucial role in preserving oral wellness and preventing associated infections when applying evidence-based practices. Nurses with updated knowledge and skills can provide high-quality care and accurate decision-making, eliminating risks for older adults. Therefore, continuous teaching programs are recommended ***(Abd Allah, Hussein, & Abdel-Aziz, 2020).***

Significance of the study:

By 2030, one in every six individuals globally will be aged 60 years or older. The global population in this age group is projected to increase from 1 billion in 2020 to 1.4 billion. By 2050, the number of people aged 60 and above will reach approximately 2.1 billion. In Egypt, the elderly population is also growing rapidly. Between 2020 and 2050, the number of adults aged 70 and older in Egypt is anticipated to triple, reaching approximately 326 million. Moreover, the proportion of the Egyptian population aged 65 years and above is projected to rise from 4.3% in 2020 to 7.4% by 2025, with an average annual growth rate of 0.50% **(Mahmoud, et al., 2022).**

Poor oral health among older adults is attributed mainly to global disparities in oral health care. In many healthcare systems, oral health is treated separately from general health, often receiving less attention, funding, and policy prioritization. As a result, oral diseases in the elderly are frequently diagnosed at advanced stages, which leads to suboptimal treatment outcomes and accelerated functional oral decline. Recently, the deterioration of oral function has been recognized as a critical issue affecting the overall oral health of older adults. Although this decline typically occurs gradually and may be reversible through timely interventions, routine screenings in primary healthcare settings often fail to assess oral function. Consequently, early-stage oral functional impairments may go unnoticed, delaying appropriate management and increasing the risk of irreversible damage (**Fukai, Dartevelle, & Jones, 2022 ; Chan et al., 2024)**.

Although various oral health programs have been developed to enhance oral function in older adults, limited research has specifically evaluated the effectiveness of oral exercises and salivary gland massage in this population. Moreover, there is a noticeable lack of evidence regarding the efficacy of salivary gland massage interventions tailored exclusively for the elderly, highlighting a critical gap in geriatric oral

health care research. Thus, the present study aimed to appraise the effects of oral exercise and salivary gland massage on oral function among the elderly.

Aim of the study

This study aimed to appraise the effects of revitalizing oral health through oral exercise and salivary gland massage on oral function among the elderly.

Research hypothesis

H (1): Revitalizing oral health will significantly improve knowledge and practices, salivary flow, and reduce the risk of mouth dryness among the elderly.

H (0): Revitalizing oral health will not significantly improve knowledge and practice, salivary flow, and reduce the risk of mouth dryness among the elderly**.**

Operational definition

Revitalizing Oral Health

Revitalizing oral health refers to the comprehensive efforts to improve and integrate oral health through oral exercise and salivary gland massage on oral function among the elderly (**Santoso, et al., 2020)**.

Subjects and Method

Research design

A quasi-experimental research design was used to operate this study and appraise the effects of revitalizing oral health b**y** oral exercise and salivary gland massage on oral function among elderly people. The design involved a one-group pretest and posttest approach for this study.

Research Setting

This study was conducted in the dental, internal medicine, and physiotherapy clinics at the Hoda Talaat Harb Specialized Center for the Treatment and Rehabilitation of the Elderly in Helwan City in Cairo Governorate, allied with the Secretariat of Specialized Medical Centers. The participating elderly were selected from the dental, internal medicine, and physiotherapy clinics affiliated with the center. Al-Huda Center is the only center dedicated to the elderly in Helwan City, which has the highest influx rate of elderly people.

Study Subjects

A purposive sample of 90 elderly individuals (both males and females) was recruited from the previously mentioned setting. The non-probability sampling technique was used to select the studied sample. Studied elderly were selected based on the researchers' specific inclusion and exclusion criteria.

Inclusion criteria

Elderly aged 60 years and above, of both sexes, who could communicate effectively and provided informed consent were included in the study. Willingness to participate voluntarily was also considered essential.

Exclusion Criteria

Elderly individuals were excluded from the study if they had been diagnosed with dementia, experienced head or neck trauma, undergone radiation therapy, practiced

habitual mouth breathing, or were diagnosed with severe periodontal disease through oral examination. Additionally, those with thyroid disorders, a history of smoking, or who were taking medications as antipsychotics, sedatives, muscle relaxants, angiotensin-converting enzyme (ACE) inhibitors, alpha and beta-blockers, anticholinergics, antidepressants, or antihistamines were also excluded.

Sample size

Based on data from the literature (**Simarjeet, 2022**), and considering a significance level (α) of 5% and a study power (1−β) of 80%, the required sample size was calculated using the following formula:

$$n = \frac{p(1-p)}{(SE \div t) + [p(1-p) \div N]}$$

N = 200
t = 1.96
SE = 0.05
P = 0.50

$$\mathbf{n} = \frac{0.50\ (1-0.50)}{(0.05 \div 1.96) + [0.50\ (1-0.50) \div 200)}$$

n = 90

Tools for data collection: Data for this study were collected using three tools, including:

Tool I: The researchers developed a structure interview sheet after an extensive review of relevant literature. It was designed in simple Arabic to ensure clarity and ease of understanding for studied elderly. The questionnaire consisted of the following parts

Part 1

Socio-demographic characteristics of elderly people (e.g., their age, sex, education levels, occupation, residence, who lives with them and Monthly income)

Part 2

Medical Health History of elderly This structure interview sheet involved the past & current medical history of elderly people and consists of 8 closed-end questions about (previous medical diseases, previous oral cavity surgery, sense of bad breath, presence of dentures, route of washing of teeth, tooth brushing (times/day), tongue wash during brushing, and current medication.

Part 3: Elderly knowledge

Older adults' knowledge about oral exercise & salivary gland massage involved 17 closed-end questions, including the concept of oral functions, definitions, causes, risk factors of dry mouth, consequences, anatomical site od saliva gland, function of saliva gland, age related oral cavity change, methods for decreasing dryness of mouth, medications that cause dry mouth, complications of dry mouth, prevention, management, and treatment, benefits, role of the salivary glands in oral health, and saliva is important for oral health.

The Scoring system included 17 closed-end questions; the correct answer scored 1 point, and zero points were given for a wrong answer or not knowing. The total knowledge scores were 17 point for 17 questions. Knowledge answers were classified into three categories.

The grades for each item were summed and then converted into a percent score **(Abd Allah, et al., 2020)**

- Poor knowledge < 50% (< 8.5 point)
- Average knowledge 50- < 75 % (8.5-less 12.75 point)
- Good knowledge ≥ 75% (≥12.75 point)

Tool II: Observation Checklist about Elderly practices

It included oral hygiene and exercise & salivary massage aimed to assess for studied elderly practices adapting from **(Shirobe, et al., 2022),** these exercises reinforce the muscles of the lips, cheeked, tongue, and surrounding oral structures. The lip-focused component included two specific items designed to enhance the mobility and strength of the lip muscles, contributing to improved oral function and salivary flow in studied elderly. Lip and Cheek Muscles Exercise comprised (2 items). Tongue Exercise: (3 items). Patakara Exercise: It contained four items. Mouth Opening Exercise: (2 items). Tongue Out Exercise: (2 items). Forehead Exercise: (2 items). Mastication Exercise: (4 items). Counting Exercise is (3 items). Tongue Twister Exercise is (3 items). Tongue Training involved (5 items). Massage Salivary Glands were (5 items).

The scoring system reported that the practices of older adults consisted of 36 steps; with a total score equal 36 point. One score was given for completed practices, and zero for incomplete practices. All scores of practices were summed up and then converted into percentages and calculated as follows:

The grades for each item were summed and then converted into a percent score:

Competent practices ≥ 60%
(≥21 point)

Incompetent practices < 60
(<21 point)

Tool III: Assessment of oral function: This tool evaluates mouth health status and the program's effect on revitalizing oral function health for older adults after applying it. This tool consisted of four parts as follows;

Part 1: Summated Xerostomia Inventory (SXI): This part was developed **by Thomson et al. (2011). Aim** to assess the severity of xerostomia, or dry mouth, particularly among older adults. SXI consists of a series of questions that focus on the frequency and severity of xerostomia symptoms. It was a shortened version of the original Xerostomia Inventory (XI), which included 11 items using a Likert scale. It is directly related to the sensation of dry mouth and its impact on daily activities.

Each item on the sheet was rated based on the frequency of xerostomia-related symptoms, using a 5-point Likert scale:1 = Never, 2 = Hardly ever, 3 = Occasionally, 4 = Fairly often, 5 = Very often. This scoring method enables a quantitative assessment of symptom severity, where higher scores indicate more pronounced symptoms of dry mouth.

The scoring system: The total score is derived by summing the responses across all items, with the minimum total score representing the absence of symptoms (all items rated as "Never") and the maximum score reflecting the highest frequency of symptoms (all items rated as "Very often" **(Wimardhani, Rahmayanti, Maharani, Mayanti, & Thomson, 2021).**

Part 2: Measuring the Flow of Saliva by using Oral Schirmer's test. The Oral Schirmer's test was a method used to measure salivary flow rates, particularly useful in assessing salivary gland function, including the elderly and those with conditions like xerostomia. Standardized filter paper strips typically had dimensions of 35 mm in length and 5 mm in width. They were designed to absorb saliva and measure the amount of moisture collected during the test. To assess unstimulated salivary flow for 1 to 5 minutes, the strip is usually placed on the floor of the mouth, close to the submandibular gland. After this period, the length of the wet portion of the strip is measured to determine the salivary flow rate. The saliva is categorized as Hypo Salivation: the salivary flow rate is less than 15 mm in 3 minutes. This condition indicates reduced saliva production, which can lead to symptoms such as dry mouth (xerostomia). Normal Salivation: Characterized by a salivary flow rate greater than 15 mm/min. Hyper Salivation: a salivary flow rate greater than 35 mm/min. This indicates an increased production of saliva, which may be associated with various conditions or stimuli (**Wróbel-Dudzińska, et al., 2021).**

Part 3: Organoleptic test for halitosis

This tool was developed by **Murata et al. (2002).** Oral malodor, commonly referred to as halitosis, can be measured using an organoleptic test, a widely recognized **gold-standard scale** employed to assess oral malodor. During the procedure, participants were instructed to take deep breaths by inhaling through the nose, holding their breath for a few seconds, and then exhaling slowly through the mouth. This standardized method allows for consistent evaluation of halitosis levels and is commonly used in clinical and research settings for objective assessment. The examiner inhaled the odor from a distance of 20 cm and assessed the category of malodor on an organoleptic scale of 0 to 5, where: 0 = absence of odor, 1 = Barely noticeable odor, 2 = Slight

malodor, 3 = Moderate malodor, 4 = Strong malodor and 5 = Severe malodor.

Part 4: Subjective symptoms of xerostomia consisted of 4 closed-end questions

Four specific questions were utilized to assess the presence and severity of oral dryness, which was measured in response to saliva secretion from the study by **(Abdelaziz, et al., 2024).** The researcher asked the patients to select "Yes" or "No" if any of the following circumstances applied: (I) “Does the amount of saliva in your mouth seem to be too little?”; (II) “Do you have any difficulty swallowing?”; (III) “Does your mouth feel dry when eating a meal?”; and (IV) “Do you sip liquids to aid in swallowing dry food?

Validity of the Tools

The content validity of the tool was tested by a panel of five experts, three in Geriatric Nursing and two in the Community Health Nursing field. The necessary modifications were done according to base on their responses; the tools were proved to be valid.

Reliability of the Tools

The internal consistency of the items verified using the Cronbach's alpha coefficient test in order to demonstrate the dependability and reliability of the instruments. The reliability of knowledge was 0.86, and for practice was 0.80. The reliability of the SXI tool using the test-retest method was $r = 0.79$ to 0.85, which suggests strong internal consistency for this version of the inventory. The reliability of measuring the Oral Schirmer's test ranged from 0.72 to 0.85. The organoleptic test's reliability was confirmed using the interrater method, and the reliability scores were 0.63 and 0.982, respectively. Overall, these scales demonstrate strong reliability, making them valuable tools for research and clinical practice in geriatric assessments.

The study was conducted in three phases

Field Work Phase

Permissions for data collection were generated from the Hoda Talaat Harb Specialized Center director by submitting a formal letter from the Faculty of Nursing, Helwan University. This letter included permission to carry out the study, explaining the purpose and nature of the study, and the date and time of starting data collection.

Once the researchers were granted approval and older adults fulfilled the inclusion criteria, written informed consent was obtained from each subject before participating in the study.

The study covers six months from the beginning of July till the end of December 2024.

The interview took approximately 15–30 minutes, depending on the elderly person's understanding and comfort level. This phase covers three months, from the

beginning of July till the end of December 2024.

Then the researchers interviewed them individually face-to-face in the waiting area of the clinics mentioned (dental, internal medicine, and physiotherapy clinics affiliated with the center) by using the tools to obtain baseline data, assess oral functions such as dry mouth symptoms, amount of salivary secretion, halitosis, and oral motor function using the summated xerostomia inventory, and measure saliva flow rates by standardized filter paper strips is typically positioned on the floor of the mouth, near the submandibular gland to measure un stimulated salivary flow 1 to 5 minutes. After this period, the length of the wet portion of the strip is measured to determine the salivary flow rate.

Implementation phase

Ninety participants were recruited using the nonprobability sampling technique (purposive sample). Considering the sampling criteria, the pretest was conducted with 5 participants per day, two days a week. They were offered oral exercises and salivary gland massage in a quiet environment. The intervention concentrated on the expression muscles, tongue, salivary glands, and swallowing, explaining the study's purpose and the benefits of oral exercises.

The intervention was divided into two stages: First, the learning stage, in which the investigator taught oral exercises for an hour using lecture cum one-to-one demonstration. Seven to ten elders attended the demonstration per day. Each participant was invited to perform a return demonstration, with corrections provided as appropriate. At this stage, pamphlets were provided to the participants.

Stage I: Learning phase

The oral exercises and salivary gland massage involved one-to-one demonstrations **Ibayashi, et al., (2008)** that included expression muscles (orbicularis oculi, buccinators, and orbicularis oris), tongue, salivary glands, and swallowing. This was followed by a one-hour return demonstration on the first day and pamphlet distribution.

Stage II: Performance phase

Following the learning phase, the second phase (performance phase) was completed. During this phase, participants were requested to perform oral exercises and salivary gland massage every day for about 30 minutes for 30 days under the supervision of the investigator. The participants were divided into groups of five members, each performing oral exercises to maintain one-to-one supervision. The intervention consists of:

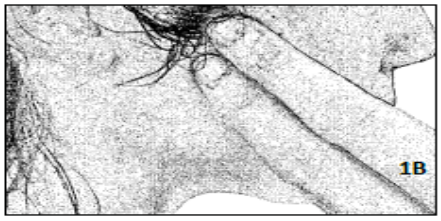
1. Oral Exercise Technique

Oral Exercise to Prevent Oral Function Decline	
Items of Oral Exercise	Step
1. Improve mouth and tongue movements and saliva production	
Mouth Muscles Exercise focusing on the lips	1. Purse your lips. 2. Open your mouth horizontally while pronouncing the sound "Eee". Repeat 10 times.
Lip and Cheek Muscles Exercise	1. Puff your cheeks with air or water. 2. Purse your lips several times.
Tongue Exercise:	1. Press your tongue firmly against the inside of your cheek. 2. From the outside of the cheek, press your finger against the tip of the tongue. 3. Resist by slowly pressing your tongue against the inside of your cheek. Repeat 10 times for the left and right cheeks.
Patakara Exercise	1. Pronounce "Pa" while smacking your lips together. 2. Pronounce "Ta" while placing the tip of your tongue behind your upper front teeth. 3. Pronounce "Ka" while placing the base of your tongue against the back of your upper jaw. 4. Pronounce "Ra" while curling your tongue. *Perform two sets of eight repetitions for each pronunciation*.
2. Improve swallowing power	
Mouth Opening Exercise	1. Slowly open your mouth as wide as possible and hold for 10 seconds. 2. Firmly close your mouth and rest for 10 seconds. *Repeat this cycle 10 times.*
Tongue Out Exercise:	1. Slightly stick out your tongue. 2. Close your mouth and swallow the saliva. *Repeat 10 times.*
Forehead Exercise	1. Open your hand and press your palm firmly against your forehead. 2. Count to five while slowly lowering your gaze toward your navel (belly button). *Repeat 10 times.*
3. Improve chewing power	
Mastication Exercise:	1. Sit down and maintain correct posture. 2. Chew gum at a steady rhythm for 2 minutes, then continue chewing freely for 3 minutes. 3. Keep your lips closed and chew firmly. 4. Chew evenly on both the left and right sides of your mouth.
Counting Exercise:	1. While eating, count to 30 as you chew each bite of food. 2. Whenever possible, choose chewy foods cut into slightly larger pieces. 3. Focus entirely on chewing and try to avoid distractions like watching TV.
4. Improve pronunciation	
Tongue Twister Exercise:	1. Peter Piper picked a peck of pickled peppers. 2. Betty Butter bought some butter. 3. How much wood would a woodchuck chuck if a woodchuck could chuck wood?
5. Improve tongue power	
Tongue Training:	1. Stick out your tongue. 2. Try to touch the tip of your lower jaw with your tongue. 3. Try to touch the tip of your nose with your tongue. 4. Move your tongue in a circular motion. 5. Press a spoon against your tongue and push your tongue firmly against the spoon. Hold for a few seconds. (**Shirobe, et al., 2022)**

Oral Exercise Technique and Salivary Gland Massage Technique For the parotid gland, the patient performed a massage routine starting with rubbing the front of both ears using four fingers—the index, middle, ring, and little fingers—on each side, repeating this 10 times. Next, the patient used both thumbs to massage the submandibular glands located beneath the chin, performing 10 massages on each side. Finally, to stimulate the sublingual glands, the patient pressed their thumbs under the jawline, massaging from the area beneath the ears toward the chin on both sides. This massage was to be done on both sides for approximately 2 minutes, three times daily.

This method differs slightly from the technique described by the Sjögren's Foundation Patient Education Sheet, which recommends using two fingers instead of four. Additionally, it contrasts with an earlier study that used the palm to massage the parotid gland **(Kim, et al., 2012).**

1. **Salivary Gland Massage Technique (How to Massage Salivary Glands) Sjögren's Foundation (2025)**



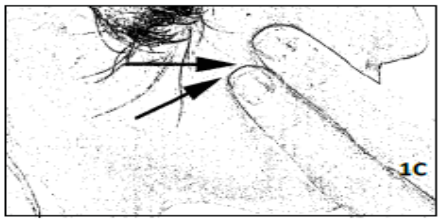
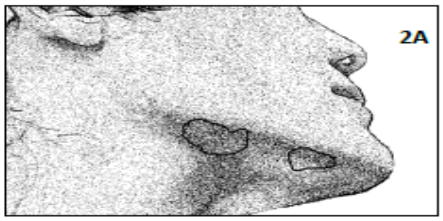


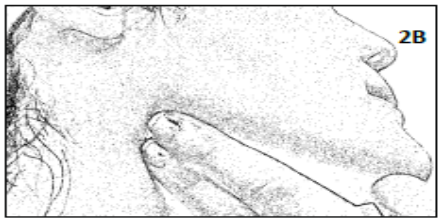
Figure 1A:
The parotid glands are located bilaterally in the cheek area in front of your ear and have a "tail" area that can extendoverthelowerjaw.

Figure 2A:
The submandibular and sublingual glands are located bilaterally under your jaw and tongue with the sublingual gland closer to the chin.

Figures 1B and 2B:
Place two fingers on the body or tail area of the parotid,
Or under the jaw for the submandibular/sublingual glands.

Figures 1C and 2C:
Sweep fingers forward with gentle pressure as indicated by the black arrows. This will encourage movement of saliva past a possible obstruction or constriction and into the oral cavity.





Evaluation phase

To evaluate the patients' practices, the researchers placed a cotton roll on the floor of the mouth and assessed its wetness after the oral exercises and salivary gland massage. The researchers also motivated the participants and their caregivers to perform daily massages by maintaining regular telephone follow-ups. Oral function was reassessed (posttest) on the 30th day using the same evaluation tools.

Ethical consideration

The Ethics Committee of Helwan University's Faculty of Nursing, number (40), approved the study on March 18, 2024. Informed consent was obtained from all participants after clearly explaining the purpose of the study. The confidentiality of all collected data was strictly maintained. Participants' privacy, anonymity, and the right to withdraw from the study were fully ensured.

Statistical analysis

After the collection, the data were coded and moved into forms created explicitly for computer-feeding. SPSS software, version 22, was used to statistically analyze the data (IBM Corporation, Armonk, NY, USA). The Wilcoxon signed-rank test, the $\chi 2$-test, and the Mann–Whitney U-test were

employed when necessary. The significance level was set at $P < 0.05$.

Data analysis

Table 1 reveals that 75.5% of the studied elderly were aged between 70 to 79 years, with a mean age of 74.4 ± 0.4 years. Males constitute 73.3% of the studied elderly, most of them with relatively high education, with 67.8% having a university education. 78.9% of the elderly were working and resided in urban areas, 73.3%. 78.9 % live with their family, and 65.6 %of them had insufficient monthly income.

Table 2 clarifies that hypertension and diabetes mellitus, 53.3% and 48.2 %, respectively, were the most frequent diseases among the studied elderly participants. 53.3% of them reported a sense of bad breath, and 64.5% used partial dentures. A substantial number, 97.8%, washed their teeth using rinse water, but only 44.4% used a toothbrush. Among those who brushed their teeth (n=40), most do so 1-2 times per day, 62.5%, and 75.0% washed their tongue during brushing. 60.0% of studied elderly tacked antihypertensive drugs and oral hypoglycemic agents, 25.6%

Figure 1 shows that 82.0 % of the studied older adults had poor levels, and pre-practicing Oral Exercise and Salivary Gland Massage decreased to 5.50 % post-implementation of oral exercise. 11.50 % had a good level, pre-practicing Oral Exercise and Salivary Gland Massage, which improved and became 76.20 % post-implementation of oral exercise. Also, there were statistically significant differences between total knowledge scores pre- and post-implementation of Exercise and Salivary Gland Oral Massage (P =.001).

Figure 2 illustrates that 55.8% of the studied elderly had unsatisfactory oral hygiene, exercise and salivary gland massage practices before the intervention. Following the implementation of the oral exercise and salivary gland massage program, this improved significantly, with 82.2% demonstrating satisfactory practices. Furthermore, there was a highly statistically significant difference between the total practice scores before and after the intervention (P = 0.001).

Table 3 demonstrates the mean ± SD scores of studied elderly people pre- and post-implementation of Oral Exercise and Salivary Gland Massage. There is a statistically significant difference in improvement in all oral function tests post-implementation of Oral Exercise and Salivary Gland Massage. Also, revitalizing oral function health for the studied elderly post-implementation of Oral Exercise and Salivary Gland Massage improved (P = 0.001).

Table 4 reveals the logistic regression analysis **of** several factors significantly impacting oral function among studied elderly. Sex, chronic disease, Previous

oral cavity surgery, Route of washing of teeth, current medication, oral exercise, and salivary gland massage (P= 0.004, P= 0.003, P= 0.007, P= 0.004, P= 0.003, P= 0.001, P= 0.004), respectively. While the occupation, place of residence, who lived with you, and presence of dentures (p = 0.784, p = 0.283, p = 0.215) respectively did not significantly impact oral function among the elderly participants.

The logistic regression analysis in **Table 5** identifies several highly significant factors that predict the effect of salivary gland massage on oral function among the elderly participants. Sex, chronic disease, route of washing of teeth, oral exercise, current medication, and salivary gland massage (p=0.005, p=0.004, p=0.003, and p=0.002), respectively. On the other hand, several factors were found to be non-significant in predicting the effect of salivary gland massage on oral function among the studied elderly. Education levels, place of residence, who lived with you, and sensed of bad breath (p=0.214, p=0.748, p=0.321, p=0.283), respectively.

The mediation analysis **in Table 6** indicates that oral exercise has a direct effect on health oral function (p=0.007); however, the indirect effect through Salivary gland massage is not significant (p=0.323). The results suggest that the implications should focus on oral exercises as an intervention to improved oral function without relying on salivary gland massage as an intermediary step.

Table 1: Distribution of the Studied Elderly's Socio-demographic Characteristics (n=90).

Item	No.	%
Elderly People age		
- 60 to 69 years	9	10.0
- 70 to 79 years	68	**75.5**
- ≥ 80 years	13	14.4
Mean ± SD	**74.4 ± 0.4 years**	
Sex		
- Male	66	**73.3**
- Female	24	26. 7
Education levels		
- Read and Write	4	3.6
- Secondary education	25	27.8
- University education	61	**67.8**
Previous occupation		
- Working	71	**78.9**
- Not working	19	21.1
Residence		
- Urban	66	**73.3**
- Rural	24	26. 7
Who lives with you		
- With family	71	**78.9**
- Alone	19	21.1
Monthly income		
- Sufficient	31	34.4
- Insufficient	59	**65.6**

Table 2. Distribution of Medical History for Studied Elderly (n =90)

Past and current medical history	No.	%
Previous medical disease		
- Yes	90	**100.0**
Chronic disease: *		
- Hypertension	13	14.4
- Diabetes mellitus	44	48.2
- Digestive disease	23	25.6
- Coronary artery disease	15	16.7
- Respiratory disease	30	33.3
- Circulatory disease	15	16.7
- Renal diseases	30	33.7
- Ophthalmological diseases	48	53.3
- Endocrine disease	25	27.8
- Cancer	10	11.2
Previous oral cavity surgery		
- Yes	15	16.7
- No	75	83.3
A sense of bad breath5		
- Yes	48	53.3
- No	42	46.7
Presence of dentures		
- No	11	12.2
- Complete	21	23.3
- Partial	58	64. 5
Route of washing of teeth *		
- No use	30	33.4
- Toothbrush	40	44.4
- Flossing	30	33.4
- Rinse water	88	**97.8**
Tooth brushing (times/day) n =40		
- 1-2	25	62.5
- ≥ 3	15	37.5
Tongue wash during brushing		
- Yes	30	75.0
- No	10	25.0
Current medication *		
- Antihypertensive	54	60.0
- Oral hypoglycemic agent (OHGA)	23	25.6
- Anti-ulcerative drugs and digestive	13	14.4
- Analgesics	11	12.3
- Respiratory drugs	16	17.7
- Antibiotic drugs	2	22.3

***More than one answer**

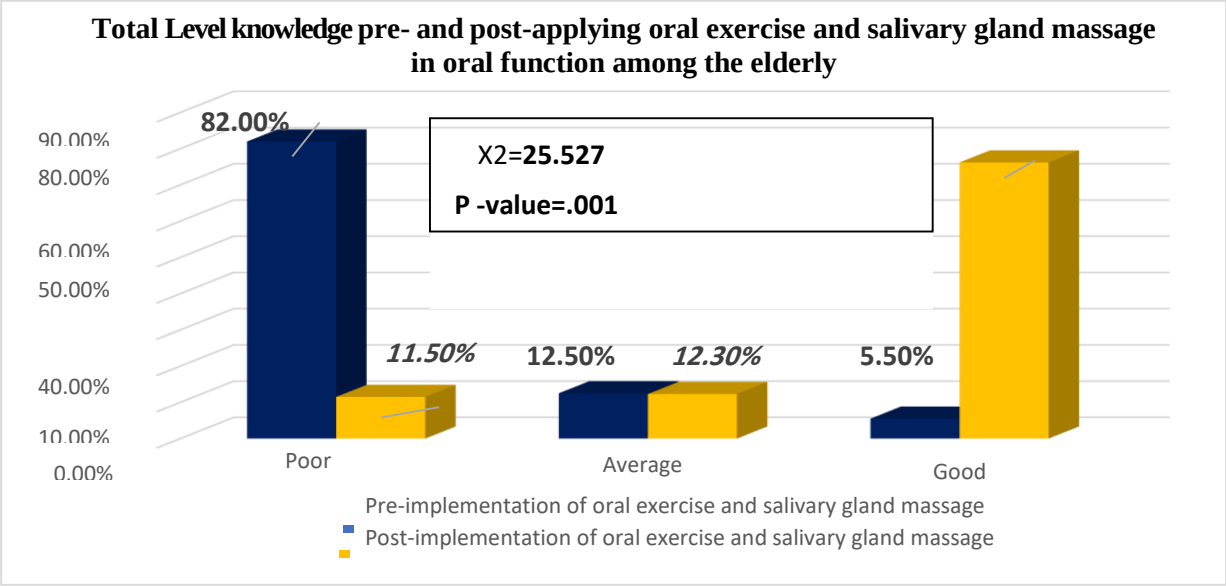


Figure 1. Distribution of Studied Elderly's Level of Knowledge about Oral Exercise and Salivary Gland Massage on Oral Function pre- and Post-Implementation Oral Exercise and Salivary Gland Massage (No =90)

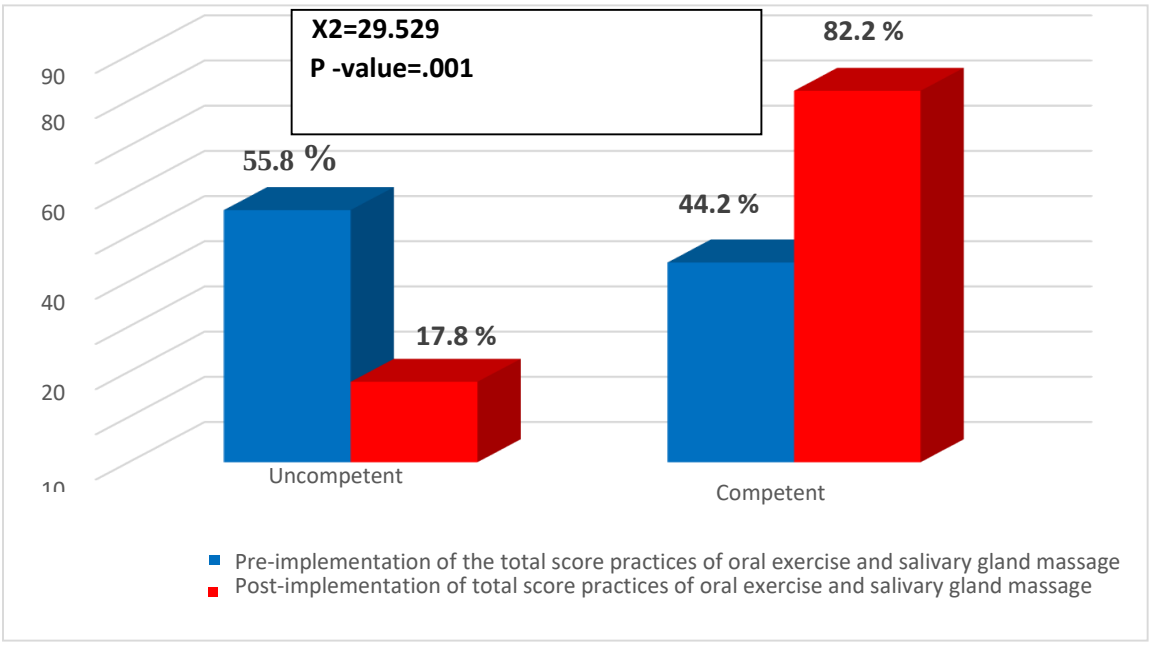


Figure 2. Distribution of Studied Elderly's Total Practices Score about Oral Exercise and Salivary Gland Massage on Oral Function Pre and Post Implementation (n=90)

Table 3: Distribution of Mean ± SD for Studied Elderly Oral Function Pre &Post Implementation (n=90)

Items	Pre-Exercise	Post-Exercise	Difference (post-pre)	Paired t	P value
	Mean ± SD	Mean ± SD	Mean ± SD		
Summated Xerostomia Inventory	.875±.693	1.66±.654	0.785±.654	6.612	.001
Measuring the flow of saliva by using the oral Schirmer test	.802±.651	1.33±.606	0.528±.606	35.851	.001
Organoleptic test for halitosis	.524±.574	1.12±.921	0.596±.566	37.161	.001
Subjective symptoms of xerostomia	.323±.457	1.41±.552	0.785±.551	14.252	.000

Table 4: Logistic Regression Analysis for Factors Predicting Oral Function among Studied Elderly (n=90)

Items	Unstandardized Coefficients		Standardized Coefficients	Paired t	P
Model	**B**	**Std. Error**	**Beta**	**T**	**Sig**
(Constant**)**	**82.988**	**7.012**		**7.758**	**<0.001**
Elderly People age	0.041	0.712	-0.012	-0.061	0.021
Sex	1.103	1.321	0.181	0.847	0.004
Education levels	1.884	1.031	0.332	1.871	0.042
Occupation	0.151	0.821	0.074	0.183	0.784
Place of Residence	0.214	0.458	0.122	1.210	0.283
Who lives with you	0.589	0.214	0.147	0.987	0.215
Monthly income	0.576	0.124	0.0.41	0.613	0.044
Chronic disease	1.103	1.321	0.181	0.847	0.004
Previous oral cavity surgery	0.151	0.021	0.064	0.183	0.003
A sense of bad breath	1.014	0.542	0.247	1.245	0.007
Presence of dentures	0.589	0.214	0.147	0.987	0.215
Route of washing of teeth	0.576	0.124	0.0.41	0.613	0.004
Current medication	1.014	0.542	0.247	1.245	0.003
Oral exercise	0.021	0.012	-0.002	-0.021	0.001
Salivary gland massage	1.013	1.211	0.181	0.847	0.004

Table 5: Logistic Regression Analysis for Factors That Predict the Effect of Salivary Gland Massage in Oral Function among the Studied elderly (n=90)

Items	Unstandardized Coefficients		Standardized Coefficients	Paired t	P
Model	**B**	**Std. Error**	**Beta**	**T**	**Sig**
Elderly People age	0.661	0.654	0.011	0.051	0.754
Sex	5.147	2.450	0.311	2.142	0.005
Education levels	1.204	1.247	0.123	0.651	0.214
Occupation	2.585	0.963	0.348	2.685	0.010
Place of Residence	0.321	1.241	0.054	0.214	0.748
Who lives with you	1.478	1.547	0.123	0.547	0.321
Monthly income	1.401	0.849	0.247	1.729	0.090
Chronic disease: *	1.201	1.321	0.181	0.847	0.004
Previous oral cavity surgery	1.151	0.021	0.040	0.183	0.002
A sense of bad breath	0.414	0.458	0.122	1.210	0.283
Presence of dentures	1.489	0.816	0.147	0.987	0.012
Route of washing of teeth *	0.576	0.124	0.0.41	0.613	0.004
Current medication *	1.014	0.542	0.247	1.245	0.003
Oral exercise	1.103	1.321	0.281	0.857	0.004
Salivary gland massage	0.143	0.031	0.054	0.183	0.002

Table 6. Mediation analysis summary of the Studied Elderly (n=90)

Items	B	T	P	95% CI (LL-UL)
Oral Message a1 b1	 0.078 0.306	 3.062 0.458	 0.002 0.467	 0.020-0.131 0.942-0.436
Direct Effect	0.327	2.683	0.007	0.057-0.307
In direct Effect Oral exercise-› Salivary gland massage-› Oral function health	0.026	0.352	0.323	0.085-0.054
Total Effect	0.230	2.704	0.007	0.053-0.276

Oral exercise: Independent variable
Salivary gland massage: Mediator
Oral function health: Dependent variable
a1: Oral exercise -›Salivary gland massage
b1: Salivary gland massage-›Oral function health

Discussion

Elderly individuals over the age of 65 often experience tooth loss, and the remaining teeth are frequently affected by decay or disease. Additionally, the muscles involved in mastication tend to weaken, leading to increased fatigue during eating. The functional capacity of taste buds to differentiate flavors also diminishes with age. Furthermore, salivary secretions decrease in volume

and become more alkaline. This weakening of oral muscles with advancing age contributes to difficulties in maintaining oral functions, such as effective chewing (**Zhou, et al., 2024**). Therefore, this study aimed to appraise the effects of revitalizing oral health by oral exercise and salivary gland massage on oral function among the elderly**.**

The current study founded that three quarters of the studied elderly were aged between 70 to 79 years, with a mean age of 74.4 ± 0.4 years and males, most of them with relatively high education . Also, most of the studied elderly were working and resided in urban areas, live with their family, and 65.6 % more than two third of them had insufficient monthly income.

Regarding route of washing of teeth, the results of the present study demonstrated that most of the studied elderly wash their teeth using rinse water, and less than half use a toothbrush. This finding may be due to these tooth brushing methods because they are considered the easiest and most comfortable tooth brushing technique for the elderly, and the roll method in cases of gingivitis. This result is confirmed with a study carried out in Korea, published by **Bok and Lee (2020)** titled "Proper tooth-brushing technique according to patient's age and oral status," which displayed that the most common method of washing teeth among the studied elderly is rinsing with water and a toothbrush.

Concerning total knowledge, the results of the current study revealed that older adults had poor levels, and pre-practicing Oral Exercise and Salivary Gland Massage decreased to 5.50 % post-implementation of oral exercise. This may be attributed to the high levels of illiteracy and the lack of oral health education among the elderly. Furthermore, the use of audiovisual materials such as videos and posters that encourage self-learning demonstrated effectiveness in this study by reducing oral dryness and improving overall oral health. This finding is consistent with a study by **Abd Allah, et al. (2020),** who revealed that more than three-quarters of the studied elderly had inadequate knowledge about oral health and recommended an educational program about oral health for elderly patients. Moreover, this finding is supported by **Ki, et al. (2021)** titled ". Effect of oral health education using a mobile app (OHEMA) on the oral health and swallowing-related quality of life in community-based integrated care of the elderly" done in Korea and showed improved knowledge level after applying oral health education program among the studied elderly.

Regarding the total practices score of the studied elderly toward oral hygiene and exercise and salivary gland massage on oral function, the current finding illustrated that more than half of the studied elderly had unsatisfactory practices pre-implementation of oral hygiene and exercise and salivary gland massage which improved to the majority of them had satisfactory practice post-

implementation of oral exercise and salivary gland massage. Also, there are significant differences between total practice scores and post-implementation of Oral exercise and Salivary Gland Massage. This result might be due to the revitalizing oral health program, which has been simplified and improved to increase the awareness and interest of the elderly in oral health. This learning mode allows for greater flexibility and application of the learning information in real practice. This finding is consistent with prior studies conducted in Thailand by **Keyong, et al. (2019)** titled "Effectiveness of an oral health promotion program for the elderly in Khiri Mat district, Sukhothai province", who displayed that improvement level of practices among the elderly in the experimental group with significantly oral health practices. Also, this finding was supported by a study by **Wongm et al. (2024)** titled "Educational programmed on knowledge, attitudes, and practices of oral care/hygiene provision by healthcare providers to older residents in long-term care institutions" in China, which illustrated that practices level were significantly higher even after the intervention group received training.

The present study demonstrated a statistically significant improvement in all oral function tests post the implementation of Oral Exercise and Salivary Gland Massage. Also, it has been improved in revitalizing oral function and health for elderly people after the implementation of oral exercise and salivary gland massage. The study demonstrated that oral exercises effectively improve oral functions, included a reduction in dry mouth symptoms, increased salivary secretion, maintenance of normal salivary pH, adequate mouth opening size, elimination of halitosis, and restoration of normal oral motor function, which supported the research hypothesis. This result may be because oral exercises stimulate salivary secretion and oral function in older people, revitalize oral health with facial muscle exercises, tongue movements, and massage of the salivary glands. Salivary secretion increased significantly after exercising the function of stretching the lips, tongue, and cheeks. This finding is matched with previous study in India published by **Raj, et al., (2020)** titled "Effectiveness of oral exercise on oral function among the elderly who showed that there was a statistically significant difference noted in the mean scores of dry mouth symptoms, number of salivary secretions, halitosis, and oral motor before and after oral exercise. Moreover, this result is supported by a study by **Irayani, et al. (2025)** titled "Facial Exercises Effect to Increase Salivary Secretion in the Elderly" in Indonesia, which displayed that average salivary volume also increased from 1.56 ml before the exercise to 2.84 ml after the exercise.

The current study displayed that several factors have a highly significant impact on oral function among elderly participants, such as sex, chronic disease, previous oral cavity surgery, route of washing of teeth,

current medication, oral exercise, and salivary gland massage. This finding may be due to the oral cavity, which serves as a critical indicator of overall health, with its pathological conditions frequently exerting a more profound impact on systemic health. Chronic diseases, especially diabetes, impact periodontal disease, encompassing vascular alterations in the gingiva, immune responses, collagen metabolism disorders, and specific microbiological profiles within periodontal pockets. This result is the same as the line with **Fu, et al. (2025)** titled "Connection between oral health and chronic diseases" study in China, which reported a significant impact on oral function among studied participants with chronic disease. Moreover, these findings were supported by a study by **Janto, et al. (2022)** titled "Oral health among elderly, impact on life quality, access of elderly patients to oral health services and methods to improve oral health "in Romania. They showed that there were significant impact of oral exercise, techniques of washing, and oral exercises on oral function.

The current study found that demonstrated oral exercise and saliva gland massage had a direct effect on improvement of oral health function for studied elderly. These rustles were consistent with a study by **Kim, et al. (2019)** titled **"**Improvements in oral functions of the elderly after simple oral exercise" in Korea, and confirmed that oral exercise has a direct impact on oral health function. From the researchers point of view this may be due to oral exercise focused on enhancing salivation and swallowing function; notably, the intervention immediately improved oral function. Oral exercise intervention with several key motions is preferred over a conventional, complex oral. The new method can be performed continuously because it is easier for elderly individuals to remember and appears to be highly utilized

Conclusion

The study concluded that revitalizing oral health, especially oral exercise, improved the oral function of elderly people. Also, there was a significant improvement in elderly people's knowledge and reported practices after the program. Also, salivary gland massage enhanced salivary flow and reduced the risk of dryness in the mouth of elderly people.

Recommendations

- Continuous educational program for elderly people about oral exercise, saliva gland massage, and oral hygiene practices.
- Promote regular dental check-ups for elderly people, particularly those with chronic conditions.
- Develop rehabilitation programs that incorporate oral exercises into daily routines for the elderly.
- Encourage further research on the long-term effects of oral exercise and salivary gland massage.

Acknowledgments

Researchers wish to offer their gratitude and appreciation to all those who have assisted in this research.

Financial support
No funding was received

Conflict of interest
No

Reference

Abd Allah, E., Hussein, S., & Abdel-Aziz, H. (2020). Assessment of oral health, oral health knowledge and oral self-care practices among rural elderly. *Mansoura Nursing Journal*, *7*(2), 184-204.

Abdelaziz, H., Abbas, H., Sobhy, O., & Ahmed, S. (2024). Assessment of an educational program for oral health in a group of Egyptian elderly population: before and after study. Egyptian *Dental Journal,* 70 (4), 3045-3052.

American dental aging, (2025). Aging and Dental Health. https://www.ada.org/resources/ada-library/oral-health-topics/aging-and-dental-health

. *International Egyptian Journal of Nursing Sciences and Research*, *5*(1), 189-210**.**

Bashirian, S., Khoshravesh, S., Ayubi, E., Karimi - Shahanjarini, A., Shirahmadi, S., & Solaymani, P. F. (2023). The impact of health education interventions on oral health promotion among older people: a systematic review. *BMC geriatrics*, 23(1), 548.

Bellander, L., Andersson, P., Nordvall, D., & **Hägglin, C. (2021).** Oral health among older adults in nursing homes: A survey in a national quality register, the Senior Alert. *Nursing open*, 8(3), 1262-1274.

Bok, H. J., & Lee, C. H. (2020). Proper tooth-brushing technique according to patient's age and oral status. *Korean Academy of Preventive Dentistry*, 16(4), 149-153.

Chan, Y., Chu, H., Ogawa, H., & Lai, H. (2024). Improving oral health of older adults for healthy ageing. *Journal of Dental Sciences*, *19*(1), 1-7.

Cong, X., Mao, D., Wu, L., & Yu, Y. (2024). The role and mechanism of tight junctions in the regulation of salivary gland secretion. *Oral Diseases*, 30(1), 3-22.

Fu, D., Shu, X., Zhou, G., Ji, M., Liao, G., & Zou, L. (2025). Connection between oral health and chronic diseases. *MedComm*, *6*(1), e70052.

Fukai, K., Dartevelle, S., & Jones, J. (2022). Oral health for healthy ageing: a people-centred and function-focused approach. *international dental journal*, *72*(4 Suppl), S2

Ibayashi, H., Fujino, Y., Pham, T. M., & Matsuda, S. (2008). Intervention study of exercise program for oral function in healthy elderly people. The Tohoku journal

of experimental medicine, 215(3), 237-245.

Irayani, S., Lesmana, H., Sitanaya, R., Ab, S., Widyastuti, N., Aida, W. N., & Achmad, H. (2025). Facial Excercises Effect to Increase Salivary Secretion in the Eldery. *Journal of International Dental and Medical Research, 18 (1), 291-295.*

Janto, M., Iurcov, R., Daina, M., Neculoiu, **C., Venter, C., Badau, D., & Daina, G. (2022).** Oral health among elderly, impact on life quality, access of elderly patients to oral health services and methods to improve oral health: a narrative review. *Journal of personalized medicine*, *12*(3), 372.

Jeamanukulkit, S., Vichayanrat, T., & Samnieng, P. (2023). Effects of the salivary gland massage program in older type 2 diabetes patients on the salivary flow rate, xerostomia, swallowing and oral hygiene: A randomized controlled trial. *Geriatrics & Gerontology International*, 23(7), 549-557.).

Jiang, N., Zhao, Y., Stensson, M., & Mårtensson, J. (2022). Effects of an integrated supportive program on xerostomia and saliva characteristics in patients with head and neck cancer radiated with a low dose to the major salivary glands: a randomized controlled trial. *BMC Oral Health*, 22 (1), 199.

Keyong, E., Thitasomakul, S., & Tianviwat, S. (2019). Effectiveness of an oral health promotion program for the elderly in Khiri Mat district, Sukhothai province: A randomized control trial. *Journal of International Society of Preventive and Community Dentistry*, *9*(3), 225-231.

Ki, Y., Jo, R., Cho, S., Park,. E., Cho, W., & Jang, H. (2021). Effect of oral health education using a mobile app (OHEMA) on the oral health and swallowing-related quality of life in community-based integrated care of the elderly: a randomized clinical trial. *International journal of environmental research and public health*, 18(21), 11679.

Kim, J., Lee, Y., Lee, S., Jung, J., Ahn, J., & Kim, I. (2019). Improvements in oral functions of elderly after simple oral exercise. *Clinical Interventions in Aging*, 915-924.

Kim, W., Ahn, C., Lee, W., & Lee, J. (2012). Effect of parotid gland massage on parotid gland Tc-99m pertechnetate uptake. *Thyroid*, 22(6), 611-616.

Li, C., & Yao, A. (2021). Socio–economic disparities in dental health and dental care utilisation among older Chinese. *International dental journal*, 71(1), 67-75.)

Mahmoud, A., El Moshy, S., Rady, D., Radwan, A., Abbass, M., & Al Jawaldeh, A. (2022). The effect of unhealthy dietary habits on the incidence of dental caries and overweight/obesity among Egyptian school children (A cross-sectional study). *Frontiers in Public Health*, 10, 953545.

Murata, T., Yamaga, T., Iida, T., Miyazaki, **H., & Yaegaki, K. (2002)**. Classification and examination of halitosis. *International dental journal*, 52 (S5P1), 181-186.

Raj, T., Sreelekha, B., & Manjula, A. (2020). Effectiveness of oral exercise on oral function among the elderly. *Journal of Family Medicine and Primary Care*, *9*(4), 1896-1903.

Santoso, B., Susanto, E., Widyawati, N., Rahman, A., & Rajiani, I. (2020). Revitalizing School Dental Health Effort through" Model 222" as a Strategy to Achieve Caries-Free Indonesia 2030. *Systematic Reviews in Pharmacy*, *11*(2).

Schoppmeier, M., Janson, M., Höfer, K., **Graf, I., Wicht, J., & Barbe, G. (2024)**. Use of the modified Schirmer test to measure salivary gland hypofunction/hyposalivation: Systematic review and meta-analysis. *European Journal of Oral Sciences*, e12977.

Seo, K., & Kim, N. (2020). Effects of oral health programmes on xerostomia in community dwelling elderly: A systematic review and met analysis. *International Journal of Dental Hygiene*, *18*(1), 52-61.)

Shirobe M, Watanabe Y, Tanaka T, Hirano H, Kikutani T, Nakajo K, Sato T, Furuya J, Minakuchi S, and Iijima K. (2022). Effect of an Oral Frailty Measures Program on Community-Dwelling Elderly People: A Cluster-Randomized Controlled Trial. *Gerontology*; 68 (4): 377–386.

Simarjeet, K. (2022). Sample Size Determination (For Descriptive Studies). *Int. J. Curr. Res*, 9, 48365-48367.

Sjögren's Foundation, **(2025).** *Salivary Glands Massage Patient Education Sheet*. Retrieved January 24, 2025, from https://sjogrens.org/sites/default/files/inline-files/Salivary%20Glands%20Massage%20Patient%20Education%20Sheet.pdf

Thomson, M., van der Putten, J., de Baat, C**., Ikebe, K., Matsuda, I., Enoki, K., & Ling, Y. (2011**). Shortening the xerostomia inventory. Oral Surgery, Oral Medicine, Oral Pathology, Oral *Radiology, and Endodontology*, 112(3), 322-327.

Wimardhani, S., Rahmayanti, F., Maharani, A., **Mayanti, W., &**

Thomson, M. (2021). The validity and reliability of the Indonesian version of the Summated Xerostomia Inventory. *Gerodontology*, 38(1), 82-86.

Wong, M., Shie, W., Kao, E., Tsoi, M., & Leung, K. (2024). Educational program on knowledge, attitudes, and practice of oral care/hygiene provision by healthcare providers to older residents in long-term care institutions: A case-control study. *Geriatrics*, *9*(1), 16.

Wróbel-Dudzińska, D., Kubik-Komar, A., Rykwa, D., Kosior-Jarecka, E., Żarnowski, T., & Chałas, R. (2021). The use of Schirmer strips to measure salivary and lacrimal flow in non-Sjögren patients. *Clinical oral investigations,* 25, 4107-4114.

Zhou, Y., Zhou, L., Zhang, W., Chen, Y., She, K., Zhang, H., & Yin, X. (2024). Prevalence and Influencing Factors of Oral Frailty in Older Adults: A Systematic Review and Meta-analysis. *Frontiers in Public Health*. 12. 1457187.