

# Effect Of Age On Taste Perception - A Review

MabbithasriA<sup>1</sup>, Gifrina Jayaraj<sup>2</sup>, R Gayatri devi<sup>3</sup>

<sup>1</sup>Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

<sup>2</sup>Reader, Department of Oral Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India.

<sup>3</sup>Assistant Professor, Department of physiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India.

Email id <sup>1</sup>151902079.sdc@gmail.com, <sup>2</sup>gifrina@saveetha.com,  
<sup>3</sup>gaytridevi.sdc@saveetha.com

**Abstract:** Taste is a sensation of the gustatory system. Taste sensation along with olfaction is carried out by the trigeminal nerve. Taste receptors are present in the taste buds. Human tongues have papillae mostly on the anterior two-third of the tongue. The taste cells present on the tongue are responsible for the perception of taste. Around 50 years of age taste sensation tends to disappear slowly. The study aims to find and analyse about the effect of age on taste perception. To undergo this review, articles from PUBMED and Google scholar were collected and many other articles were collected from the reference section of other articles. It is found that many factors are responsible for loss of taste sensation like reduction of taste buds, poor oral hygiene, salivary flow, systemic diseases, smoking, and medication. After referring to many articles it is evident that perception of bitter taste is lost with age. From the current study it is evident that many techniques have been used to detect the taste perception in old age people and the most effective method was threshold perception.

**Keywords:** Age, Receptors, Sensation, Stimulant, Taste, Tongue.

## 1. INTRODUCTION

Taste is a sensation of the gustatory system. When the taste receptors cells present in the taste buds react chemically with the substance in the mouth sensation of taste is produced. The receptors for taste are located in the oral cavity mostly on the tongue. The impulse for taste along with olfaction is carried out by the trigeminal nerve, that decides the flavour of food or other substances. (KeshaavKrishnaa and Jayaraj, 2017) There are five basic tastes, they are sweet, salt, bitter, sour and umami. Human tongue has four types of papillae mostly on the anterior two-third, they are filiform, fungiform, foliate and circumvallate papillae. In the anterior two-third of tongue, filiform and fungiform papillae are located on the tip, whereas the foliate and circumvallate papillae are present on the lateral border. In the posterior one-third of the tongue certain foliate and circumvallate are present. All papillae have taste buds in them except the filiform papillae, taste buds are the receptor cells which is involved in chemosensory function. There are three taste cells namely Type-I, Type-II, Type-III, the Type I receptors are responsible for the detection of salt taste, Type-II cells help in the recognition of sweet, bitter and umami and the Type-III are responsible for the recognition of sour and sometimes can also detect salt taste. There are many stimulants available for each taste, for

salt the ancient stimulant is alkali metals like( Na+.).For sweet glucose acts as a stimulant,meat and glutamate can induce umami,urea or caffeine can be a stimulant for bitter and mild acids can be used as a stimulant for sour. (Brennan et al., 2020) . Taste sensation is essential for determining the nutritional value , assessing the quality of food , food safety and liking nature of food. The sensation of taste tends to disappear with age associated with disorders . Many factors can affect taste sensation like reduced taste buds , salivary flow , smelling,sensation , medication, systemic disease , genetics and other behavioural habits like smoking , oral hygiene and so on. (Ogawa et al., 2017) .

## 2. SCOPING PROCESS OF REVIEW

In this review process articles were collected from Google scholar and PUBMED. The articles collected were segregated according to relevance and time. Articles relevant from references of other articles were also taken . Articles related to Age, Taste, Smell changes ,systemic diseases ,Taste disorders,effect of medication on taste perception and Threshold changes were analysed. The level of evidence of the reviewed articles were categorized as per the criteria of Centre for Evidence- based Medicine, Oxford, UK (Howick et al., 2018).

### *Threshold*

Threshold is one of the factors affecting taste. Difference in taste perception can be measured by alteration of threshold. Many studies have analysed threshold changes and found that the detection threshold increases with age. A study specifically concludes that the detection threshold decreases (Wardwell et al., 2009). In the study conducted by Cowart et al (Cowart et al., 1994)decreases in sensitivity with age to bitterness were observed at threshold and supra threshold level.Similarly many articles concluded that detection threshold for bitter taste decreases with age. (Mavi and Ceyhan, 1999) In the study conducted by Fukunga et al (Fukunaga et al., 2005) an increase in threshold for all tastes was observed in older individuals than younger ones. In another study conducted by Nakazato et al (Nakazato et al., 2002) It is evident that there is an increase in threshold with age 60 ,smokers and females aged 30-40 were found to have lower detection threshold . lowest perception is seen in older adults .(Palati et al., 2020)

### *Effect Of Systemic Disease*

Systemic diseases such as diabetes mellitus, pernicious anemia , cardiovascular disease and other diseases like Crohn's disease and Sjogren syndrome cause taste dysfunction and loss of taste sensation (Shree et al., 2019). Gastrointestinal disease ,cancer and obesity can also be associated with taste dysfunction. Many studies have concluded that taste dysfunction can be due to renal failure and seen that it affects patients with high GFR(Prasanna and Gheena, 2016). Taste perception occurs mostly in hemodialysis patients and patients with Zinc deficiency(Lynch et al., 2013) . Most of the head and neck cancer patients undergoing radiation therapy were found to have taste dysfunction of all five tastes. (Deshpande et al., 2018) . In the study conducted by (Deeplaxmi et al., 2012) all oral submucous fibrosis patients were able to perceive sour taste with some exceptional cases(Latha et al., 2018). Taste perception decreases in Type -2 diabetes the patients were found to have an increased threshold for salt and sweet taste specifically. (Heckmann et al., 2005) . The sensation sweet taste tends to remain the same incase of stroke patients but other tastes were altered, especially bitter taste (*Journal of Clinical Periodontology*, 2018) Gingivitis patients experienced alteration of all tastes except salt (Graham et al., 1995).

### *Taste Disorders*

Agusia is a taste disorder with the inability to taste. Dysgeusia is the distorted ability to taste and other mucosal disorders like oral infection, inflammation, and mucositis caused due to radiation can cause loss of taste. The microvilli present in the taste buds are affected by radiation is responsible for altered taste perception. Lesions found in the oral cavity including the mucosa and taste buds can ultimately cause taste dysfunction (Manohar and Abilasha, 2019; Sukumaran and Padavala, 2018). Poor oral health and hypogeusia which can be due to bacterial infection can cause loss of taste with normal aging process. In a study conducted by (Abitha and Santhanam, 2019) it is said that loss of taste sensation is not due to reduction in taste buds but due to altered ion channels and decrease in salivary flow. The stretching of chorda tympani nerve and deficiency of Zinc, copper, and nickel can also cause loss of taste sensation (Bergdahl and Bergdahl, 2002). Bypass surgery and other surgeries in the gastric region can also affect taste (Sheriff et al., 2018).

### *Effect Of Medication On Taste Perception*

Chemosensory activities can be affected by drugs that reduce the chemicals to react with the receptors leading to dry the oral mucosa. Drugs will affect the impulse carried by neurons. Antimicrobial drugs having bitter and metallic taste changes the taste of sodium and potassium thereby affecting the corresponding taste that it stimulates. Angiotensin II antagonist cause ageusia and dysgeusia. (Uma et al., 2020) Calcium blockers have the ability to treat many diseases like hypertension, angina, migraine and vascular diseases which leads to dysgeusia. Diuretics, anti depression, anti-seizure drugs, anti corticosteroids, thyroid medication also affects taste sensation (Doty and Bromley, 2004) (Schiffman, 1997). The use of anti asthmatic drugs is also associated with taste loss. (Ikeda et al., 2005)

### *Remedial Measures*

Taste loss can be treated by giving Zinc supplements to patients. Polaprezinc is found to be the most effective drug. (Ripamonti et al., 1998) Apart from this flavour enhancement is done adding food and amplification of flavours in nutrition rich foods can prevent malnutrition and increase the food intake. (Schiffman, 1997)

## **3. DISCUSSION**

The reviewed literature indicated that both young and older patients did not have taste dysfunction for all the basic tastes. The information reaching the brain does not differ in both young and older participants (Brodoehl et al., 2013) (Gunasekaran and Abilasha, 2016) (Brodoehl et al., 2013). There is a significant decrease in brain activation to somatosensory areas found in older adults from younger ones. The increase in response to stimuli and brain activation is seen in young adults than older. (Harrita and Santhanam, 2019; Sarbeen et al., 2016) Older adults are found to have less perception of sour, salty, and bitter taste (Murphy and Gilmore, 1989) (Palati et al., 2019) (Hannah et al., 2018). They prefer salty rather than bitter. More recent study shows that there is more effect of age on loss of bitter taste perception. (Weiffenbach et al., 1982) Decrease in the suprathreshold for sweet perception increases the risk in patients with diabetes to consume excess sugar. Decrease in suprathreshold for salt perception makes it difficult for patients with Hypertension (Schiffman and Graham, 2000) (Ahad and Gheena, 2016) (Krishnan et al., 2018).

## Limitations

The variable study population in different study and old study has less technology compared to recent ones and found to be more successful and less complicated.

## 4. CONCLUSION

Older individuals have an increased threshold for taste, more so in patients with systemic diseases. This has a serious consequence on their nourishment leading to malnutrition. In order to overcome this, natural taste enhancers and management of the underlying systemic conditions within limits can greatly contribute to adequate feeding and thereby a better quality of life in the elderly population.

## Conflict of interest

The authors have none to declare

## REFERENCES

- [1] Abitha T and Santhanam A (2019) Correlation between bizygomatic and maxillary central incisor width for gender identification. *Brazilian Dental Science*. DOI: 10.14295/bds.2019.v22i4.1775.
- [2] Ahad M and Gheena S (2016) Awareness, attitude and knowledge about evidence based dentistry among the dental practitioner in Chennai city. *Research Journal of Pharmacy and Technology*. DOI: 10.5958/0974-360x.2016.00380.2.
- [3] Barragán R, Coltell O, Portolés O, et al. (2018) Bitter, Sweet, Salty, Sour and Umami Taste Perception Decreases with Age: Sex-Specific Analysis, Modulation by Genetic Variants and Taste-Preference Associations in 18 to 80 Year-Old Subjects. *Nutrients*. DOI: 10.3390/nu10101539.
- [4] Bergdahl M and Bergdahl J (2002) Perceived taste disturbance in adults: prevalence and association with oral and psychological factors and medication. *Clinical oral investigations* 6(3): 145–149.
- [5] Brennan F, Stevenson J and Brown M (2020) The Pathophysiology and Management of Taste Changes in Chronic Kidney Disease: A Review. *Journal of renal nutrition: the official journal of the Council on Renal Nutrition of the National Kidney Foundation*. DOI: 10.1053/j.jrn.2019.11.004.
- [6] Brodoehl S, Klingner C, Stieglitz K, et al. (2013) Age-related changes in the somatosensory processing of tactile stimulation—An fMRI study. *Behavioural brain research* 238: 259–264.
- [7] Cowart BJ, Yokomukai Y and Beauchamp GK (1994) Bitter taste in aging: compound-specific decline in sensitivity. *Physiology & behavior* 56(6): 1237–1241.
- [8] Deeplaxmi R, Sakarde SK, Sur J, et al. (2012) Altered taste perception in oral submucous fibrosis: A research. *J Indian Acad Oral Med Radiol* 24: 288–291.
- [9] Deshpande TS, Blanchard P, Wang L, et al. (2018) Radiation-Related Alterations of Taste Function in Patients With Head and Neck Cancer: a Systematic Review. *Current treatment options in oncology* 19(12): 72.
- [10] Doty RL and Bromley SM (2004) Effects of drugs on olfaction and taste. *Otolaryngologic clinics of North America* 37(6): 1229–1254.
- [11] Freeny L (2019) *But You Can't Hide*. TOPLINK PUB LLC.
- [12] Fukunaga A, Uematsu H and Sugimoto K (2005) Influences of Aging on Taste Perception and Oral Somatic Sensation. *The Journals of Gerontology Series A:*

- Biological Sciences and Medical Sciences*. DOI: 10.1093/gerona/60.1.109.
- [13] Graham CS, Graham BG, Bartlett JA, et al. (1995) Taste and smell losses in HIV infected patients. *Physiology & Behavior*. DOI: 10.1016/0031-9384(95)00049-o.
- [14] Gunasekaran G and Abilasha R (2016) TOOTH SENSITIVITY AMONG RESIDENTIAL UNIVERSITY STUDENTS IN CHENNAI. *Asian Journal of Pharmaceutical and Clinical Research*. DOI: 10.22159/ajpcr.2016.v9s2.13228.
- [15] Hannah R, Ramani P, Herald. J. Sherlin, et al. (2018) Awareness about the use, Ethics and Scope of Dental Photography among Undergraduate Dental Students Dentist Behind the lens. *Research Journal of Pharmacy and Technology*. DOI: 10.5958/0974-360x.2018.00189.0.
- [16] Harrita S and Santhanam A (2019) Determination of Physical Height Using Clinical Crown Height of Deciduous Teeth. *Indian Journal of Forensic Medicine & Toxicology*. DOI: 10.5958/0973-9130.2019.00255.x.
- [17] Heckmann SM, Hujoel P, Habiger S, et al. (2005) Zinc Gluconate in the Treatment of Dysgeusia—a Randomized Clinical Trial. *Journal of dental research* 84(1). SAGE Publications Inc: 35–38.
- [18] Howick J, Chalmers I, Glasziou P, et al. (2018) Explanation of the 2011 Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence (Background Document).(2011). Oxford centre for evidence-based medicine. Available: <http://www.cebm.net> ....
- [19] Ikeda M, Aiba T, Ikui A, et al. (2005) Taste disorders: a survey of the examination methods and treatments used in Japan. *Acta oto-laryngologica* 125(11): 1203–1210.
- [20] Jilani H, Peplies J and Buchecker K (2019) Assessment of Sensory Taste Perception in Children. *Instruments for Health Surveys in Children and Adolescents*. DOI: 10.1007/978-3-319-98857-3\_12.
- [21] *Journal of Clinical Periodontology* (2018) PR494: The effect of periodontal treatment on taste perception in periodontally involved patients. DOI: 10.1111/jcpe.495\_12915.
- [22] KeshavKrishna P and Jayaraj G (2017) Effect of age on taste perception: A survey. *International Journal of Orofacial Biology* 1(1). Medknow Publications and Media Pvt. Ltd.: 35.
- [23] Krishnan RP, Ramani P, Sherlin HJ, et al. (2018) Surgical Specimen Handover from Operation Theater to Laboratory: A Survey. *Annals of maxillofacial surgery* 8(2): 234–238.
- [24] Latha GS, Chandrashekar DM and Others (2018) Altered taste threshold in chronic Type 2 diabetes mellitus. *National Journal of Physiology, Pharmacy and Pharmacology* 8(4). MedScience (India) Publishers: 569–574.
- [25] Liem DG (2017) Infants' and Children's Salt Taste Perception and Liking: A Review. *Nutrients* 9(9). DOI: 10.3390/nu9091011.
- [26] Lynch KE, Lynch R, Curhan GC, et al. (2013) Altered taste perception and nutritional status among hemodialysis patients. *Journal of renal nutrition: the official journal of the Council on Renal Nutrition of the National Kidney Foundation* 23(4): 288–295.e1.
- [27] Madilogovit J, Chotechuan N and Trachootham D (2016) Impact of self-tongue brushing on taste perception in Thai older adults: A pilot study. *Geriatric nursing* 37(2): 128–136.
- [28] Manohar J and Abilasha R (2019) A Study on the Knowledge of Causes and Prevalance of Pigmentation of Gingiva among Dental Students. *Indian Journal of Public Health Research & Development*. DOI: 10.5958/0976-5506.2019.01859.x.
- [29] Mavi A and Ceyhan O (1999) Bitter taste thresholds, numbers and diameters of circumvallate papillae and their relation with age in a Turkish population. *Gerodontology*. DOI: 10.1111/j.1741-2358.1999.00119.x.
- [30] Mennella JA, Nolden AA and Bobowski N (2018) Measuring Sweet and Bitter Taste in

- Children: Individual Variation due to Age and Taste Genetics. *Pediatric Food Preferences and Eating Behaviors*. DOI: 10.1016/b978-0-12-811716-3.00001-4.
- [31] Mulheren RW, Humbert IA, Cappola AR, et al. (2018) Taste Perception and Water Swallow Screen Results in Old-Old Women. *Geriatrics* 3(4). DOI: 10.3390/geriatrics3040083.
- [32] Murphy C and Gilmore MM (1989) Quality-specific effects of aging on the human taste system. *Perception & psychophysics* 45(2): 121–128.
- [33] Nakazato M, Endo S, Yoshimura I, et al. (2002) Influence of aging on electrogustometry thresholds. *Actaoto-laryngologica. Supplementum* (546): 16–26.
- [34] Ogawa T, Uota M, Ikebe K, et al. (2017) Longitudinal study of factors affecting taste sense decline in old-old individuals. *Journal of oral rehabilitation* 44(1): 22–29.
- [35] Okayama T and Watanabe H (2019) Association between taste perception, nutrient intake, and mental health in young Japanese women. *Nutrition Research and Practice*. DOI: 10.4162/nrp.2019.13.1.41.
- [36] Palati S, Ramani P, Herald. J. Sherlin, et al. (2019) Age Estimation of an Individual Using Olze’s Method in Indian Population-A Cross-Sectional Study. *Indian Journal of Forensic Medicine & Toxicology*. DOI: 10.5958/0973-9130.2019.00179.8.
- [37] Palati S, Ramani P, Shrelin HJ, et al. (2020) Knowledge, Attitude and practice survey on the perspective of oral lesions and dental health in geriatric patients residing in old age homes. *Indian journal of dental research: official publication of Indian Society for Dental Research* 31(1): 22–25.
- [38] Prasanna GE and Gheena S (2016) A study of empathy across students from 4 health disciplines among 1st years and Final years. *Research Journal of Pharmacy and Technology*. DOI: 10.5958/0974-360x.2016.00286.9.
- [39] Ripamonti C, Zecca E, Brunelli C, et al. (1998) A randomized, controlled clinical trial to evaluate the effects of zinc sulfate on cancer patients with taste alterations caused by head and neck irradiation. *Cancer* 82(10): 1938–1945.
- [40] Rodrigues L, Espanca R, Costa AR, et al. (2017) Association between Salivary Leptin Levels and Taste Perception in Children. *Journal of nutrition and metabolism* 2017: 7260169.
- [41] Sarbeen JI, InsiraSarbeen J and Gheena S (2016) Microbial variation in climatic change and its effect on human health. *Research Journal of Pharmacy and Technology*. DOI: 10.5958/0974-360x.2016.00359.0.
- [42] Schiffman SS (1997) Taste and smell losses in normal aging and disease. *JAMA: the journal of the American Medical Association* 278(16): 1357–1362.
- [43] Schiffman SS and Graham BG (2000) Taste and smell perception affect appetite and immunity in the elderly. *European journal of clinical nutrition* 54 Suppl 3: S54–63.
- [44] Sheriff KAH, Ahmed Hilal Sheriff K and Santhanam A (2018) Knowledge and Awareness towards Oral Biopsy among Students of Saveetha Dental College. *Research Journal of Pharmacy and Technology*. DOI: 10.5958/0974-360x.2018.00101.4.
- [45] Shree KH, Hema Shree K, Ramani P, et al. (2019) Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis. *Pathology & Oncology Research*. DOI: 10.1007/s12253-019-00588-2.
- [46] Sukumaran G and Padavala S (2018) Molar incisor hypomineralization and its prevalence. *Contemporary Clinical Dentistry*. DOI: 10.4103/ccd.ccd\_161\_18.
- [47] Uma PK, Ramani P, Sherlin HJ, et al. (2020) Knowledge about Legal Aspects of Medical Negligence in India among Dentists--A Questionnaire Survey. *Medico Legal Update* 20(1): 111–115.
- [48] Wardwell L, Chapman-Novakofski K and Brewer MS (2009) Effects of age, gender and chronic obstructive pulmonary disease on taste acuity. *International journal of food sciences and nutrition* 60 Suppl 6: 84–97.

[49] Weiffenbach JM, Baum BJ and Burghauser R (1982) Taste thresholds: quality specific variation with human aging. *Journal of gerontology* 37(3): 372–377.

Table 1 : Description of included studies

S.No	Author	Year	Type Of Study	Study Population	Findings	Level Of Incidence
1	Freeny et al(Freeny, 2019)	2019	Survey	Exercising and inactive males	Taste perception intensity differed between active males and inactive females	Level 2
2	(Okayama and Watanabe, 2019) (Okayama and Watanabe, 2019)	2019	Survey	women	insensitive taste perception could be due to zinc deficiency in young women	Level 2
3	(Barragán et al., 2018)	2018	Survey	18-80 year old	Decrease in the intensity of taste with age	Level 3
4	(Mennella et al., 2018)	2018	Study	children	Children are more sensitive to bitter	Level 4
5	(Mulheren et al., 2018)	2018	Survey	Older women	Swallowing and taste changes in older age	Level 2

6	(Jilani et al., 2019)	2018	survey	children	Increased in the intensity of taste perception	Level 3
7	Yamaim et al [2017]	2017	Survey	Elder	Increased taste perception in younger	Level 3
8	(Liem, 2017)	2017	Study	children	increase in liking of salt	Level 3
9	(Rodrigues et al., 2017)	2017	Survey	children	Sweet taste motivates ingestion and bitter taste acts as deterrent of intake	Level 2
10	(Madiloggovit et al., 2016) (Madiloggovit et al., 2016)	2016	Survey	Children	Daily brushing was more effective than weekly brushing in improving the sweet and bitter taste.	Level 2