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# Evaluation Of Periodontal Status In Patients Reporting For Treatment Of Alzheimer Disease: An Observational Study

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## Abstract

Alzheimer Disease is a neurological disorder common among aged population with increasing prevalence with multifactorial etiology. Despite a large improvement in understanding the pathogenesis of AD, the etiology of this disorder is unexplored and no treatment is able to prevent, slow or stop its progression at present.(1) The progression and development AD is new focus of interest due to its molecular mechanism MATERIALS AND METHODS:Patient reporting with Alzheimer's disease in the Department of Oral Medicine, Department of Periodontology in Sri Ramachandra Dental college and Hospital and Dementia clinic in Sri Ramachandra Medical Centre were chosen for the study. The sample size of the study was 31 patients as calculated by single mean hypothesis testing. The clinical parameters to asses the periodontal status were the periodontal Inflamed Surface Area(PISA),OHI-S and Oral Health Assessment Tool (OHAT).A proforma was prepared to assimilate history of Alzheimer's disease in patient and also record current periodontal status.
RESULTS:Alzheimer's disease and occurrence of periodontitis is directly co-related to oral hygiene of patient. Poor oral hygiene is a predisposing factor for Alzheimer disease.
CONCLUSION:The patient suffering from Alzheimer's disease and early dementia had higher probability with the occurrence of periodontitis. The prevalence of periodontitis is directly correlated to poor oral hygiene and lack of manual dexterity..

**Key Words:** Alzheimer's disease, Oral Hygiene, Dementia, Oral Health Assessment Tool, Periodontitis.

## Introduction

A neurodegenerative disease most common among in the current era is Alzheimer's Disease which is having increasing prevalence in older adults. The onset of Alzheimer's can be early or late occurrence. This is disorder is characterized by the salient inflammatory features, microglial activation and increased levels of inflammatory cytokines which contribute to inflammatory condition of Central Nervous System(CNS). Periodontitis is more preferably defined as polymicrobial inflammatory disorder causing progressive destruction of alveolar bone and supporting periodontium It is established by numerous longitudinal studies that Periodontitis is a "low-grade systemic disease" by release of pro- inflammatory cytokines into systemic and elevation of C-reactive Protein(CRP).The bridging link hypothesised for establishing the bi-directional relationship between Alzheimer disease and periodontitis is still a keen interest.

AD can be of a early or late onset , of which the one that is genetically determined is the early onset. In major population the onset of disease occurrence is late or sporadic. It is established finding that genetic and environmental factors are the known predisposing factors. The known contributing risk factors for AD are family history, Education, High Fat diet, history of head Trauma .Apo Lipoprotein E (APOE) is the gene susceptible for AD. The rationale of the study is to evaluate the periodontal parameters and Oral Health in Alzheimer's patients

## Subject selection:

A total of 31 Alzheimer's patients reporting for dental treatment in the department of Oral Medicine, Department of Periodontology in Sri Ramachandra Dental College and Dementia Care Clinic in Sri Ramachandra Medical Centre were recruited for this study after obtaining informed consent.
The Ethical approval is obtained from Sri Ramachandra University Institutional Ethics Committee.**(CSP/22/MAE/108/204)**

## Inclusion creteria:

Both male and female patients more than 35 years of age.
Patient having more than 10 teeth.
Patients diagnosed for Alzheimer's Disease, by staging of Alzheimer's Disease by James Wilson(2021).The severity of the disease can be classified as mild, moderate, severe.

Patients with periodontal disease was classified based on AAP-1999 criteria and used as a guide for severity on the basis of clinical loss of attachment (CAL) as follows.

- Slight = 1-2 mm CAL,
- Moderate = 3- 4 mm CAL and
- Severe = 5 mm CAL

## Exclusion criteria:

Patients presenting with acute behavioural problems of AD.
Patients or care givers who did not give consent for oral and verbal consent.

## Clinical examination:

All periodontal parametera are examined by the single examiner using UNC-15 probe.The folowing index were assesed .

- OHI-S Index(Silness and Loe 1964)
- Papillary bleeding index developed by Saxer & Muhlemann (1978)

The periodontal inflamed surface area (PISA) is the sum of PPD of bleeding on probing (BOP) positive sites which is risk predictor of periodontitis. Spreadsheets available from the website: www.parsproto.info was used. This spreadsheet provides surface area of bleeding of pocket epithelium in millimetre square indicating the inflammatory burden of periodontitis. Pocket Depth is calculated on six sites of each tooth with respective clinical attachment loss

Oral Health Assement Tool (OHAT) also known as the Modified Brief Oral Health Status Examination was devised (modified from Kayser-Jones et al by Chalmers 2004).
The category included in OHAT are Lips,Tongue,Gums and tissues,Saliva,Natural teeth, Oral cleanliness and Dental Pain.The score greater than 9 is considered as Poor oral hygiene.
The highest score is 16 and lowest score is 0.

**Fig.1 Oral Health Assessment Tool**

| Resident: | | Completed by: | | Date: |
|---|---|---|---|---|
| *Scores– You can circle applicable words as well as giving a score for each category.* *(* if 1 or 2 scored for any category please organize for a dentist to examine the resident)* | | | | |
| Category | 0 = healthy | 1 = changes* | 2 = unhealthy* | Category scores |
| Lips | smooth, pink, moist | dry, chapped, or red at corners | swelling or lump, white/red/ulcerated patch; bleeding/ulceration at corners | |
| Tongue | normal, moist roughness, pink | patchy, fissured, red, coated | patch that is red and/or white, ulcerated, swollen | |
| Gums and tissue | pink, moist, smooth, no bleeding | dry, shiny, rough, red, swollen, one ulcer/sore spot under the dentures | swollen, bleeding, ulcers, white/red patches, generalized redness under dentures | |
| Saliva | Moist tissues, watery and free-flowing saliva | dry, sticky tissue, little saliva present, resident thinks they have a dry mouth | Tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth | |
| Natural teeth yes/no | no decayed or broken teeth/roots | 1–3 teeth decayed or broken teeth/roots or very worn-down teeth | 4+ decayed or broken teeth/roots, or very worn-down teeth, or fewer than 4 teeth | |
| Dentures yes/no | no broken areas or teeth, dentures regularly worn, and named | 1 broken area/tooth or dentures only worn for 1–2 hours daily, or dentures not named or loose | More than 1 broken area/tooth, denture missing or not worn, loose and needs denture adhesive, or not named | |
| Oral cleanliness | clean and no food particles or tartar in mouth or denture | food particles/tartar/plaque in 1–2 areas of the mouth or on small area of dentures or halitosis (bad breath) | Food particles/tartar/plaque in most areas of the mouth or on most of the dentures or severe halitosis (bad breath) | |
| Dental pain | no behavioural, verbal or physical signs of dental pain | verbal and/or behavioural signs of pain such as pulling at face, chewing lips, not eating, aggression | physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal and/or behavioural signs (pulling at face, chewing lips, not eating, aggression) | |
| | | | | TOTAL SCORE: __/16 |

## Statistical analysis:

One way ANOVA statistical test was done to find statistical significance between the groups. Post Hoc analysis was done when a significant result was obtained in ANOVA to find the category to the significance. The mean age of participants of this study was 60 years.The statiscal significance is set at 0.01

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## Result:

The participants were mostly male (84%).On performing One Way ANOVO test between two groups-OHAT and Dementia Severity, significant co relation was found between oral hygiene and severity of AD.(p=-0.011). Further a Post Hoc analysis was done to ascertain which category correlated the most.

A p-value of 0.014(<0.05) was obtained between group with severe AD and higher scores in OHAT indicating a positive co relation.

Similarly, one way ANOVA test was computed between OHI-S scores and AD severity. This showed a greater significant level of 0.000 to 0.011 in all categories of severity of AD, thus demonstrating oral hygiene was affected in all AD patients irrespective of the severity.
A positive correlation was found moderate and severe AD with Periodontal Inflamed Surface Area (p-value=0.001) using same statistical test.

## Graphical Representation Of Mild,Moderate And Severe Alzheimer Disease In Prevalence With Periodontal Status

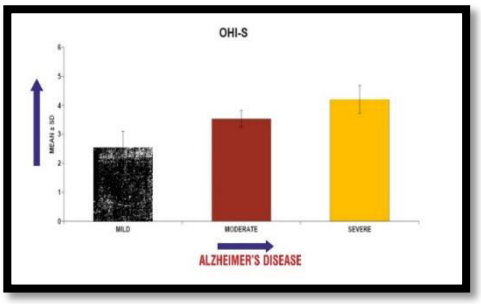


Fig.1 OHI-S in AD patients

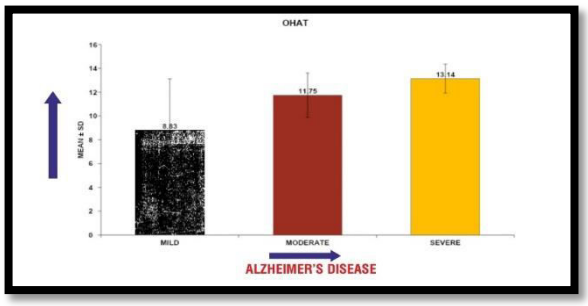


Fig.2 OHAT in AD patients

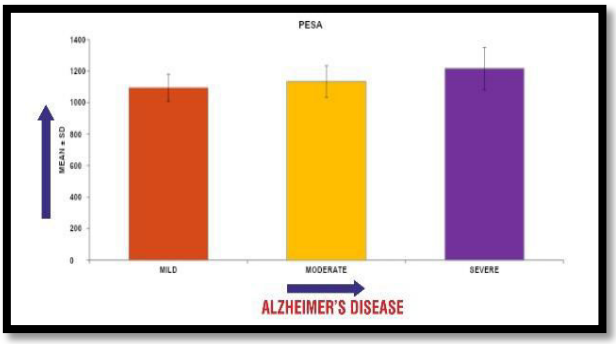


Fig.3 PESA in AD patients

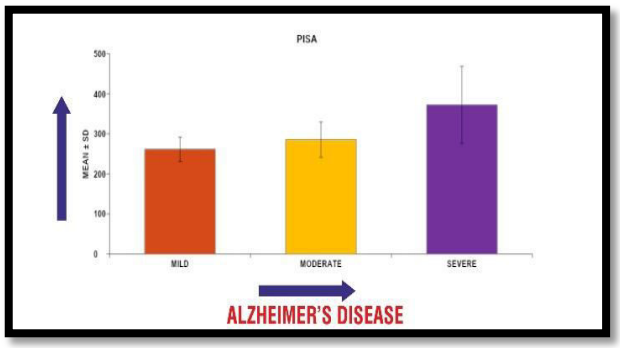


Fig.4 PISA in AD patients

**TABLE 1: CLINICAL PARAMETERS (MEAN + SD) AND P VALUES IN OHAT**

| OHAT | MEAN | SD | ANOVA | POST HOC |
|---|---|---|---|---|
| MILD | 8.83 | 4.282 | 0.11 | 0.59 |
| MODERATE | 11.75 | 1.865 | 0.11 | 0.594 |
| SEVERE | 13.14 | 1.215 | 0.11 | 0.014 |

**TABLE 2: CLINICAL PARAMETERS (MEAN + SD) AND P VALUES IN OHI**

| OHI | MEAN | SD | ANOVA | POST HOC |
|---|---|---|---|---|
| MILD | 2.55 | 0.5502 | 0.000 | 0.000 |
| MODERATE | 3.533 | 0.2871 | 0.000 | 0.000 |
| SEVERE | 4.2 | 0.4796 | 0.000 | 0.0011 |



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**TABLE 3: CLINICAL PARAMETERS (MEAN + SD) AND P VALUES IN PISA**

| PISA | MEAN | SD | ANOVA | POST HOC |
|---|---|---|---|---|
| **MILD** | 261.358 | 30.3545 | 0.001 | 0.456 |
| **MODERATE** | 285.5 | 44.1282 | 0.001 | 0.008 |
| **SEVERE** | 372.1 14 | 96.0964 | 0.001 | 0.001 |

**TABLE 4: CLINICAL PARAMETERS (MEAN + SD) AND P VALUES IN PESA**

| PESA | MEAN | SD | ANOVA | POST HOC |
|---|---|---|---|---|
| **MILD** | 1094.383 | 86.0885 | 0.063 | 0.629 |
| **MODERATE** | 1133.517 | 100.6816 | 0.063 | 0.232 |
| **SEVERE** | 1216.057 | 133.8174 | 0.063 | 0.051 |

## Discussion:

The periodontal disease (PD) ranks 11$^{th}$ amongst the most prevalent condition in the word. As stated previously, the world-wide prevalence of PD is likely upsurge in the near future, thus necessitating further understanding of its associated outcomes on systemic health. Alzheimer's disease (AD) is advanced neuro degenerative disorder characterized by dementia and cognitive decline/impairment, often leading to severe morbidity and mortality in elderly. The association of AD with periodontal disease has been carried out in the last decade, emphasizing the need for further evaluation.[3]

Periodontitis is of global concern now being11th amongst the most prevalent condition.The world wide prevalnce increasing and is likely upsurge in near future.Hence,it is essential further understanding of disease progression.

A substantial connection between immunologlobin G(Ig G), for P. gingivalis and different types of dementia is reported in literature, but a positive correlation between PD and AD is not definitely established by sound studies. A significant relationship between PD and AD was noted in the current study.

Several evidence are showing similar associations. A previous study had evaluated for severity of PD with AD, and reported some AD(prevalence= 20.7%) had severe PD as opposed to controls( prevalence=6.7%).

Meta analysis qualified several studies that sowed PD was greater in subjects diagnosed AD than those who had no AD. But this is was not the case in study conducted by Syrjala et al (2012).According to this study, there is no significant association considering PPD> or = 4mm as criteria. This study was done after adjusting known confounding factors like age ,sex or related habits ,dementia grade and number of teeth remaining.[4]

The role of inflammatory mediators and response of host immune mechanism in these two disease had provided basis of PD-AD associations. The periodontal microbes and altered host defence leads to secretion of inflammatory mediators [like interleukin-1Beta/6,C-reactive protein, or tumour necrosis factor-alpha] as noted in AD.

This can be further by the concept that cytokines and mediators of inflammation producing local destruction local destruction in PD are distrusted systemically, affect the primal glial cells and contribute to progression of AD.

The concept may also be furthered in a different directional curve, that the amyloid metabolism might be inflammatory mediators. The amyloid dispositions and neuro-tangles are features of AD patient.

As with many other systemic inflammatory disorders like atherosclerotic cardiovascular disease, diabetes mellitus or chronic inflammatory lung disease, a bi-directional pathogenesis can also be explained in case of AD-PD association. There is a evidence that reported an association of cerebral vessel inflammation or ischemic stroke and lacunar infarcts(as in vascular dementia which is often seen overlapping in AD) endorsing on this bidirectional relationship.

From more practical point of view, the AD patients have difficulty in brushing or maintain oral hygiene due to reduced manual dexterity in early-moderate stages. The visiting for dental care is often not a choice in advanced

AD as patient may need caretaker for basic functions or for those under palliative care. AD patients are highly subjective to opportunistic and non opportunistic infection that may cause PD associated tooth loss.

The patients with dementia (as in AD) may need home based oral and regular care.[5] The care giver reported dementia is a reported risk factor for poor hygiene and prompts a need for dental management in advancing AD patients.[6]

Institutionalized patients of aged population, need planned funding and oral health education. In scenario of developing nations early detection, control of early PD and recognition of severity of PD with concurrent evaluation for AD symptoms may be ideally practiced.

The results of the our study are in accordance with secondary research conducted . A recent meta analysis by Qui C et al showed that patient with periodontitis had higher risk of AD. They reported that no significant difference in the risk of AD in patient with moderate periodontitis but a higher risk in severe PD.[7] This finding is endorsed by another meta-analysis which also showed that severe forms of PD had significant association. Also, as per these meta-analyses, the clinical periodontal parameters (PPD, CAL, Plaque index and bleeding on probing) and number of teeth were significantly different in AD as opposed to control or those with dementia and without dementia.[9] Another meta-analysis by Nadim R et al associating dementia with PD from all high quality studies was 1.38, agreeing with the current study. The number of studies selected for final consideration varied in existing meta-analyses but a positive association was almost reported from the observational studies . Also, there is need for more epidemiological studies with more participants or implementing exact definition for more both terminology with adjustment for confounders. The qualitative and quantitative data substantiated that carers involvement in maintenance of residents oral health was improved by use of the Oral Health Assessment Tool, even with more than half of participants who were cognitively impaired.[8] Carers found the OHAT users-friendly and was stated by many of study participants.

The data used in this study were collected specifically for this analysis and were extracted from the old medical records. The definitive diagnosis of dementia and the duration and level of dementia are unknown, and the relationship between caregiver-reported dementia, the physician's diagnosis of dementia and the duration and the level of dementia needs to be investigated in future studies. In statistical analysis, the different observation periods for each patient were not strictly considered. The dental treatment and periodontal therapy performed within the observation period varied widely and were not interrupted in the statistical analysis.

This is the first study to involve Oral Health Assessment Tool in evaluating the status of periodontitis in Alzheimer's disease. Limitation in this study involves smaller sample size restraining to rare clinical condition. Future studies is directed toward evaluating biomarkers establishing the bidirectional association between Alzheimer's disease and Periodontitis.

## Conclusion:

Pain or other oral cavity problems tend to aggravate the behavioural problems in Patient with Alzheimer Disease need a routine follow up with periodontal care and mandatory neurological review. Simple Assessment tool Like OHAT can be taught to patient may be risk assessment tool. Early diagnosis and intervention for periodontal pathology can reduce taker burden and improve the quality of life in patients with AD. The medical fraternity must be educated about the importance of oral hygiene measures in patient with AD and Dementia.

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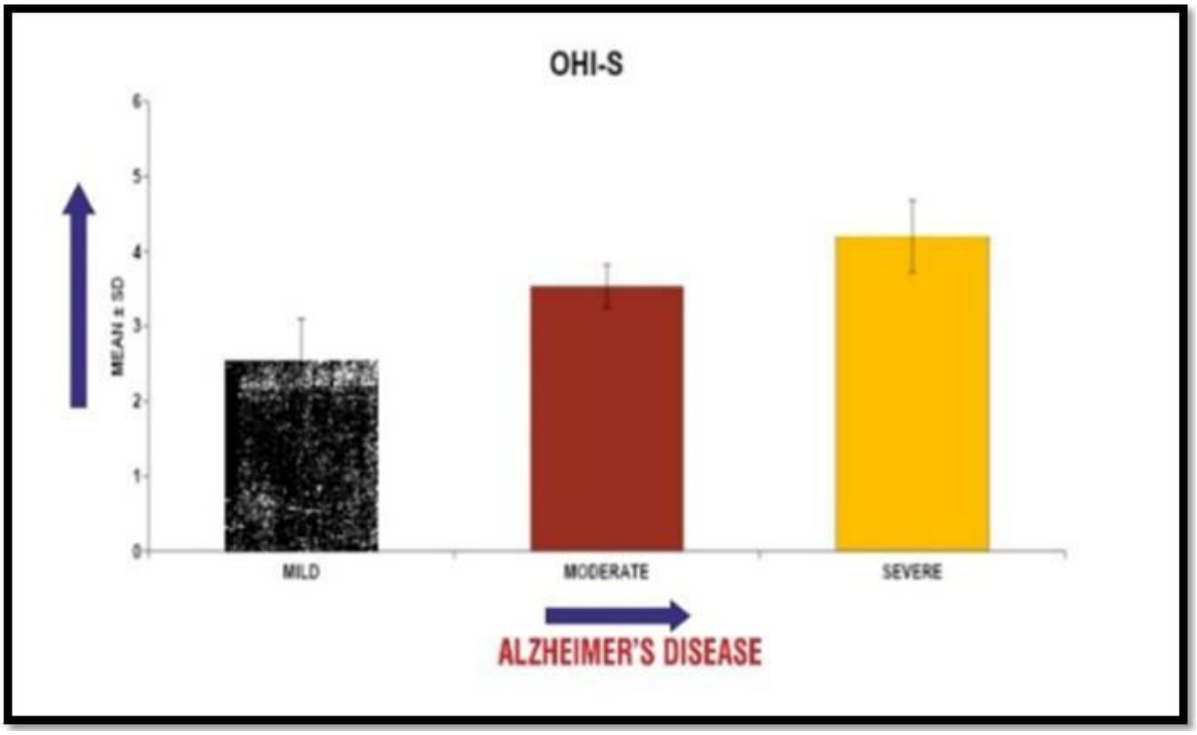


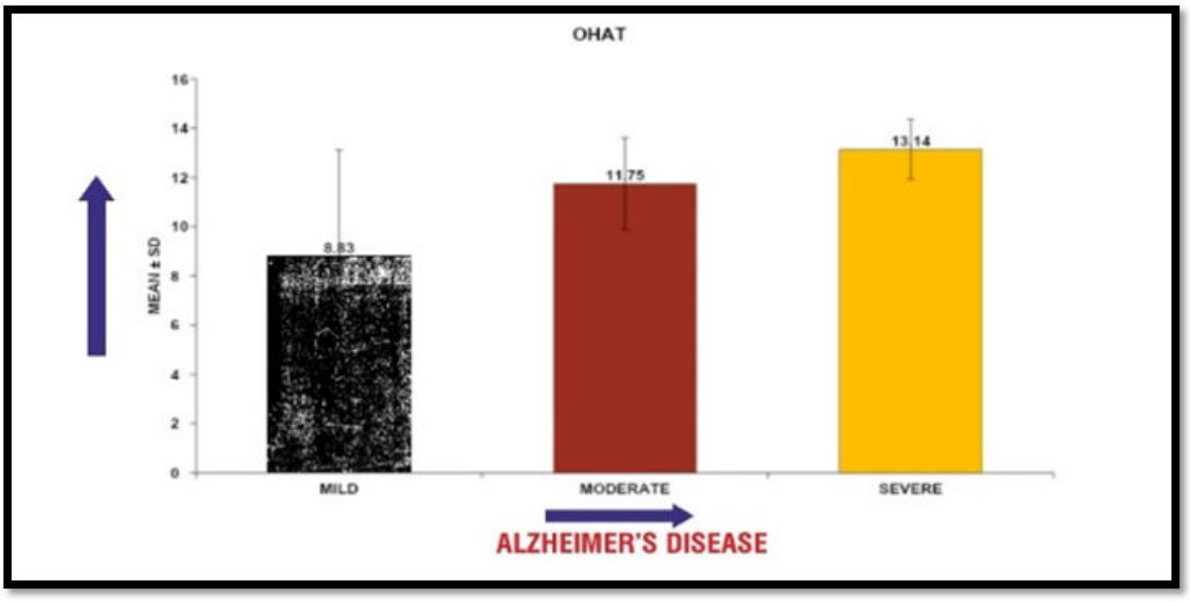

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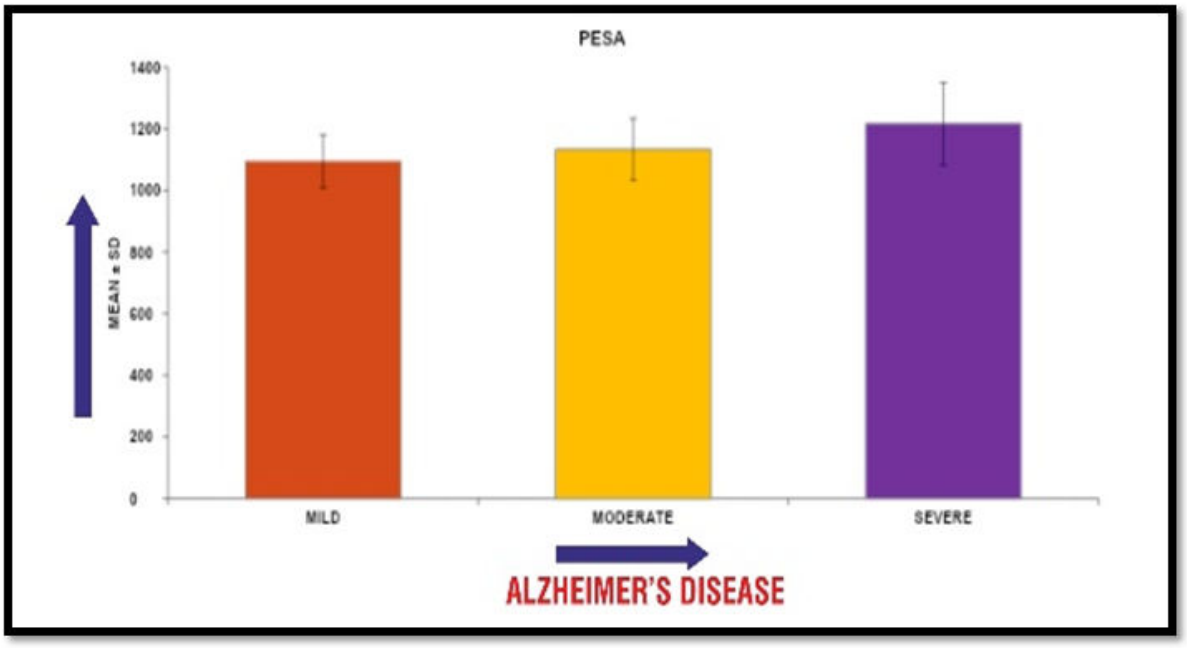


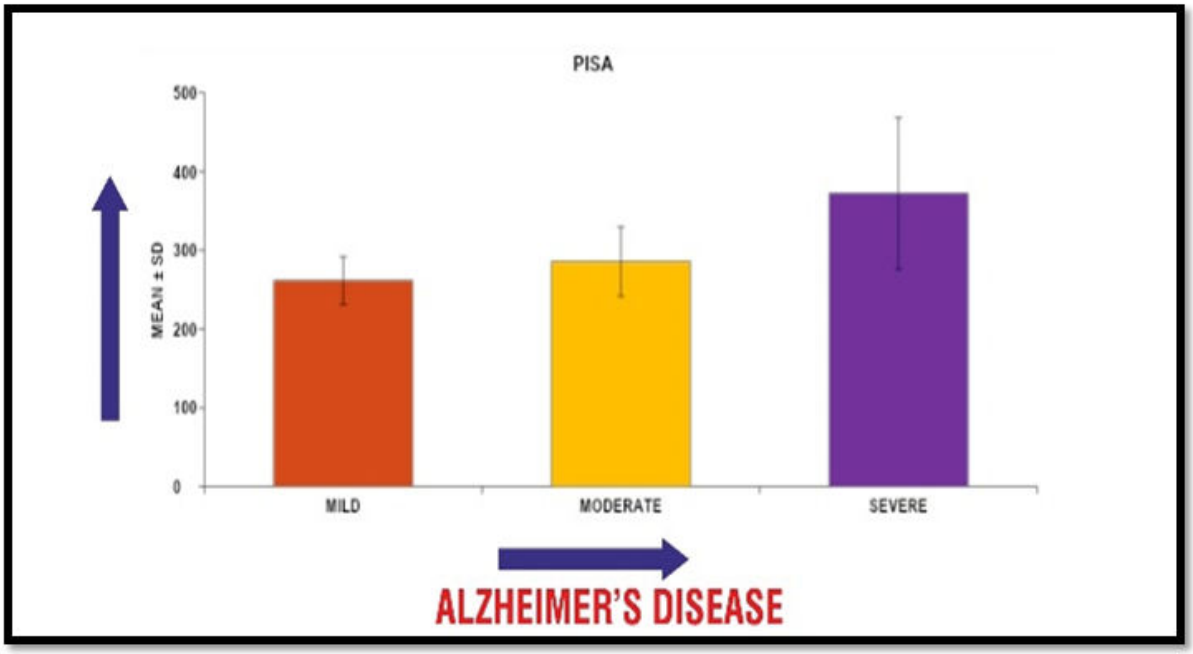




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| Resident: | Completed by: | | | Date: |
|---|---|---|---|---|
| *Scores– You can circle applicable words as well as giving a score for each category.* *(* if 1 or 2 scored for any category please organize for a dentist to examine the resident)* | | | | |
| Category | 0 = healthy | 1 = changes* | 2 = unhealthy* | Category scores |
| Lips | smooth, pink, moist | dry, chapped, or red at corners | swelling or lump, white/red/ulcerated patch; bleeding/ulceration at corners | |
| Tongue | normal, moist roughness, pink | patchy, fissured, red, coated | patch that is red and/or white, ulcerated, swollen | |
| Gums and tissue | pink, moist, smooth, no bleeding | dry, shiny, rough, red, swollen, one ulcer/sore spot under the dentures | swollen, bleeding, ulcers, white/red patches, generalized redness under dentures | |
| Saliva | Moist tissues, watery and free-flowing saliva | dry, sticky tissue, little saliva present, resident thinks they have a dry mouth | Tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth | |
| Natural teeth yes/no | no decayed or broken teeth/roots | 1–3 teeth decayed or broken teeth/roots or very worn-down teeth | 4+ decayed or broken teeth/roots, or very worn-down teeth, or fewer than 4 teeth | |
| Dentures yes/no | no broken areas or teeth, dentures regularly worn, and named | 1 broken area/tooth or dentures only worn for 1–2 hours daily, or dentures not named or loose | More than 1 broken area/tooth, denture missing or not worn, loose and needs denture adhesive, or not named | |
| Oral cleanliness | clean and no food particles or tartar in mouth or denture | food particles/tartar/plaque in 1–2 areas of the mouth or on small area of dentures or halitosis (bad breath) | Food particles/tartar/plaque in most areas of the mouth or on most of the dentures or severe halitosis (bad breath) | |
| Dental pain | no behavioural, verbal or physical signs of dental pain | verbal and/or behavioural signs of pain such as pulling at face, chewing lips, not eating, aggression | physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal and/or behavioural signs (pulling at face, chewing lips, not eating, aggression) | |
| | | | | TOTAL SCORE: __/16 |



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