

## Evaluating the Dental, Morphological and Psychological Variables in Patients with Dental Attrition.

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### Abstract

The aim of this research project was to find the possible risk factors for dental attrition and to find a correlation between these variables and severity of attrition. Patients with dental attrition reporting in the OPD of Department of orthodontics were thoroughly analyzed. The sample consisted of 100 patients falling in the age group of 15-60 years.

A holistic approach was taken and factors like sociodemographic variables, dental and occlusal variables, soft tissue and functional variables, craniofacial and morphological variables, parafunctional, physical and psychological variables were assessed through case history sheets of patients with dental attrition. It was found that age, male sex, married people, patients with edge to edge bite, poor oral hygiene, euryprosopic facial form, presence of crossbite, well aligned arches and generalized pattern of attrition and presence of higher degree of stress predispose the patient to severe forms of attrition. These observations need to be validated on case control study design with a larger sample size. This information will help the clinicians to take timely preventive steps as soon as any risk factors are identified.

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### Introduction

Dental attrition is defined as the physiologic wearing away of tooth as a result of tooth to tooth contact, as in mastication. [1] This occurs only on occlusal, incisal, and proximal surfaces of teeth, not on other surfaces unless a very unusual occlusal relation or malocclusion exists.

The affected teeth are characterized as flat, round or sharply angled with polished surfaces on the occlusal or incisal areas of the teeth and may be the result of excessive attrition of one tooth against the other. [2] Attrition initially affects the enamel and, if unchecked may proceed to underlying dentine. It causes discomfort and sensitivity especially during eating, drinking or tooth brushing. If left untreated, it may lead to pain or can affect the vitality of the tooth. It is also unaesthetic, especially when anterior teeth are involved. The prevalence of attrition in India is 88%. [3] It is generally accepted that attrition is age related and therefore a physiological process. However it is sometimes observed in young dentitions also when it is pathological in nature. An understanding of the multi factorial nature of dental attrition and its risk factors is important in the patient's diagnostic protocol and management strategies.

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There is very limited literature on the etiological factors or risk factors contributing to dental attrition. [4] Majority of the papers are correlation studies to assess the relation of TMJ disorders or stress and attrition. [5,6] The present study takes a holistic approach towards the possible risk factors that might contribute to dental attrition and also correlates them to severity of attrition. As severe grades of attrition may lead to non-vitality, increased pain and sensitivity and even loss of tooth if left unattended, these irreversible damages to the tooth could be prevented with a knowledge of these factors.

Hence this study will help us better understand the possible significant variables contributing to severe forms of attrition, which will help us educate the patients and warn them of the consequences. It will also help the clinicians to take timely preventive steps as soon as any risk factors are identified.

## Materials and Method

The study was conducted in the Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dentistry, Jamia Millia Islamia, New Delhi, India. Before commencing the Research Institutional ethical clearance was obtained. The patients reporting in the OPD were randomly divided into case group and control group on the basis of attrition. The patients were thoroughly examined to assess dental attrition. Only those patients who had attrition in one or more tooth were included in the case group. The inclusion criteria were as follows:

1. Patients having generalized or single tooth attrition on the occlusal or incisal surface.
2. Attrition involving either the anterior or posterior teeth.
3. Patients in the age group of 15-60 years.

Restored or carious tooth surfaces were excluded from the study. Attrition level was graded by the tooth wear index by Smith & Knight [7] as summarized in Table 1.

Grade	Criteria
0	No loss of enamel surface characteristics
1	Loss of enamel surface characteristics
2	Buccal, lingual and occlusal loss of enamel, exposing dentine for less than one third of the surface Incisal loss of enamel Minimal dentine exposure
3	Buccal, lingual and occlusal loss of enamel, exposing dentine for more than one third of the surface Incisal loss of enamel Substantial loss of dentine
4	Buccal, lingual and occlusal complete loss of enamel, pulp exposure or exposure of secondary dentine Incisal pulp exposure or exposure of secondary dentine

**Table 1:** Smith and knight tooth wear index.

Those patients who had no signs of attrition in the anteriors or posteriors were included in the control group. The sample consisted of 100 patients in the case group. Assuming prevalence of attrition as 88% and alpha = 0.05 the power of study as 85%, the sample size of 100 cases was justified.

The goals of the study were explained to potential participants and their written informed consent was obtained. Clinical oral examination of study subjects was done in the out-patient dental clinic using sterilized mouth mirrors and dental probes under the operating light on the dental chair unit. Patients were evaluated for the following factors:

**Baseline sociodemographic information**

The following data was obtained:

1. Age
2. Sex
3. Marital Status
4. Education
5. Income level
6. Awareness of the attrition by the patient
7. Employment status

**Dental and Occlusal variables**

These were evaluated by examining the following factors.

S. No.	Variables
1.	Past dental history.
2.	Family history for attrition.
3.	Teeth affected by attrition.
4.	Attrition level.
5.	Overjet measured with the use of a millimeter ruler and using a dry point compass. Edge-to-edge bite will be considered in cases of no overjet and overbite. The negative overjet will be obtained by the distance between the end of the incisal edge of lower incisors and the anterior surface of the maxillary incisor, measured horizontally.
6.	Presence of anterior open bite (negative overbite) or deep bite
7.	Presence of anterior or posterior crossbite (unilateral or bilateral).
8.	Classes I, II or III malocclusion, (based on Angles first molar relationship.)
9.	Maxillary and mandibular arch form.
10.	The type of anterior guide. The patient was asked to do the laterality move, right and left, (absent, canine, total or partial group function) and protrusive movement (absent or present) to the top position.
11.	Any supernumerary or missing teeth.
12.	Crowding of teeth.
13.	Presence of large restorations causing tooth interferences or high points.
14.	Pain or sensitivity in teeth
15.	Chewing efficiency as reported by patients
16.	Aesthetics as evaluated by patient and clinician.
17.	Periodontal condition
18.	Abrasion or erosion present
19.	History of orthodontic treatment.
20.	Oral hygiene status (Green and Vermillion index) <sup>8</sup> and brushing habits.

**Table 2:** Dental and occlusal variables.

**Craniofacial Morphological variables**

The following variable were evaluated

S. No.	Variables
1.	Facial form.
2.	Facial profile
3.	Facial asymmetry.

**Table 3:** Craniofacial morphological variables.

#### Soft tissue and functional variables

The following variable were evaluated

S. No.	Variables
1	Masticatory muscles
2	Temporomandibular joint
3	Opening pattern of mandible
4	Size of mouth opening in mm
5	Ridging of buccal mucosa
6	Scalloping of tongue

**Table 4:** Soft tissue and functional variables.

#### Parafunctional habits

Any parafunctional habit or use of psychoactive substance was evaluated.

S. No.	Variables
1	Any habits (nail biting, tongue thrusting, mouth breathing)
2	Use and frequency of psychoactive substances (tobacco, alcohol, caffeine, or medications for sleep, depression, and anxiety)
3	Bruxism

**Table 5:** Parafunctional variables.

History of Bruxism was recorded according to the ICSD's minimal criteria for sleep bruxism (1) the presence of teeth grinding during sleep; and (2) at least one of the following associated features: abnormal tooth wear, muscular discomfort, or sound associated with the tooth grinding. 9 Questions were asked to evaluate Bruxism

S. No.	Question	Answer
1.	According to you, or your bed partner, do you grind your teeth during your sleep?	6 to 7 nights a week/4 to 5 nights a week/2 to 3 nights a week/once a week/2 to 3 nights a month/1 night a month; never or rarely
2.	Have you had dental work because you grind your teeth during your sleep?	Yes/no
3.	Do you have muscular discomfort in your jaw because of your teeth grinding?	Always/sometimes/rarely/never/do not know
4.	Is the tooth grinding so loud that your bed partner (or individuals living with you) can hear it?	Always/sometimes/ rarely/never/do not know

**Table 6:** Questionnaire to evaluate bruxism.

## Physical and psychological variables.

S. No.	Variables
1	Medical history with special note on any medications or illness
2	Dietary habits
3	Stress evaluation

**Table 6:** Physical and psychological variables.

S. No.	Question
1.	In the last month, how often have you been upset because of something that happened unexpectedly?
2.	In the last month, how often have you felt that you were unable to control the important Things in your life?
3.	In the last month, how often have you felt nervous and "stressed"?
4.	*In the last month, how often have you dealt successfully with irritating life hassles?
5.	*In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6.	*In the last month, how often have you felt confident about your ability to handle your personal problems?
7.	*In the last month, how often have you felt that things were going your way?
8.	In the last month, how often have you found that you could not cope with all the things that you had to do?
9.	*In the last month, how often have you been able to control irritations in your life?
10.	*In the last month, how often have you felt that you were on top of things?
11.	In the last month, how often have you been angered because of things that happened that were outside of your control?
12.	In the last month, how often have you found yourself thinking about things that you have to accomplish?
13.	*. In the last month, how often have you been able to control the way you spend your time?
14.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
	choose from the following alternatives: 0. Never 1. Almost never 2. Sometimes 3. Fairly often 4. Very often.
	*scored in reverse direction. PPS scores are obtained by reversing the scores on seven positive answers e.g. 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0, and then summing across all fourteen items.

**Table 7:** Questionnaire for evaluating stress [10].

Medical history was taken for acidity gastric reflux etc. and dietary habits were evaluated by questions focusing on the consumption of carbonated/acidic drinks, type of food etc. as mentioned in case sheet.

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## Observations

Variable	Total N = 100 (Frequency = 100%)	Attrition level ≥ 2 (42) 3 (37) 4 (21) N%			Mean	95%Confidence interval of the Difference L-U	P value
1. Sex							
• Male	48	22.4%	31.1%	29.3%	3.06	0.277-0.887	<0.01
• Female	52	55.7%	36.5%	7.6%	2.48		
2. Marital status							
• Married	48	22.9%	43.7%	33.3%	3.10	-0.960- -0.363	< 0.01
• Unmarried	52	59.6%	30.7%	9.61%	2.44		
3. Bite							
• Edge to egde							
• Present	16	18.6%	12.5%	68.8%	0.99*	-1.72- -0.46	<0.01
• Absent	84	46.4%	41.6%	11.9%			
• Anterior openbite							
• Present	3	66.6%	33.3%	0	-0.57*	-1.54- 0.41	0.349
• Absent	98	41.2%	37.1%	21.6%			
• Deep bite							
• Present	27	74.1%	40.7%	22.2%	-0.35*	-0.69- 0.00	0.051
• Absent	73	30.1%	35.6%	20.5%			
4. Crossbite							
• Present	13	15.4%	46.1%	38.4%	3.23	-1.014- -0.068	< 0.05
• Absent	87	45.9%	35.6%	18.39%	2.69		
5. Crowding of teeth							
• Present	39	51.3%	46.1%	2.6%	2.49	0.125-0.770	0.007
• Absent	61	36.1%	31.1%	32.8%	2.93		
6. Pain or sensitivity							
• Present	65	46.2%	29.2%	24.6%	2.89	-0.712- -0.044	<0.05
• Absent	35	34.3%	51.4%	14.3%	2.51		
7. Abrasion or erosion							
• Present	9	22.2%	33.3%	44.4%	3.33	-1.186- -0.074	<0.05
• Absent	91	43.9%	37.4%	18.7%	2.70		
8. Oral hygiene							
• Poor	25	24%	40%	36%	3.08	0.060-0.794	<0.05
• Average	75	48%	36%	16%	2.65		
9. Facial form							
• Leptoprosopic	28	57.1%	32.1%	10.7%	0.80*	-1.50- -0.10	0.294
• Mesoprosopic	62	38.7%	41.9%	19.3%	0.29*		
• Euryprosopic	10	20%	20%	60%	0.80*	0.10-1.50	<0.05
10. Tmj disorders							
• Abnormal	36	47.2%	4.6%	11.1%	2.61	-1.569- 0.104	0.173
• Normal	64	39.0%	34.3%	26.5%	2.84		
11. Ridging of buccal mucosa							
• Present	85	37.6%	41.1%	21.1%	2.80	-0.720-0.187	0.246
• Absent	15	66.6%	13.3%	20%	2.53		
12. Scalloping of tongue							
• Present	83	39.7%	40.9%	19.3%	2.78	-0.570-0.297	0.535
• Absent	17	52.9%	17.6%	29.4%	2.65		

13. Stress							
• Not stressed	4	75%	25%	0			
• Mild stressed	31	41.9%	25.8%	32.2%	1.06*	-0.02-2.14	0.057
• Moderate stressed	43	41.8%	44.1%	13.9%	1.06*	0.00-2.13	0.05
• Severe stressed	22	36.7%	40.9%	22.7%	1.02*	-0.08-2.13	0.079

**Table 8:** Observations and significant data.

## Results

All the data was collated and statistically analyzed. The spread of severity of attrition based on various parameters was tabulated. The number of patients in accordance to severity of attrition was tabulated in respect to each variable. Statistical significance was defined as a P values < 0.050. Analysis was performed using SPSS software. Post hoc test was done for those factors where more than two variables were present ex: age group. Where 2 variables were present independent sample T-test was performed ex: sex.

A total of 100 patients in the age group 15-60 years were evaluated out which 48 were males and 52 were females. The first factor was Sociodemographic variables under which the post hoc test showed that attrition is related to age and its severity increases with age. It was found that the severity of attrition is more in males as compared to females. It also showed that the married people had significantly higher severity of attrition than unmarried sample.

Second factor was Dental and occlusal variables under which the severity of attrition was significantly more in patients showing generalized attrition and in those patients depicting edge to edge bite had more severe attrition. It also showed that the patients showing higher grades of tooth wear had well aligned arches and absence of crowding. However patients with higher grades of tooth wear were significantly related to poor oral hygiene. The severity of attrition was found to be more in patients with cross bite.

Next factor was Craniofacial morphological variables in which we found that the facial form was significantly related to the severity of attrition with Euryprosopic facial forms showing more severe attrition. In Soft tissue and functional variables Ridging of buccal mucosa and scalloping of tongue were present but not significantly related to severity of attrition. No other soft tissue or functional variable was significantly related to the severity of dental attrition. Parafunctional variables were not significantly related to dental attrition. Last factor was physical and psychological variables which showed that severity of attrition increases with level of stress.

## Discussion

Wear of tooth surface can be due to various reasons like attrition, abrasion, erosion and abfraction. This study has focused on the wear of tooth surface due to a phenomenon known as attrition. As previously mentioned, dental attrition is defined as the physiologic wearing away of tooth as a result of tooth to tooth contact, as in mastication. [1] there are several methods and indices to assess tooth wear. [7, 11-17]

There have been various studies in the past which relate the various intrinsic and extrinsic factors with dental attrition. However this is the first study which takes a holistic approach towards this phenomenon and tries to correlate these factors with various attrition levels. Since severe attrition can lead to non-vitality of the tooth or even loss of tooth apart from compromised esthetics and function, one needs to know which variables can make a tooth more prone to severe grades of attrition.

There have been various studies in the past which relate the various intrinsic and extrinsic factors with dental attrition. However this is the first study which takes a holistic approach towards this phenomenon and tries to correlate these factors with various attrition levels. Since severe attrition can lead to non-vitality of the tooth or even loss of tooth apart from compromised esthetics and function, one needs to know which variables can make a tooth more prone to severe grades of attrition.

Our study also confirms the fact that not only the presence of attrition but its severity is also related to age. It is generally accepted that men have higher wear levels than women due to stronger musculature an assumption confirmed by our results. [11-14, 18]

In our study it was found that married people had significantly higher severity of attrition than unmarried sample which might be related to increased levels of stress. The literacy level had no significant relation with the severity of attrition. Similarly income level also did not have significant relation with the severity of attrition. This is in accordance with the study conducted by Bernhardt<sup>4</sup> which found that unemployment was significantly related to attrition however its relation to high occlusal wear was low. Amongst the 100 patients evaluated 78 patients were not aware of this problem which shows the low levels of awareness of this problem in the masses and a need to educate them.

Amongst the Dental and occlusal variables it was found that the severity of attrition was significantly more in patients showing generalized attrition rather than in any individual tooth or groups of teeth for ex: lower anteriors. This factor has not been evaluated in any other study. It was also found that the patients depicting edge to edge bite had more severe attrition whereas presence of deep bite did not increase the severity of attrition. The severity of attrition was more in patients with cross bite.

The presence of any particular malocclusion or missing teeth was not significantly related to attrition or its severity. In fact the patients showing higher grades of tooth wear had well aligned arches and absence of crowding. The severity of attrition was related to more discomfort any pain to the patient which could be understood by the fact that severe attrition could lead to dentinal or pulpal exposure and hence increased sensitivity and pain in these patients. Poor periodontal health did not predispose the patient to severe forms of attrition. However patients with higher grades of tooth wear were significantly related to poor oral hygiene. The brushing frequency, method and any other aid could not be significantly related to dental attrition. These findings are in accordance with the previous studies [4,14,19,20] However a few studies observed decreased number of tooth contacts i.e. missing teeth and increased tooth wear. [4,21]

Amongst the Craniofacial morphological variables only the facial form was significantly related to the severity of attrition with euryprosopic facial forms showing more severe attrition. This could be a result of the fact that brachyfacial patients usually have stronger muscular forces and hence increased severity of attrition. Facial profile and symmetry was not related to the severity of attrition.

Amongst the Soft tissue and functional variables hypertrophy or pain and tenderness of Masticatory muscles was not significantly related to the severity of attrition. This could also be due less number of sample size in these groups. Clicking, pain and tenderness of TMJ was also not significantly related to severity of attrition. These finding are in accordance with study conducted by Bernhardt.<sup>4</sup> Ridging of buccal mucosa and scalloping of tongue though were observed in these patients but were not significantly related to severity of attrition.

Amongst the Para functional, physical and psychological variables none of the Parafunctional variables were significantly related to dental attrition. Bruxism was also not related but could be due to our small sample of patients with Bruxism. The results point out that the severity of attrition increases with level of stress as has been found in other studies also. Though 49 out of 100 patients complained of problem of acidity but it was not significantly related to the severity of attrition but could be a predisposing factor to attrition. It is also known that stress and acidity are interrelated. Medical history and dietary habits like type of food, acidic drinks, carbonated drinks, use of psychoactive substances were not significantly related to the severity of attrition.

## Conclusion

1. Age, male sex, married people, patients with edge to edge bite, poor oral hygiene, euryprosopic facial form, presence of crossbite, well aligned arches and generalized pattern of attrition and presence of higher degree of stress predisposes the patient to severe forms of attrition.
2. The clinician needs to keep in mind these factors since these variables can make a tooth prone to severe forms of attrition and hence need to be managed with utmost priority to prevent irreversible damage to the tooth surface.



**Limitations and future recommendations**

1. A correlation between various variables and dental attrition can be more precisely evaluated if control group was also included i.e. if data was randomly collected for patients with and without attrition and then odds ratio was calculated.
2. A study with larger sample size is needed to justify so many variables and the conclusion need to be further extrapolated with a bigger sample size.

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