

# Teeth loss and its association with locomotive syndrome among patients visiting the outpatient department of a dental school in Mahbubnagar, India-A cross sectional study

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**Abstract.** *Background:* Locomotive syndrome (LoS) is condition wherein mobility functions such as sit-to-stand or gait are declined due to locomotive organ impairment. The important risk factors for the LoS are ageing and physical factors. Physical factors are significantly associated with dental status. *Aim:* To investigate the relationships between teeth lost and locomotive syndrome. *Materials and method:* A cross sectional study was conducted among (45-90 years) individuals by using Loco Check List. Factors related to demographics (age, sex) and number of teeth lost were assessed. Pearson's chi-square test, multiple logistic regression analysis were performed.  $p < 0.05$  was considered to be statistically significant. *Results:* Out of 322 subjects, majority of subjects (58.7%) had LoS. Locomotive syndrome was observed high significantly (78.0%  $P = 0.0000$ ) among  $>60$  years age group. Majority of the subjects with tooth loss more than 10 teeth (92.6%) had a locomotive syndrome followed by the subjects with tooth loss 1-10 teeth (52.1%). Multiple logistic regression analysis revealed Locomotive syndrome was significantly ( $P = 0.000$ ) higher among older age groups ( $>60$  years) when compared with the 45- 60 years age group (or = 0.732) and subject with more than 10 teeth lost when compared with others (or = .009, or = 0.105) *Conclusion:* Study indicates that older age and number of teeth lost affect the prevalence of locomotive syndrome. Hence, maintaining oral health is necessary to retain more number of teeth throughout life which reduces the risk of locomotive syndrome. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Keywords:** Locomotive, dental status, periodontal status, teeth lost and oral hygiene.

The pace of population ageing around the world is dramatically increasing (1) which is a natural process, inevitable biological phenomenon (2). There will be 2 billion people over age of 60, 80% of them living in developing countries by 2050 (3). India, by no means, is an exception to this phenomenon. There is a substantial increase in the life span of man in the last half of the 20th century due to the advances made in medicine (2). As a result of this, there is an increase in life expectancy among the elderly individuals which in turn affects daily living activities; one among them is the difficulty in locomotion (4).

The term locomotive syndrome (LoS) proposed by Japanese Orthopaedic Association in 2007 (5) is defined as "condition wherein mobility functions such as sit-to-stand or gait are declined due to locomotive organ impairment" (4). In LoS, the locomotive system consists of three main components: 1) bones, 2) joints and intervertebral discs, and 3) muscles and nerves. Thus, musculoskeletal ambulation diseases, such as osteoporosis, osteoporosis-related fractures, osteoarthritis (OA), spondylosis, sarcopenia, and neural disorders, are often related to cause LoS (6). The important risk factors for the

LoS are ageing and physical factors, such as knee and spinal factors—including back muscle strength and low back pain (fig1) (6) resulting in decrease in both mental and social activity. As the physical performance is reduced in LoS it results in decreased in manual dexterity or impaired range of motion of the wrist, elbow or shoulder influence the plaque control procedures further deteriorate oral health (2). Physical performance is significantly associated with dental status and periodontal status, as well as chewing ability, among the elderly (7). Deterioration of locomotive constituents lead to symptoms such as pain, limitations in the range of joint mobility, impaired balance and difficulty walking initiating reduced habitual exercise, sedentary lifestyles, and inadequate nutritional intake which may also further deteriorate oral health in LoS individuals (8).

To maintain oral health, it is necessary to retain more number of teeth throughout life as Missing teeth can interfere with chewing ability, diction, and esthetics (9). Low self-esteem related to tooth loss can hinder an individual's ability to socialize, hamper the performance of work and daily activities, and lead to absence from work (9). Locomotive syndrome and Teeth lost strongly impacts the individual's quality of life (10,11). However, few reports have assessed the relationship between locomotive syndrome, lifestyle factors such as smoking, alcohol consumption (7) and blood parameters (12). But no studies have been done to know the association between Teeth lost and LoS among elder patients. So the present study was aimed to determine association between Teeth lost and LoS among older individuals visiting the outpatient de-

partment of a dental school in Mahbubnagar, India. The null hypothesis for this test is that there is no association between teeth lost and LoS.

## Materials and method

A cross sectional study was carried among (45-90 years) individuals visiting the outpatient department of a dental school in Mahbubnagar, India by using Loco Check List (13) a self-administered questionnaire both English and Local language (Telugu) (Annexure I) between December 2018 and March 2019. The validity of the questionnaire was checked by a pilot study as well as by back translation by professional proficient in both languages. An individual answering in the affirmative to one or more items of the 7 statements in this checklist is considered to have LoS. Additionally, demographic details like age, gender and number of teeth lost were included in the questionnaire. The study was approved by the ethical committee of institutional review board of the SVS Institute of Dental Sciences and Hospital, Mahbubnagar (SVSIDS PHD125). Participants were informed about study and their written consent (Annexure II) was obtained. Participants who could walk unassisted and perform activities of daily life without assistance were included while participants who had visual/hearing impairment, decreased cognitive function, or motor paralysis were excluded from the study. Statistical analysis was done using statistical package for social sciences (SPSS) software (21.0) version. Pearson's chi-square test was used for the comparison of LoS with age, gender and teeth loss. For multivariate analysis, multiple logistic regression analysis was performed. A  $p < 0.05$  was considered to be statistically significant. Sample size estimation: sample size of 267 was calculated for 6% absolute precision, 95% confidence and a power of 80%.

## Results

Out of 322 subjects, majority of subjects (58.7%) had locomotive syndrome. Male were slightly higher in number (52.8%) when compared with females.

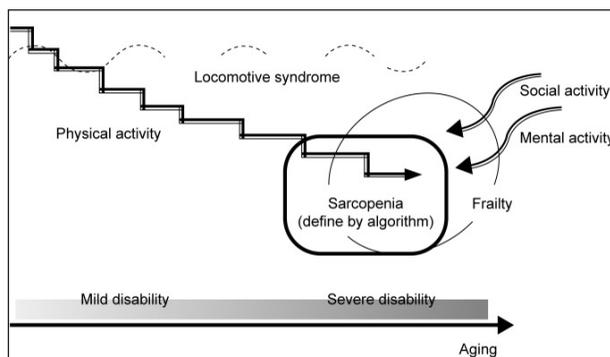


Figure 1.

Only 12.1% of the individuals had no tooth loss. The mean age and mean number of tooth loss of participants was  $58.994 \pm 10.9658$  and  $7.882 \pm 7.98$  respectively (Table 1).

**Table 1:** Demographic distribution of the study subjects

Variable	Frequency (n %)
Age	45-60 Years 199(61.8%)
	>60 Years 123(38.2%)
Gender	Male 170(52.8%)
	Female 152(47.8%)
Locomotive syndrome	Yes 189(58.7%)
	No 133(41.3%)
Number of teeth loss	0 39(12.1%)
	1-10 188(58.4%)
	11-32 95(29.5%)
<b>Total</b>	<b>322</b>

Locomotive syndrome was observed high (78.0%) among >60 years age group. while absence of locomotive syndrome was observed high (61.8%) among 45-60 years age group suggesting locomotive syndrome increases as age being increased which was statistically significant ( $P=0.000$ ) (Table2).

When compared to females, most of the males had Locomotive syndrome (65.3%) which was statistically significant ( $P=0.011$ ) (Table 3).

Majority of the subjects with tooth loss more than 10 teeth (92.6%) had a locomotive syndrome followed by the subjects with tooth loss 1-10 teeth (52.1%). while a least number of subjects with no tooth loss had a locomotive syndrome (7.7%) which was significant statistically ( $P=0.000$ ) (Table 4).

Multiple logistic regression analysis revealed Locomotive syndrome was significantly ( $P= 0.000$ ) higher among older age groups (>60 years) when compared with the 45- 60 years age group (odds ratio

**Table 2:** Frequency distribution of study subjects based on Locomotive syndrome and Age groups

Locomotive Syndrome	Age		Total	P Value
	45-60 Years	>60 Years		
Yes (n%)	93(46.7%)	96(78%)	189(58.7%)	
No (n %)	106(53.3%)	27(22%)	133(41.3%)	
<b>Total (n %)</b>	199(61.8%)	123(38.2%)	322(100%)	0.000*

p value <0.05 was statistically significant

**Table 3 :** Frequency distribution of study subjects based on Locomotive syndrome and Gender

Locomotive Syndrome	Gender		Total	P Value
	Males	Females		
Yes (n %)	111(65.3%)	78(51.3%)	189(58.7%)	
No (n %)	59(34.7%)	74(48.7%)	133(41.3%)	
<b>Total (n %)</b>	170(52.8%)	152(47.2%)	322(100%)	0.011*

p value <0.05 was statistically significant

**Table 4:** Frequency distribution of study subjects based on Locomotive syndrome and Number of teeth lost

Locomotive Syndrome	Number of teeth lost			Total	P Value
	0	1-10	11-32		
Yes (n %)	3(7.7%)	98(52.1%)	88(92.6%)	189(58.7%)	
No (n %)	36(92.3%)	90(47.9%)	7(7.4%)	133(41.3%)	
<b>Total (n %)</b>	39(12.1%)	188(58.4%)	95(29.5%)	322(100.0%)	0.000*

p value <0.05 was statistically significant

= 0.732). Even though males reported a higher locomotive syndrome when compared with females but was not significant. However locomotive syndrome was observer high among the subject with 11-32 tooth loss group when compared with no tooth lost and 1-10 teeth lost group (odds ratio = 0.009, odds ratio = 0.105) which was significant ( $P=0.000, P=0.000$  respectively) (Table 5).

## Discussion

Locomotive syndrome is a condition of weakness among elderly population which require early detection and assessment for prevention and treatment. A screening tools, the loco-check (valid and reliable) was used to measure locomotive syndrome quantitatively (13). Our study showed that older age individuals, ( $\geq 60$  years), number of teeth lost ( $>10$ ) were significantly associated with risk of locomotive syndrome.

The prevalence of locomotive syndrome among the study subjects was 58.7% which was lower than the study done by Noge S et al, (14) they reported that 87.3% had locomotive syndrome. The reason for high prevalence might be due to higher age group subjects (above 80 years) participated in the study.

Our study reported that older aged individuals were ( $\geq 60$  years) significantly associated with the risk of locomotive syndrome, as compared to younger aged individuals ( $< 60$  years), which was in consistent with studies done by Akahane M et al (7) and Yoshimura et al (15). Seichi et al (16) reported that the prevalence

rates of locomotive syndrome in Japan were 4.6%, 7.8%, 12.0%, and 24.5% for individuals in their 40s, 50s, 60s, and 70s respectively, indicating a gradual increase of locomotive syndrome with advancing age. This might be due to increased risks of musculoskeletal problems such as spinal disorders and osteoarthritis in the knee and hip joints which effects locomotion of individual. Suggesting that elderly are at high risk of inability to ambulate due to problems in locomotor system (6).

On comparison with the females, males reported a higher risk locomotive syndrome (58.7%) in this study which was in contrary to the study done by Akahane M et al (7) Matsumoto H et al (17) Tomohiro Saito et al (18). This might be because of cultural difference between the study groups.

In the present study number of teeth lost ( $>10$ ) showed a direct relationship with the presence of locomotive syndrome, indicating that oral health status in older adults has been associated with locomotive syndrome. Several reported that motor performance and physical performance of the extremities influence of oral health (19,20).Moriya S et al. (21) reported that muscle strength and static balance function effects masticatory ability. Sheiham A et al (22) revealed that the dental status of older people was associated with their ability to eat, affecting the food choice preparation, and ultimately the intake leading to low blood levels of some key nutrients triggering deterioration of oral health. So the dental health workers could contribute to strategies for preventing locomotive syndrome by proper and continuous health education

**Table 5:** Multiple Logistic Regression Analysis Of The Associations Between Age, Gender Number of Teeth Lost and Locomotive Syndrome.

Locomotive syndrome	ODDS RATIO	95% Confidence Interval		P value
		Lower Bound	Upper Bound	
Age(45-60)	.732	.394	1.362	.000*
Age(>60)	ref	.	.	.
Teeth lost (0)	.009	.002	.037	.000*
Teeth lost (1-10)	.105	.044	.252	.000*
Teeth lost (11-32)	ref	.	.	.
Gender (male)	1.233	.728	2.091	.436
Gender (female)	ref	.	.	.

p value  $<0.05$  was statistically significant

from an early age to maintain oral health and ensure good nutritional status.

The limitations of this study are single institution, subjects with locomotive syndrome are less likely to participate in study since many locomotive organ diseases, such as osteoarthritis and spinal canal stenosis are associated with pain and limitations in movement. This could lead to a potential bias. A cross-sectional questionnaire study design is another limitation, as we could not prove causality between locomotive syndrome and age, Gender and number of teeth lost.

## Conclusion

Our study indicates that older age and number of teeth lost affect the prevalence of locomotive syndrome. Hence, maintaining oral health is necessary to retain more number of teeth throughout life which reduces the risk of locomotive syndrome and should be promoted by public health professionals.

**Authors contribution:** Dr Jithender Nagilla & Sripriya Nagarajan conceived the study and designed the research protocol and were responsible for the final statistical analysis. Drs Lakshmi Gayathri Trovagunta, Harish Gakkula, Anup Kumar and Rampalli Viswa Chandra were the primary investigators responsible for conducting the study and collating the data.

**Conflicts of interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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Received: 13 January 2020

Accepted: 30 January 2021

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