

## Alcoholic liver cirrhosis as wellspring for periodontal indisposition: a case control study

**Running title :** Alcoholic liver cirrhosis as wellspring for periodontal indisposition: a case control study

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### **Abstract**

**Aims:** To evaluate the effect of alcoholic liver cirrhosis on health of periodontal status.

**Methods and Material:** A total of 120 subjects were included in the study between the age group of 35 to 75 years of age. A total of 60 patients diagnosed as alcoholic liver cirrhosis (based on AST: ALT = >2) were included in the study. A control group of 60 subjects were included which do not have alcohol consumption habit and not having any systemic problems. Periodontal parameters included Plaque index, gingival index, Number of missing teeth, Probing depth and Clinical attachment loss. **Statistical analysis:** Statistical Analysis was performed using statistical software SPSS version 17. A post hoc test was done for intergroup comparison of periodontal parameters between the test and control group.

**Result:** The Plaque Index, gingival index, probing depth and clinical attachment loss has shown a statistically significant difference ( $p=0.000$ ) when compared between test and control groups. There was no statistically significant difference ( $p=0.045$ ) found in the number of missing teeth between test and control group.

**Conclusion:** Alcoholic liver cirrhosis can be considered as one of the risk indicator for periodontal diseases which compromises the periodontal health.

**Key words:** Alcoholic liver cirrhosis; Aspartate transaminase[AST]; Alanine transaminase[ALT]; liver dysfunction; periodontal status

**Introduction:**

Periodontal disease is characterized by inflammation of the tooth investing and supporting structures. Etiology of periodontal disease is multi-factorial, the dental bio-film is considered as the primary factor for the origin, manifestation and progression of the disease [1]. It is influenced by a wide variety of features that include social, psychological, behavioral, local and systemic elements which affect its progression and manifestations. These features modify protective mechanism of host and can act as risk factors [2,3]. The knowledge and understanding of risk issues for periodontal disease is limited. Most studies were carried out to identify the association between age, gender, socioeconomic status, oral hygiene, periodontopathic bacteria, smoking and diabetes with that of periodontitis [4-11]. In various studies additional risk factors are identified which includes race, genetics, stress, osteoporosis, alcohol consumption and obesity [12-18]. Alcohol consumption is one of the estimated causes of liver cirrhosis, epileptic conditions, road accidents, violence and various pre-cancerous and cancerous conditions.

The purpose of this study was to assess the relationship between alcoholic liver cirrhosis and its ramification on periodontal health.

**Subjects and Methods:**

A total of 200 males between the age group of 35 to 75 years from the outpatient department were screened out of which 120 subjects were included in the study with the institutional ethical approval. A total of 60 patients having alcoholic liver cirrhosis were included in the test group (based on AST: ALT = >2). The control group included 60 subjects, not having alcohol consumption habit and was systemically healthy. The controls and the test group were matched for age and gender. Informed written consent forms were taken from all study participants. Questionnaires were filled which record the age, gender, body mass index, education level, income grade, medical status, smoking status and past dental history of the subjects. A complete periodontal examination was performed using a UNC-15 probe for plaque index, gingival index, probing depth, clinical attachment loss, and number of missing teeth. Laboratory tests including aspartate aminotransferase and alanine aminotransferase level were conducted for AST: ALT ratio for diagnosis of alcoholic liver cirrhosis (AST: ALT = > 2).

**Results:**

SPSS statistical software version 17 was used to perform Statistical Analysis . The correlation between periodontal variables in test and control group was assessed by Post hoc test. The mean plaque index in alcoholic liver cirrhosis group was  $2.06 \pm 0.51$  and  $0.899 \pm 0.42$  for the control group which was statistically significant ( $p = 0.000$ ). Mean gingival index in alcoholic liver cirrhosis was  $1.25 \pm 0.55$  as compared to control group which was  $0.69 \pm 0.31$  which was found to be statistically significant ( $p = 0.000$ ). The mean number of missing teeth in alcoholic liver cirrhosis was  $1.82 \pm 1.76$  as compared to control group which was  $1.50 \pm 1.77$ . On comparison there was no statistically significant difference ( $p = 0.0008$ ). The mean probing depth in alcoholic liver cirrhosis and control was  $3.32 \pm 0.65$  and  $2.12 \pm 0.31$  respectively and the difference was statistically

significant ( $p = 0.000$ ). The mean clinical attachment loss was  $3.38 \pm 0.69$  and  $2.12 \pm 0.32$  in alcoholic liver cirrhosis and control group respectively. The comparison had shown statistically significant difference ( $p = 0.000$ ).

### Discussion:

Alcoholic liver disease (ALD) encompasses a spectrum of injury, starting from simple steatosis to frank cirrhosis. As per Evidence fermented beverages existed at the Neolithic period (about 10,000 BC) <sup>[19]</sup> and liver disease related to it almost as long. Alcohol endures a considerable cause of liver disease worldwide. Many possible factors responsible for development of liver injury include the quantity, time span and variety of alcohol consumption, drinking patterns, gender and ethnicity. It is associated with risk factors including obesity, iron overload, concomitant infection with viral hepatitis and genetic factors. Failure to recognize alcoholism remains a significant problem and impairs efforts at both the prevention and management of patients with ALD <sup>[20, 21]</sup>.

In the present study, the mean plaque index was high and statistically significant in alcoholic liver cirrhosis group when compared to control group. Plaque is primary etiological factor for periodontal diseases. The subjects with alcoholic liver cirrhosis had poor oral hygiene which can be due to repeated hospitalizations and tendency to neglect their oral hygiene which in turn leads to plaque accumulation. Debilitating effect of the medical conditions and/or the lack of provision of facilities or equipment for oral health care maintenance affects oral hygiene <sup>[22]</sup>. Anand et.al. in 2001 <sup>[23]</sup> also found that plaque index was statistically significant ( $p < 0.05$ ) in chronic liver disease group (CLD) as compared to systemically healthy controls. The plaque index was statistically significant ( $p < 0.05$ ) and higher in alcoholic cirrhosis when compared to other forms of chronic liver diseases. Movin et.al. in 1981 <sup>[24]</sup> when compared plaque index in the age group of 35-64 years, 45-54 years and 55-64 years with that of duration of cirrhosis, there study showed statistically significant ( $p < 0.001$ ) differences in plaque index. They observed that as the increased duration of liver cirrhosis had impact on plaque index score. On contrary to the above studies, Barak et.al. in 2001 <sup>[25]</sup> found that plaque index for three groups i.e. post-transplant (PT), liver cirrhosis (LC) and control group was similar, there was no statistically significant difference ( $p = 0.430$ ) within the three groups. Both test groups were under treatment for liver dysfunction with antibiotics and/or immunosuppressive drugs which causes inhibition of microbial growth and prevent formation of plaque.

The gingival index was high and statistically significant ( $p = 0.000$ ) in alcoholic liver cirrhosis group when compared to control group. Gingival inflammation may be due to the inflammatory mediators and cytokines released from liver due to abnormalities in liver function. These inflammatory mediators increase capillary permeability which causes bleeding on provocation. Bleeding on probing is an indicator of acute response of periodontal tissues to bacterial challenge as a part of innate immunity. Movin et.al. in 1981 <sup>[24]</sup> found significant ( $p < 0.0001$ ) association of gingival inflammation in liver cirrhosis subjects compared to healthy controls. The liver cirrhosis patients predominantly had shown low plaque index but, paradoxically, high gingival index score.

This may be due to greater amount of sub-gingival calculus covered by a layer of metabolically active plaque. They also distinguished that the patients care for their oral hygiene diminishes as the drinking aggravates. While the study conducted by Barak et.al. in 2001 <sup>[25]</sup> who compared liver cirrhosis (LC), post transplant patient (PT) and patients undergoing immunosuppressive (IT) therapy and found that there was no statistically significant difference ( $p = 0.274$ ) in all three groups in relation to gingival index.

In the present study, the mean number of missing teeth in alcoholic liver cirrhosis patients was not statistically significant ( $p= 0.045$ ) compared to the control group. It may be due to the teeth indicated for extractions were not excluded and the extraction of offending teeth was delayed due to long term hospitalisations. Similar results ( $p>0.30$ ) were observed in a study conducted by Movin et.al.in 1981 <sup>[24]</sup>. This may be due to variation in age, dental visit pattern and daily oral hygiene measures of an individual. Whereas, Anand et.al. in 2001 <sup>[23]</sup> and Panov et.al. in 2011 <sup>[26]</sup> found statistically significant difference ( $p<0.01$ ) between the mean number of missing teeth in alcoholics with or without liver disease. Missing teeth can be influenced by age factor and duration of chronic systemic condition. Repeated hospitalisations lead to poor hygiene which is major cause for periodontal diseases and dental caries resulting in extraction of teeth.

The mean probing depth was statistically significant ( $p = 0.000$ ) in alcoholic liver cirrhosis group when compared to control group. Increased probing depth in liver cirrhosis patients is due to bacterial infections and liver dysfunction. Bacterial infections are common complicating findings in the course of liver cirrhosis. Cirrhotic patients, as a consequence of their liver dysfunction, have elevated levels of serum cytokines particularly IL-1 $\beta$ , IL-6, TNF- $\alpha$  and IL-8 <sup>[27]</sup>. All of these cytokines are also involved in the destructive process of periodontal disease probably through enhancement of collagenase and metalloproteinase activity <sup>[28, 29]</sup>.

Barak et.al. in 2001 <sup>[25]</sup> found statistically significant difference ( $p<0.0001$ ) in the mean probing depth in liver cirrhosis and post liver transplant patients when compared to the control group. As a consequence of liver dysfunction, elevated levels of serum cytokines particularly IL-1 $\beta$ , IL-6, TNF- $\alpha$  and IL-8 were seen in systemic circulation. The greater periodontal destruction found in liver cirrhosis patients may be associated with altered immune response and increased serum cytokines. While a study conducted by Movin et.al. in 1981 <sup>[24]</sup> indicated the probing depth in liver cirrhosis patient which was statistically insignificant ( $p>0.10$ ) compared to healthy controls. The probing depth may vary depending upon the severity and duration of the liver cirrhosis.

In the present study, the mean clinical attachment loss was statistically significant ( $p = 0.000$ ) in liver cirrhosis subjects as compared to controls. The increased clinical attachment loss is periodontal inflammatory response which is triggered by bacteria. These responses lead to most of the tissue destruction with direct destructive effect by bacteria. It has been found that neutrophils and antibody/complement system provides protection against periodontal bacteria. Patients with cirrhosis have increased susceptibility to bacterial infections and have compromised function of immune system. Therefore, clinical attachment loss emulates both the oral hygiene as well as the immune system. Barak et.al. in 2001 <sup>[25]</sup> observed that clinical attachment loss in post-transplant

(PT) and liver cirrhosis (LC) patients was similar and statistically significant ( $p < 0.001$ ) compared to that of healthy controls. Greater periodontal destruction in liver cirrhosis might be due to altered immune response and increased serum cytokines. In post transplant patients, there was no improvement seen even after restoration of liver function because no periodontal treatment was carried out.

Novacek et.al. 1995<sup>[30]</sup> found that the loss of attachment was higher in alcoholic with or without cirrhosis, but statistically significant ( $p < 0.05$ ) difference was found between healthy group and patients with alcoholic liver cirrhosis. The non-immune and immune components of saliva provide an initial protective barrier against the invasion of foreign pathogens in oral cavity. Therefore, loss of attachment reflects not only the oral hygiene but also the immune system. While a study conducted by Movin et.al. 1981<sup>[24]</sup> observed that the liver cirrhosis and control groups exhibited no statistically significant ( $p > 0.10$ ) difference in clinical attachment loss. They suggested that aggravation of periodontal conditions is related to increasing negligence toward oral hygiene as cirrhotic condition aggravates. It is also dependant on the duration of diseased condition and affects the destruction caused by disease. Similar results were seen in a study conducted by Banihashemrad et.al. 2009<sup>[31]</sup> found that there was no significant correlation ( $p > 0.05$ ) in clinical attachment loss of liver cirrhosis patients as compared to healthy control group. They observed that the severity and duration of liver disease had no influence on periodontal tissue. It may be due to the small sample size and uneven distribution of alcoholic and non-alcoholic liver cirrhosis subjects.

### **Conclusion:**

As the periodontal diseases have multifactorial etiology, various risk indicators are considered during evaluation of periodontal status. Many systemic conditions have an impact on periodontal health of an individual. Alcoholic liver cirrhosis should be considered as risk indicator and liver diseases should be considered in the medical conditions which are responsible for compromised periodontal status.

### **Limitations:**

Intake and duration of medications taken by the patients with alcoholic liver cirrhosis was not measured in this study. The duration and discontinuation of alcohol consumption habit was not taken into consideration. Likewise, the brushing technique, frequency and methods of brushing were not taken into account due to variation in the socioeconomic status, physical and psychological state in test groups. Microbiological parameters were not considered during clinical examination to differentiate active and inactive sites of periodontal disease. Therefore, with the above mentioned limitations further more clinical studies can be carried out by taking these limitations as different study phases and more longitudinal studies can be planned in near future.

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**Table1: Characteristics of individuals in test group and control group**

| Parameters          | Alcoholic liver cirrhosis (%) | Control (%)      |
|---------------------|-------------------------------|------------------|
| Age (mean $\pm$ SD) | 46.63 $\pm$ 8.34              | 44 $\pm$ 8.04    |
| BMI                 | 19.77 $\pm$ 1.76              | 22.53 $\pm$ 2.97 |
| Income              | 5733 $\pm$ 4124               | 13041 $\pm$ 9840 |
| Education           | 7.15 $\pm$ 3.32               | 5.76 $\pm$ 4.75  |

**Table 2: Mean and standard deviation of plaque index in test group and control group**

| Periodontal Parameter    | Group                     | N  | Mean  | SD    | Std. error |
|--------------------------|---------------------------|----|-------|-------|------------|
| Plaque Index             | Alcoholic Liver Cirrhosis | 60 | 2.06  | 0.51  | 0.065      |
|                          | Control                   | 60 | 0.899 | 0.42  | 0.054      |
| Gingival Index           | Alcoholic Liver Cirrhosis | 60 | 1.25  | 0.55  | 0.0721     |
|                          | Control                   | 60 | 0.699 | 0.31  | 0.0407     |
| Missing Teeth            | Alcoholic Liver Cirrhosis | 60 | 1.82  | 1.76  | 0.22       |
|                          | Control                   | 60 | 1.50  | 1.77  | 0.22       |
| Probing Depth            | Alcoholic Liver Cirrhosis | 60 | 3.32  | 0.65  | 0.084      |
|                          | Control                   | 60 | 2.12  | 0.311 | 0.040      |
| Clinical Attachment Loss | Alcoholic Liver Cirrhosis | 60 | 3.38  | 0.695 | 0.089      |
|                          | Control                   | 60 | 2.12  | 0.329 | 0.042      |

**Table 3:** Inter-group comparison using post-hoc test

| Parameter                |  |                     | Mean diff. | Std. Error | Sig.  |
|--------------------------|--|---------------------|------------|------------|-------|
| Plaque index             | Group I<br>Alcoholic<br>Liver<br>Cirrhosis | Group II<br>Control | 1.166      | 0.0902     | 0.000 |
| Gingival index           |  |                     | 0.558      | 0.082      | 0.00  |
| Missing teeth            |  |                     | 0.317      | 0.385      | 1.00  |
| Probing depth            |  |                     | 1.201      | 0.093      | 0.000 |
| Clinical attachment loss |  |                     | 1.262      | 0.099      | 0.000 |

**Graph 1:** Comparison of periodontal parameters in test group and control group