

# Comparative Evaluation of Oral Health Status in Children with Acute Lymphoblastic Leukemia

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## Abstract

**Introduction:** Leukemia is the most common childhood malignancies characterized by an excessive proliferation of immature white blood cells and their precursors. Oral complications due to chemotherapy or radiotherapy include increased incidence of dental caries, gingival and periodontal disease, candidiasis, oral mucositis.

**Aim:** The aim was to evaluate oral health status (OHS) of acute lymphoblastic leukemia (ALL) and to compare OHS with healthy children.

**Method:** A total of 60 children of both sexes in the age group of 2-14 years in which 30 healthy children and 30 diagnosed children with ALL were selected for the study. The oral cavity was examined for dental caries using def-t and decay-missing-filled teeth (DMF-T) indices, gingival status by using the modified gingival index, oral hygiene by using "oral hygiene index-simplified (OHI-S)." Results of the study were statistically evaluated.

**Results:** Statistical analysis was performed by using unpaired *t*-test. The mean gingival index in ALL was found to be 1.59 as compared to 0.079 in the control group. About 13% with severe gingivitis and 80% with moderate gingivitis in ALL group when compared to the control group with 3% moderate gingivitis and 26% mild gingivitis. The mean OHI-S value of ALL was found to be 2.29 compared with 0.82 in the control group. 20% of ALL group was found with poor oral hygiene. The def-t of 76% and DMFT of 46% in ALL group when compared with def-t of 66% and DMFT of 13% in the control group. The mean DMFT value of ALL was found to be 5.28 as compared to 1.97 in the control group.

**Conclusion:** The gingival index, OHI, DMFT index were significantly higher in the ALL group compared to healthy children.

**Keywords:** Acute lymphoblastic leukemia, Children, Dental caries, Gingival status, Oral hygiene status

## INTRODUCTION

Leukemia is the proliferation of a clone of abnormal hematopoietic cells with impaired differentiation, regulation and programmed cell death (apoptosis). Acute lymphoblastic leukemia (ALL) is a neoplastic disease characterized by an excessive proliferation of immature white blood cells and their precursors which can be rapidly fatal. Leukemic cells multiply abnormally resulting in marrow failure, altered blood cell counts and when left untreated,

death occurring in 6 months or less due to infection, bleeding, or both.<sup>1</sup> Mechanism includes aberrant expression of proto-oncogenes, chromosomal translocations, altered transcription factors, and hyperdiploidy involving more than 50 chromosomes.<sup>1</sup> Acute leukemia, the most common childhood cancer represents 24% of all childhood malignancies with a peak incidence at 2-5 years.<sup>2</sup> Clinical manifestations include flu-like symptoms, pain in the bone or joint caused by malignant marrow expansion. Marrow failure results in thrombocytopenia. Oral features are in the form of gingival enlargement, periodontal disease, dental caries, mucositis, candidiasis, herpes simplex.<sup>3</sup> The treatment regimen includes multi-agent chemotherapy in three phases: Induction therapy, intensification therapy, maintenance therapy and radiotherapy.<sup>4</sup> Children are more prone to infections due to immune suppression caused by disease and its therapy. Any unusual clinical signs in the oral

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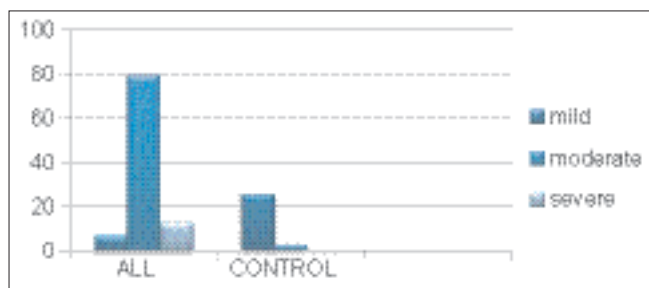
cavity can help in the early diagnosis of ALL. Therefore, the aim of this study was to evaluate oral health status (OHS) of ALL and to compare OHS with healthy children.

## MATERIALS AND METHODS

The present study was carried out in 60 children of both sexes in the age group of 2-14 years. 30 healthy children reporting to the Department of Pediatrics and Preventive Dentistry, Vokkaligara Sangha Dental College and Hospital for routine dental checkup and 30 children diagnosed with ALL from the Department of Pediatrics, Indira Gandhi Institute of Child Health, Bangalore, Karnataka were selected for the study. Institutional ethical clearance was obtained. Signed written informed consent was obtained from their parents. The OHS was examined with a sterile mouth mirror, explorer, and disposable sterile gloves. As the probes induce gingival bleeding, these were not used for examination of gingival status. The oral cavity was examined for gingival status by using the modified gingival index, oral hygiene status by using “oral hygiene index-simplified (OHI-S)” and dental caries using def-t and decay-missing-filled teeth (DMF-T) indices. The results of the study were statistically evaluated using unpaired *t*-test.

## RESULTS

- Gingival status was assessed by Modified Gingival index given by Loe and Silness which was found to be 13% with severe gingivitis and 80% with moderate gingivitis in ALL group as compared to control group with 3% moderate gingivitis and 26% mild gingivitis. No severe gingivitis was seen in the control group (Graph 1, Table 1). The mean gingival index in ALL was found to be 1.59 when compared to 0.079 in the control group (Table 2). Statistically, significant difference was seen.
- Oral hygiene was assessed by the Modified OHI. 20% of ALL group was found with poor oral hygiene (Graph 2, Table 3). The mean OHI S value of ALL was found to be 2.29 compared to 0.82 in the control group (Table 4), which was statistically significant.



Graph 1: Comparison of gingival index between acute lymphoblastic leukemia group and control group

- Dental caries was assessed by DMFT/deft index. The deft of 76% and DMFT of 46% in ALL group as compared to deft of 66% and DMFT of 13% in the control group (Graph 3, Table 5). The mean DMFT value of ALL was found to be 5.28 as compared to 1.97 in the control group (Table 6). Statistically significant difference was seen.

Table 1: Comparison of Gingival index between ALL group and control group

Group	Mild (%)	Moderate (%)	Severe (%)
ALL	7	80	13
Control	26	3	0

ALL: Acute lymphoblastic leukemia

Table 2: Comparison of mean for gingival index between ALL group and control group

Group	ALL	Control
Mean	1.59379	0.07953
SD	0.73359	0.20091

SD: Standard deviation, ALL: Acute lymphoblastic leukemia

Table 3: Comparison of OHI-S between ALL group and control

Group	Good (%)	Fair (%)	Poor (%)
ALL	0	80	20
Control	80	20	0

ALL: Acute lymphoblastic leukemia, OHI-S: Oral hygiene index-simplified

Table 4: Comparison of mean for OHI-S between ALL group and control

Group	ALL	Control
Mean	2.2931	0.8220
SD	0.6667	0.5265

ALL: Acute lymphoblastic leukemia, OHI-S: Oral hygiene index-simplified, SD: Standard deviation

Table 5: Comparison of DMFT index between ALL group and control group

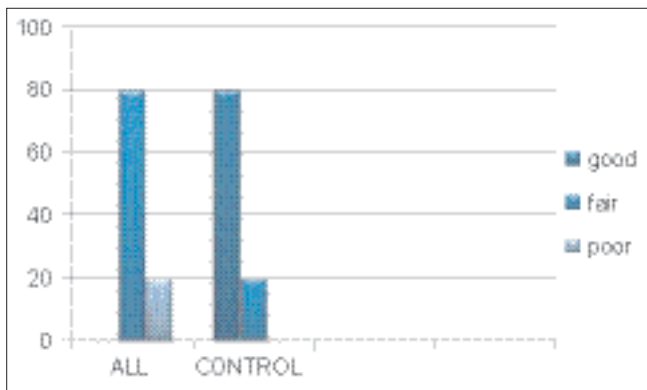
Group	deft (%)	DMFT (%)
ALL	76	46
Control	66	13

ALL: Acute lymphoblastic leukemia, DMFT: Decay-missing-filled teeth

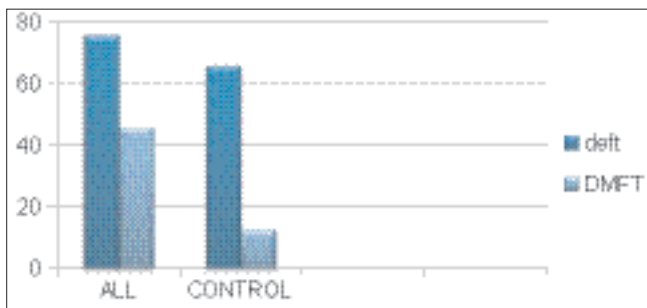
Table 6: Comparison of mean for DMFT index between ALL group and control group

Group (%)	ALL (%)	Control (%)
Mean	5.28	1.97
SD	1.87	1.56

ALL: Acute lymphoblastic leukemia, DMFT: Decay-missing-filled teeth, SD: Standard deviation



Graph 2: Comparison of oral hygiene index-simplified between acute lymphoblastic leukemia group and control



Graph 3: Comparison of decay-missing-filled teeth index between acute lymphoblastic leukemia group and control group

## DISCUSSION

In the present study, OHS of ALL group was compared with that of the control group. The level of gingivitis was significantly higher in ALL group. The mean gingival index in ALL was found to be 1.59 as compared to 0.079 in the control group. 13% with severe gingivitis and 80% with moderate gingivitis was seen in ALL group as compared to the control group with 3% moderate gingivitis and 26% mild gingivitis. No severe gingivitis was seen in the control group. The gingiva appeared to be edematous, deep red and may bleed easily. This was in accordance with a study conducted by Javed *et al.* who also found that gingivitis was common in children with ALL as compared to healthy children.<sup>5</sup> Similarly, Hegde *et al.* reported deterioration in gingival status in leukemic children when compared with control group.<sup>6</sup> Also, Azher *et al.* showed increase in “Loe and Silness” gingival index in different phases of ALL treatment.<sup>7</sup> Torres *et al.* reported that 91.84% of the ALL children had gingivitis.<sup>8</sup> Similarly Nasim *et al.* in his study reported a poor gingival condition in patients undergoing chemoradiation therapy.<sup>9</sup> Al-Mashhadane *et al.* also found that the chemotherapeutic agents modify the oral health, and there was a significant increase in plaque and gingival indices.<sup>10</sup>

The mean OHI- S value of ALL was found to be 2.29 compared to 0.82 in the control group. 20% of children from ALL group showed poor oral hygiene, whereas 80% showed fair oral hygiene. In control group, 80% of children had good oral hygiene whereas only 20% showed fair oral hygiene. There was a significant increase in plaque accumulation since brushing regimen was difficult to be followed in ALL group. Establishing a good oral hygiene was difficult due to their small age and the nature of the disease which was debilitating prevents performance of good oral hygiene. Hegde *et al.* also reported poor OHS in leukemic children when compared with the control group.<sup>6</sup> However in contrast to this, Pels *et al.* found that oral hygiene was significantly better in children with ALL than in healthy children and the results were attributed to the oral hygiene regimen that the children were following during the cancer treatment protocol.<sup>11</sup>

The DMFT of 46% and deft of 76% which was found to be significantly higher in the ALL group than in the control group with DMFT of 13% and deft of 66%. The mean value of ALL was found to be 5.28 as compared to 1.97 in the control group. The number of decayed teeth in primary dentition were more than that in permanent dentition, which could be related to inadequacy in manual brushing in these age group and more prolonged time the primary teeth being exposed to the bacterial plaque. Decayed teeth were more in the ALL group since oral pediatric medications contain high amounts of sucrose. Hegde *et al.* and Dens *et al.* have reported high caries prevalence in leukemic children.<sup>6,12</sup> Furthermore, Azher *et al.* found increased DMFT/def index ALL.<sup>7</sup> Xerostomia was one of the most frequent effects of radiotherapy which makes them prone for dental caries. Javed *et al.* showed children with ALL had a reduced salivary flow rate, which makes them more susceptible to dental caries as compared to healthy children.<sup>5</sup>

## CONCLUSION

- The gingival index, OHI, DMFT index was significantly higher in the ALL group compared to healthy children.
- Maintenance of good oral hygiene and simultaneous caries treatment should be considered mandatory to prevent any dental and periodontal infections in leukemic children.
- Recommended to educate and reinforce the caretaker and child about the importance of oral care, which can compromise child's health and quality of life during the treatment procedure. Therefore, the chances for a successful outcome of oncology treatment can be improved.

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