



## Effectiveness Of Yoga Therapy On Socio-Adaptive Functioning And Oral Health Among Students Diagnosed With Multiple Disabilities – An Interventional Study

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### ABSTRACT

**Background:** Disability is any restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the range considered normal for a human being. Dental problems are common comorbid conditions among disabled children, which are more prone to oral disease and complicate their dental care. **Aim & objectives:** Aim of this study was to determine the effect of yoga intervention in socio-adaptation and oral health among children with multiple disabilities. **Materials and methods:** An interventional study who met the eligibility criteria and who were willing to participate in the study were selected. Social adaptation was assessed using Vineland Social Maturity Scale (Indian adaptation by Malin 1965) by trained Psychologist. Oral health status and gingival health status were recorded using Plaque index (Silness and Loe 1964) and Gingival index (Loe and Silness 1963). Yoga intervention consisted of Asana, Pranayama, and Meditation was given to participants for 45 mins for period of 3 months. **Results:** The mean age of the study population with both males and females was  $13.07 \pm 1.12$  years of age. The mean difference of plaque index score at baseline ( $1.87 \pm 0.20$ ) at 12 weeks ( $0.85 \pm 0.26$ ) and gingival index score at baseline ( $0.85 \pm 0.26$ ) and at the end of 12 weeks ( $0.33 \pm 0.17$ ) were statistically significant ( $P=0.001$ ). The mean difference of social age (SA) at baseline ( $42.4 \pm 14.3$ ) at 12 weeks ( $45.53 \pm 15.85$ ) and social quotient (SQ) at baseline ( $29.4 \pm 11.3$ ) and at the end of 12 weeks ( $31.8 \pm 12.5$ ) were statistically significant (0.012) **Conclusion:** This study concluded that significant improvement in their social adaptation skills and lower plaque and gingival scores after yoga intervention along with regular oral hygiene instructions.

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## **INTRODUCTION:**

Disability is any restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the range considered normal for a human being. The World Health Organization (WHO) defines disability as covering impairments, activity limitations, and participation restrictions.<sup>1</sup> Multiple disabilities is a term for a person with a combination of disabilities. Disabled population accounts for 2.86 crore of the total population.<sup>2</sup> World Health Organization estimates that 15% of the world's populations live with some form of disability, of whom 2-4% experience significant difficulties in functioning.<sup>3</sup> Social adaptation is the process of adaptation of an individual or a group to the social environment, involving acquisition of individual subjectivity for self-implementation of social actions and functions.<sup>4</sup> Adaptive functioning skills are an important determinant of prognosis in disabled children, including the level of independence that an individual can obtain in adulthood.<sup>5</sup>

The barriers to oral health that children with disabilities experience will vary by age and the level of parenteral or social support received. Oral health may receive a lesser priority among these children depending on their level of disability and social skills. Dependence on parents or caregivers for the maintenance of oral hygiene in turn affects oral health and quality of life.<sup>6</sup>

Dental problems are common comorbid conditions among these children as it is influenced by various factors like severity of impairment, limitation of communication, poor self-care and resistance to adhere to good oral hygiene performance due to their potential, sensory and social behavior impairment. These conditions make the disabled children more prone to oral disease and complicate their dental care.<sup>7</sup> Prevalence of gingival

disease among disabled population varies range from 35 -37%. Since studies on oral health of children with multiple disabilities are relatively sparse, however a study done by Shiva (2018) et al mean decayed, filled teeth together and DMFT scores were  $3.53 \pm 1.02$  and  $3.89 \pm 1.30$ , respectively and decayed component had the highest score in both the groups.<sup>6</sup>

Health care for individuals with special needs requires specialized knowledge acquired by additional training, as well as increased awareness and attention, adaptation, and accommodative measures beyond what are considered routine. There are various approaches to improve self-adaptation and independence.<sup>8</sup> Yoga is regarded as one of the major disciplines that primarily concentrate on the well-being of an individual, both physically and mentally. It relies on the development of self-control, rather than on external stimuli for reinforcement or punishment, and the relaxation components of yoga interventions can help increase the focusing abilities thereby decreasing the number of instances of impulsive behaviors of students with disabilities.<sup>9</sup>

Yoga has been the subject of research in the past few decades for therapeutic purposes of modern epidemic diseases like mental stress, obesity, diabetes, hypertension, coronary heart disease, and chronic obstructive pulmonary disease. Psychological stress and yoga are believed to be reciprocally related. Stress induces imbalance of the autonomic nervous system with decreased activity of the parasympathetic nervous system and increased activity of the sympathetic nervous system.<sup>10</sup>

Practice of yoga may optimize the production of the pro-inflammatory cytokines and it has effects on the oxidative status of the body, thus helpful in relieving the stresses of life. Regular yoga practitioners have achieved a

20% reduction in oxidative stress.<sup>11</sup> This oxidative stress has been found to be responsible for increased production of reactive oxygen species and depletion of anti-oxidant levels in GCF are responsible for the chronic local activation of periodontal inflammation and tissue destruction. Therefore, a substantial reduction in oxidative stress such as this may help in reducing the gingival inflammation and in turn symptomatically decrease bleeding gums.<sup>12</sup>

Since, there is less literature evidence comparing the positive outcomes of yoga on oral health which becomes even sparse when it comes to the oral health of children with multiple disabilities. Hence this study was aimed to determine the effect of yoga intervention in social adaptation and oral health among children with multiple disabilities.

#### **METHODOLOGY:**

##### **ETHICAL CLEARANCE:**

This interventional study was conducted following approval by the Ethical Committee, Ragas Dental College and National Institute for Empowerment of Persons with Multiple Disabilities, Chennai. The general guidelines to ensure the rights of participants were followed. Before the investigation, parental/guardian consent was obtained, and the study information was reaffirmed orally.

##### **PARTICIPANTS:**

On the conservative estimate, considering a moderate effect size, according to Cohen (1988), sample size was calculated. In order to achieve a minimum power of 0.80, with  $\alpha=0.05$  and the required sample size was calculated as 30 subjects. A convenient sampling was used to include 30 disabled students from an institutionalized setup, at Chennai.

##### **INCLUSION & EXCLUSION CRITERIA**

Students with multiple disabilities of age 12-15 years old, those who were attending regular school and gave consent to participate were included. Uncooperative child and children with open dental caries,

dental pain and gingival scores more than 2 were excluded from the study.

##### **RECRUITMENT OF STUDY SUBJECT:**

A total of 40 students were screened of which of 30 subjects who met the inclusion and exclusion criteria were identified.

##### **SOCIO ADAPTIVE ASSESSMENT**

The Vineland Social Maturity Scale is an assessment scale of personal and social skills pertaining to individuals from birth to 18 years. This scale has been adapted for Indian population by Malin in 1965.<sup>13</sup> The Indian adaptation of VSMS gives a profile on development in eight domains -Self-help General (SHG), Self-help Eating (SHE), Self-help Dressing (SHD), Self-direction (SD), Occupation (OCC), Communication (COM), Locomotion (LOM), and Socialization (SOC). The scale consists of 89 test items grouped into year levels. It provides an estimate of Social Age (SA) and Social Quotient (SQ), and shows high correlation (0.80) with intelligence. Social quotient is the ratio between social age and chronological age. A social quotient is a parallel concept to an IQ, wherein a score of 100 indicates average performance for ages and scores less than 100 indicate below average functioning.<sup>13</sup> This VSMS was measured by a trained psychologist from Department of Psychology, NIEPMD.

##### **ORAL HEALTH ASSESSMENT:**

Oral examination of children was performed by the principal investigator in the month of February, 2020 at NIEPMD (yoga centre). Baseline oral hygiene status and gingival health status were recorded using plaque index (PI) (Silness and Loe 1964)<sup>14</sup> and gingival index (GI) (Loe and Silness 1963)<sup>15</sup>. Subsequently, the indices were scored at the end of third month (12 Weeks). Intraexaminer reliability was checked during the calibration sessions and found to be 0.8.

##### **INTERVENTION**

The yoga intervention consisted of Asana, Pranayama, and Relaxation. All practices

were introduced in a slow and progressive manner by a trained yoga instructor available at the disability center. Yoga training was for 45 minutes, for 5 days in a week for 12 weeks. Students practiced Yoga asanas (postures) and Pranayama (breathing techniques). Each asana pose was held for 15–30 sec initially, and for 1 minute in the later stages followed by pranayama 2–3 minute initially and was gradually increased to 25 minutes and relaxation for 10 min. Each exercise was performed for 2 minutes with 10 rounds each. Along with these 5 minute of Oral hygiene Instructions (Brushing techniques) were given orally.

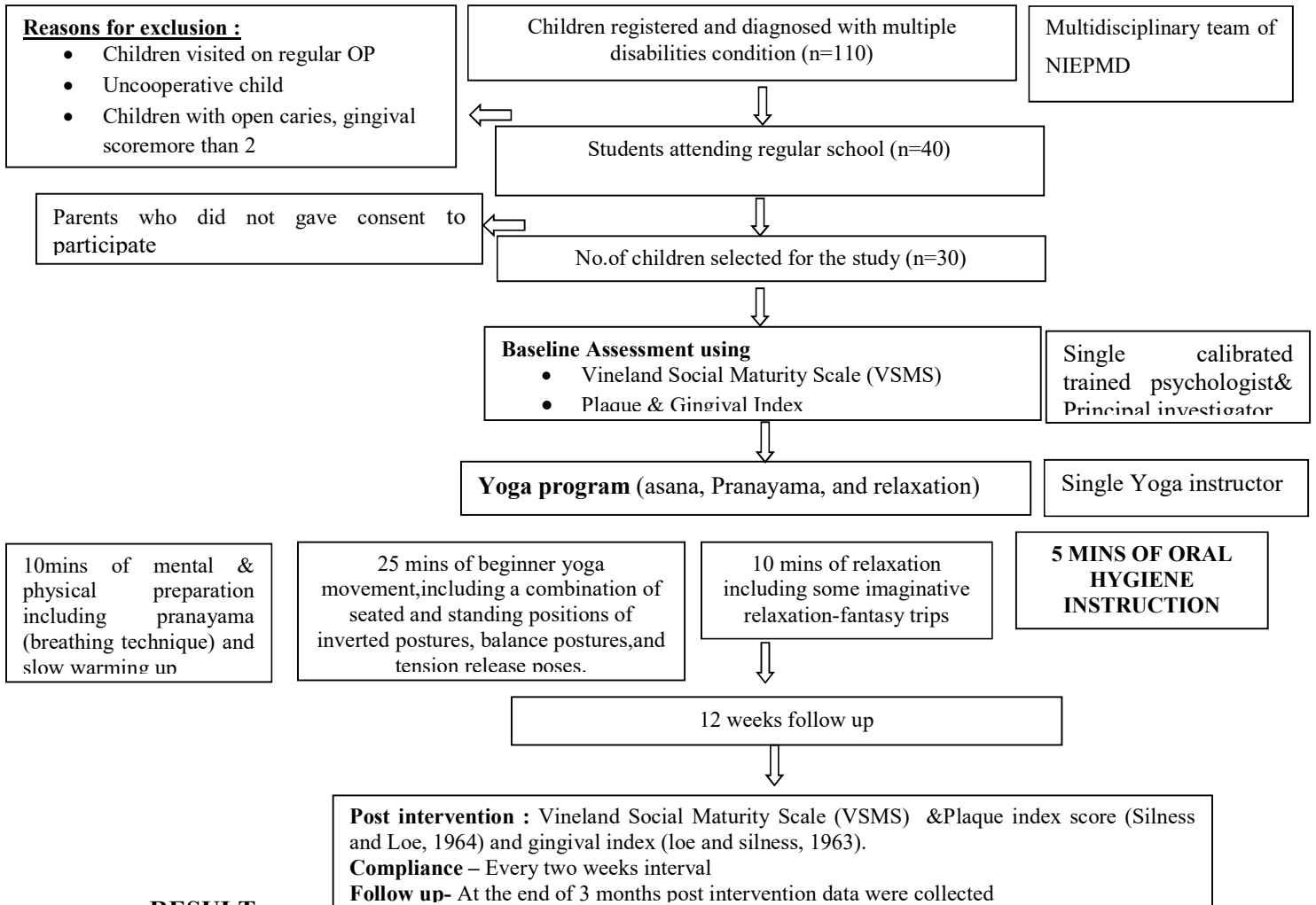
**POST INTERVENTION**

Follow up examinations were carried out

among children using plaque and gingival index at the end of 3 months by the principal investigator. Also social adaptation were assessed by the psychologist using Vineland social maturity scale. There was no loss to follow up in the study.

**STATISTICAL ANALYSIS**

Data collected was entered in Microsoft excel 2007 and analyzed using SPSS 20.0 (IBM CORP). Kolmogorov -Simronov and Shapiro -wilks test were used to check the distribution of mean plaque ,gingival score. Since it doesn't follow normal distribution, Wilcoxon signed rank test was used to compare both the outcomes. For all the tests, the statistical significance level was set at 5%



**RESULT**

A total of 30 children, aged 12–15 years of age diagnosed with Multiple Disabilities

participated in this study. The mean age of the study population with both males and females was  $13.07 \pm 1.12$  years of age. The distribution of the study participants are presented in table I.

**Table I Distribution of study participant based on the gender**

<i>Number of participants</i>	n(%)
Male	25
Female	5

**Table II Assessment of social adaptive function at baseline and 12 weeks**

Outcome	Pre intervention (BASELINE) Mean $\pm$ S.D (months)	Post intervention (12 WEEKS) Mean $\pm$ S.D (months)	p value
Social age (SA)	$42.4 \pm 14.3$	$45.53 \pm 15.85$	0.012*
Social quotient (SQ)	$29.4 \pm 11.3$	$31.8 \pm 12.5$	0.012*

\*Wilcoxon test  $p < 0.005$  statistical significant

Mean social age and social quotient at baseline and 12 weeks were tabulated (Table II). The mean difference of social age (SA) at baseline ( $42.4 \pm 14.3$ ) at 12 weeks ( $45.53 \pm 15.85$ ) and social quotient (SQ) at baseline ( $29.4 \pm 11.3$ ) and at the end of 12 weeks ( $31.8 \pm 12.5$ ) were statistically significant (0.012).

**Table III Assessment of Plaque and Gingival score at baseline and 12 weeks**

Outcome	Pre intervention (BASELINE) Mean $\pm$ S.D (months)	Post intervention (12 WEEKS) Mean $\pm$ S.D (months)	p value
Plaque index (PI)	$1.87 \pm 0.20$	$1.39 \pm 0.43$	0.001*
Gingival index (GI)	$0.85 \pm 0.26$	$0.33 \pm 0.17$	0.001*

\*Wilcoxon test  $p < 0.005$  statistical significant

PI and GI score at baseline, end of third month, are tabulated in Table 3 respectively. The mean difference of plaque index score at baseline ( $1.87 \pm 0.20$ ) at 12 weeks ( $0.85 \pm 0.26$ ) and gingival index score at baseline ( $0.85 \pm 0.26$ ) and at the end of 12 weeks ( $0.33 \pm 0.17$ ) were statistically significant ( $P = 0.001$ ).

## DISCUSSION:

Oral health is fundamental to general health and well being and affects physical and psychological aspects of human life. Children diagnosed with multiple disabilities not only suffer from physiological problems, but also lack the social skills required for adapting in their routine environment. Therefore, this has become a major concern in dealing with these children, which makes clinical research more challenging. Keeping these in consideration, we planned for a holistic approach wherein the participants were trained in yoga, relaxation techniques along with maintenance of oral hygiene<sup>16</sup>.

Social Adaptation is an area where many students with Multiple Disabilities struggle. During the time of development children generally begin to mirror each other at a very young age, which becomes difficult for those with disabilities, thereby resulting in a struggle to adapt to different social situations. Since social adaptation and social skills development are a major hindrance for these children to do their routine day-to-day activities, the main priority for the parents/ care givers of these kids would be to bring them at par with their peers in the society.<sup>17</sup> In our present study, Vineland social maturity scale<sup>13</sup> was employed to evaluate their level of social adaptation at baseline and after 3

months by a trained psychologist. There were two interventions, former being yoga, relaxation techniques given by a trained yoga instructor to these children and the later being oral hygiene instructions given by the principal investigator. At the end of three month session positive changes were observed in the students' behavior including communication, functional object use, language, and play with peers. This was similar in lines with study done by Nagarathna, and Nagendra (2010) who reported that the ASD children showed better social adaptation after the end of 10 months in terms of greeting the therapist with a smile, better interaction with peers and family members.<sup>18</sup>

The students in our study also improved in their non-verbal communication skills and concentration as they were able to maintain eye contact to one another, and provide gestures to indicate basic needs which was similar to a study conducted by Sotoodeh et al. (2017)<sup>19</sup>. Another study done by Rommel and Anderson (2013)<sup>20</sup> reported that children with intellectual disabilities experienced a positive change in their behavior and created less disruption in class, increased their on-task behaviors (concentration), and physically looked as though they enjoyed the learning process after the yoga session.

Children with special needs may have great limitations in oral hygiene performance due to their potential motor, sensory and intellectual disabilities, and are prone to poor oral health. Poor oral health is also connected to other aspects of physical and psychological health.<sup>21</sup> Children with special health care needs have been reported in literature to have poor oral hygiene and periodontal status. Studies have shown linkage between physical activity and inflammation. Hence, doing regular physical activity will lower levels of interleukin-6 (IL-6) and other pro-inflammatory cytokines. Exercises boost production and release of IL-6 from muscles which, in turn, can reduce inflammation<sup>22</sup>. Therefore, incorporating

physical activity i.e., Yoga along with oral hygiene instructions can improve compliance to oral hygiene.

In this study, the oral health status of these children were assessed using the plaque index PI proposed by Sillness and Loe (1964) and gingival index GI proposed by Loe and Sillness in (1963). A highly significant reduction in both plaque and gingival scores were observed at the end of 12th week of follow up compared to the baseline ( $p=0.001$ ). This was similar to study done by Eswari et al (2019)<sup>26</sup> in children with ASD showed a significant improvement in mean plaque and gingival score (0.001) after giving yoga therapy for a period of 6 months.

A study done by Archika Sudhanshu (2017)<sup>23</sup> reported a significant improvement in Plaque Index Score, Bleeding on Probing after a yoga therapy for a period of 3 months. Another study by Rajbhoj et al (2015)<sup>24</sup>, reported that 12 weeks of yoga postures and pranayama practice reduced pro-inflammatory cytokine and increased anti-inflammatory cytokine also yoga enhances the systemic immunity which in turn enhances the oral defense mechanisms. Impact of yoga on oxidative stress level, pro-inflammatory cytokines and improving immune function can facilitate to reduce the chronic gingival inflammation and improve the health of gingiva (Singh, 2017).<sup>25</sup> Repeated oral hygiene instructions, and the involvement of parents and care givers are of paramount importance in oral disease prevention.

Though the results of this study demonstrate, the additional benefit of yoga therapy, the results cannot be generalized to all children with special health care needs with differing disabilities because regular yoga can be imparted only to those children who are under controlled environment like institutional care and good care-taking at home. Further this was a short-term intervention study that was conducted only in one school in Chennai. Therefore, further multicentric studies

done for longer periods are needed to be conducted to validate the present findings.

**CONCLUSION:**

Oral health problems and lack of social skills have always been an incessant problem among disabled patients. Maintenance of oral health and social adaptive skills are always been neglected as compared to general population due to

impaired disability. Affirmative evidence exists to show that disabled children have poor oral hygiene practices and social adaptation. This study concluded that significant improvement in their social adaptation skills and lower plaque and gingival scores after yoga intervention along with regular oral hygiene instructions.

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