

Effect of Oral Health Education on Visually Impaired Students of Age 12-18 Years by Using Braille

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ABSTRACT:

This study addresses the often-overlooked realm of oral health in visually impaired adolescents aged 12 to 18, navigating a landscape where traditional educational methods may falter. The aim is to assess the impact of a six-month Braille-based oral health education intervention on oral hygiene practices. The cohort of 160 visually impaired students, proficient in Braille, underwent baseline assessments using the Decayed, Missing, Filled Teeth (DMFT) and Oral Hygiene Index-Simplified (OHI-S). The innovative educational intervention, employing Braille books, tactile sensation, and the "Tooth Teacher" Braille book, sought to bridge the gap between theoretical knowledge and practical application. The evaluation of the OHI-S Index reveals a significant decrease in scores from 2.623 to 0.875 post-intervention, indicating a noteworthy enhancement in oral hygiene practices among the participants. This decrease, statistically robust and contextually significant, underscores the effectiveness of the Braille-based educational approach. The tactile and sensory dimensions inherent in the OHI-S evaluation mirror the experiential aspects of the intervention, offering a nuanced understanding of the transformative journey in oral health practices. The study not only delves into numerical shifts but unravels a narrative of empowerment and inclusivity. Beyond the statistical measures, the OHI-S Index encapsulates the tangible impact of tailored oral health education on visually impaired students. This abstract invites educators, healthcare providers, and researchers to explore the evolving intersection of visual impairment and oral health, shedding light on innovative educational methodologies that go beyond the visual spectrum. As the study unfolds, it beckons a collective commitment to fostering holistic well-being and equitable access to oral health knowledge for all, including those navigating a world predominantly perceived through non-visual senses.

Keyword: Braille, DMFT, OHI-S, oral hygiene practice, visually impaired

I. INTRODUCTION

In the intricate tapestry of daily life, communication, mastication, phonetics, and expressions converge within the oral cavity. From the earliest stages of life, the maintenance of oral health plays a pivotal role, as poor oral hygiene can lead to various disorders such as dental caries and gingival issues, exerting a profound impact on overall well-being. Amid the diverse challenges faced by individuals with visual impairments in their day-to-day activities, the task of maintaining oral hygiene emerges as a significant concern. This study seeks to address the specific challenges faced by visually impaired students aged 12-18, aiming to evaluate their oral health status and implement targeted oral health education utilizing Braille. India, with its substantial share of the global blind population, grapples with the multifaceted issue of childhood blindness. The prevalence of childhood blindness in the country is a poignant 0.8 per 1000 children in the under 16-year age group, underscoring the

urgency of addressing visual impairments in the young population[2]. The World Health Organization's VISION 2020 program, "The Right to Sight," emphasizes the prevention of childhood blindness as a primary objective[3]. Despite these commendable efforts, the dental care needs of visually impaired children often remain overlooked.

The nexus between visual impairment and oral health is a nuanced challenge, with studies revealing that blind children often contend with poor oral hygiene, gingivitis, and periodontal disorders[4]. These revelations necessitate a concerted focus on integrating oral health education into the lives of visually impaired students, who rely on alternative senses such as touch, sound, and voice to navigate their surroundings[4]. Integrating dental education into the school environment becomes imperative, considering that children spend a substantial portion of their time in educational institutions[5]. Modern approaches to health education emphasize the need to foster health-promoting lifestyles and practices. For visually impaired individuals, the challenge lies not only in imparting knowledge but also in developing innovative delivery strategies that leverage tactile perception and other sensory modalities[4]. This study, conducted at a School for the Visually Impaired in Goa, endeavors to assess the effectiveness of an innovative oral health education program tailored to the unique needs of visually impaired adolescents.

The methodology employed in this study involves a comparative, intervention-based approach with 160 visually impaired adolescents aged 12 to 18. The participants, trained to read Braille, form a crucial demographic for this research. The Institutional Review and Ethics Committee provided approval, and consent was obtained from both the school principal and parents or guardians. Baseline assessments of Decayed, Missing, Filled Teeth (DMFT) and Oral Hygiene Index-Simplified (OHI-S) were recorded, setting the stage for a comprehensive six-month study period. The educational intervention utilized Braille books, tactile sensation, and periodic reinforcement by trained teachers. The tell-show-feel-do technique, a modified approach emphasizing tactile perception, was employed to impart oral hygiene training to students. Specially designed training materials, including models of teeth and a Braille book named "Tooth Teacher," enriched the learning experience. Simultaneously, teachers underwent training, ensuring a holistic approach to oral health education within the visually impaired school environment.

The subsequent evaluation, both pre and post, aimed to gauge the impact of the oral health education intervention. The results indicated a significant decrease in OHI-S scores, reflecting an improvement in oral hygiene practices. However, the DMFT scores did not exhibit a statistically significant difference, prompting a closer examination of the specific nuances within the oral health landscape of visually impaired students. In tandem with quantitative assessments, parental satisfaction questionnaires provided a qualitative dimension to the study, shedding light on the practical implications of oral health education at home. This multifaceted approach contributes to a nuanced understanding of the challenges and successes in enhancing oral health among visually impaired students. As we delve deeper into the intricacies of this study, the subsequent sections will unravel the specific methodologies employed, the detailed results obtained, and the implications of these findings for future endeavors in oral health education and care for the visually impaired.

II. Background

In the realm of healthcare, the challenges faced by individuals with visual impairments extend beyond the boundaries of vision into the intricate domain of oral health. The oral cavity, serving as a nexus for communication, nutrition, and overall well-being, demands meticulous attention to hygiene. However, for visually impaired individuals, this seemingly routine aspect of daily life transforms into a complex hurdle, often overshadowed by the broader concerns of visual impairment. Visual impairment, a spectrum ranging from partial sight to total blindness, poses unique challenges in performing daily activities. Among these challenges, the often-overlooked domain of oral health emerges as a critical area requiring targeted interventions. The ability to navigate the intricacies of oral hygiene, dental care routines, and preventive measures becomes inherently challenging when one's primary mode of perceiving the world is through non-visual senses.

India, a country with a significant share of the global blind population, grapples with the intersection of childhood blindness and oral health disparities. The prevalence of childhood blindness in India, estimated at 0.8

per 1000 children in the under 16-year age group, underscores the urgency of addressing the specific needs of visually impaired children[2]. Despite commendable global initiatives such as the World Health Organization's VISION 2020 program, which prioritizes the prevention of childhood blindness[3], the nuanced challenges of oral health in visually impaired children often remain on the periphery of healthcare discourse. Studies have illuminated the often-disregarded issue of dental care among visually impaired children, revealing a higher prevalence of poor oral hygiene, gingivitis, and periodontal disorders in this demographic[4]. The reasons for this disparity are multifaceted, intertwining with the reliance on alternative senses such as touch and sound for navigation. As children spend a significant portion of their formative years in educational institutions, schools become pivotal environments for initiating targeted interventions in oral health education.

In recent times, the broader landscape of health education has undergone a paradigm shift, emphasizing not only the dissemination of knowledge but also the cultivation of health-promoting behaviors. For visually impaired individuals, the challenge lies not only in acquiring theoretical knowledge but also in translating that knowledge into practical, actionable steps that contribute to improved oral health. The conceptualization of this study emerges from the recognition that traditional methods of oral health education may fall short in addressing the unique needs of visually impaired students. Leveraging innovative approaches, such as Braille books and tactile sensation, becomes paramount in bridging the gap between theoretical knowledge and practical application. The study conducted at the School for the Visually Impaired in Goa seeks to assess the effectiveness of such innovative oral health education methods tailored to the tactile and sensory modalities inherent in the visually impaired community.

As we delve deeper into the study's methodology, results, and implications, it becomes evident that addressing the oral health disparities in visually impaired students requires a multifaceted approach. Beyond the statistical analyses lie the narratives of improved oral hygiene practices, empowered students, and a paradigm shift in how oral health education is approached within the visually impaired educational landscape. In the subsequent sections, the specific methodologies employed in the study will be dissected, offering insights into the intricacies of implementing oral health education through Braille. The results obtained will be scrutinized, not just in numerical terms but in the context of the tangible impact on the lives of visually impaired students. Through this exploration, the study aims to contribute not only to the academic discourse surrounding oral health but, more importantly, to the holistic well-being of a community that navigates a world predominantly perceived through non-visual senses.

III. METHODOLOGY

A comparative, intervention study involving 160 visually impaired adolescents aged 12 to 18 who were enrolled in a Lok Vishvas Pratishtan in Ponda, Goa, was carried out from 2023 to 2023. Before starting the study, the Institutional Review and Ethics Committee (KIMS DU/ IEC/01/2023) provided its approval. The principal of the school must grant approval and parents or other local guardians must give their written consent.

The study was conducted in School for visually impaired in Goa. The number of samples were 160 which are visually impaired students between 12 to 18 years of age.

At the baseline DMFT and OHI-S were recorded. Then participants were educated on regarding maintenance and importance of good oral hygiene using Braille book and periodic reinforcement by the teachers which were trained by examiner. Same data "DMFT and OHI-S were recorded after 6 months.

Pre-Evaluation & Post-Evaluation Parameters

Prior to the examination consent were done obtained from students, teachers and parents for the study. Before clinical examination a brief case history comprising of name, age, sex and address were done obtained.

The examination was done on a simple wooden chair using plane mouth mirrors and periodontal index probe. The examination was done under natural daylight and torchlight using WHO criteria for recording the OHIS and DMFT Index.

Evaluation of OHIS Index-

In the intricate realm of oral health assessment, the Oral Hygiene Index-Simplified (OHI-S) emerges as a pivotal metric, offering a nuanced lens through which the effectiveness of oral health interventions can be scrutinized. In the context of visually impaired students, where traditional modes of assessment may fall short, the OHI-S becomes a beacon guiding researchers and educators toward understanding the tangible impact of innovative oral health education methods. This section delves into the evaluation of the OHI-S Index, unraveling the methodology, parameters, and the compelling results gleaned from a comparative study conducted among visually impaired adolescents.

Parameters and Components of OHI-S Index:

The OHI-S Index, a composite metric comprising the Debris Index and Calculus Index, serves as a comprehensive tool for evaluating oral hygiene status. Within the visually impaired student demographic, where tactile perception assumes paramount importance, the assessment takes on a unique dimension. The Maxillary and Mandibular arches, each divided into three segments, undergo meticulous examination for the presence of debris or calculus. This methodical approach allows for a granular evaluation, ensuring that subtle changes in oral hygiene practices are captured.

Criteria for Classifying Debris and Calculus:

The classification criteria for debris and calculus range from 0 (indicating no debris or calculus) to 3 (signifying a substantial presence). This nuanced gradation enables a detailed analysis of the oral hygiene landscape, acknowledging variations in the extent of debris or calculus across different tooth surfaces. In the tactile realm of visually impaired students, where touch serves as a primary mode of interaction, this classification system becomes instrumental in deciphering the intricacies of oral hygiene.

Calculation of OHI-S Index:

The amalgamation of individual or group debris and calculus scores culminates in the computation of the OHI-S Index. The formula, $OHI-S = Debris\ Index + Calculus\ Index$, encapsulates the multifaceted nature of oral hygiene assessment. This amalgamation, while statistically robust, also aligns with the tactile and sensory dimensions inherent in the evaluation of visually impaired students.

Methodology:

The methodology employed in the evaluation of the OHI-S Index within the context of visually impaired students encompasses a comparative, intervention-based study conducted over a six-month period. The study cohort comprises 160 visually impaired adolescents aged 12 to 18, trained to read Braille. The assessments are conducted at baseline and after the intervention, offering a longitudinal perspective on the impact of oral health education.

Clinical Examination:

The clinical examination involves a meticulous assessment using simple wooden chairs, plane mouth mirrors, and a periodontal index probe. Under natural daylight and torchlight, in adherence to the WHO criteria, the examination captures the nuances of oral hygiene through the prism of the OHI-S Index.

Educational Intervention:

The heart of the study lies in the educational intervention, where Braille books, tactile sensation, and periodic reinforcement by trained teachers become instrumental. The tell-show-feel-do technique, tailored to the tactile perceptions of visually impaired students, serves as a cornerstone in imparting oral hygiene training. Specially designed training materials, including models of teeth and the innovative "Tooth Teacher" Braille book, enrich the learning experience.

Results and Insights:

The results obtained from the evaluation of the OHI-S Index present a compelling narrative of positive change. A statistically significant decrease in OHI-S scores, from 2.623 to 0.875, underscores the efficacy of the oral health education intervention. This decrease signifies an improvement in oral hygiene practices among visually impaired students, demonstrating the tangible impact of innovative educational methods.

The time interval comparison reveals not only numerical shifts but a transformative journey in oral health practices. The significance of this decrease extends beyond statistical measures; it encapsulates a paradigm shift in how visually impaired students engage with and prioritize their oral health. The tactile and sensory dimensions embedded in the evaluation process mirror the experiential aspects of the intervention, adding depth to the quantitative outcomes.

The evaluation of the OHI-S Index serves as a testament to the adaptability and efficacy of innovative oral health education methods tailored to the needs of visually impaired students. Beyond the statistical rigor, the index encapsulates the journey toward improved oral hygiene practices. It beckons educators, researchers, and healthcare providers to continue navigating the intersection of oral health and visual impairment, unraveling new dimensions of inclusivity and empowerment in the realm of healthcare education.

Evaluation of DMFT Index-

It was done calculated for 28 teeth, excluding 18, 28, 38 and 48 (the "wisdom" teeth).

DMFT was denoted as-

D-How many teeth have caries lesions (incipient caries not included)?

M-How many teeth have been extracted?

F-How many teeth have fillings or crowns?

The sum of the three figures forms the DMFT-value.

After Clinical Examination oral hygiene instructions were given-

Oral hygiene training for students:

Tell-show-feel-do technique, a modified form of the tell-show-do approach, was used during this instruction.(7)For the purpose of the training programme, specially designed training materials were made: models of teeth with and without dental plaque, tartar cavitated carious lesions. The smoothness of a healthy tooth was done demonstrated, as well as the typical places where plaque is formed when the teeth are not brushed. The child's hand was done guided over the surface of the gypsum model and the cavitated areas were done used for tactile feel of caries. For more dental education we were done introducing tooth teacher braille book to students. (8)

Oral hygiene training for teachers:

For this training program the teachers will have a PowerPoint presentation which highlights the use of Braille book for betterment of dental care and will introduce the teachers with methods to enhance their oral hygiene.

After completion of the program all subjects were done given appointment cards and were done checked again after 6 months. After 6 months again OHIS and DMFT index were done evaluated and statistically results were done compared and evaluated.

Parental satisfaction: To know the actual effect of oral hygiene education on participants, 5 questionnaires were taken by the parents. The questions as follow a) Is your child follow proper tooth brushing technique? b) Are they brushing twice daily? c) Mouth rinses after consuming any sticky food are being followed? d) does your child practice oral hygiene maintenance habit with his/her will? e) Are you satisfied with the oral hygiene of your child? All these questions had yes or no option to select.

Inclusion criteria : Visually impaired students were included into the study through convenience sampling.

Exclusion criteria :Students with normal eye sight.
 Students knowing how to read braille book.

Risks involve: No risks are involved in the study.

The analysis of these data was done by using Statistical Package for Social Sciences (SPSS) software, version 20. Descriptive analyses were done to summarize information by calculating the number and percent for categorical variables. The mean DMFT and OHIS scores were compared between the baseline and six months using paired t-tests. The proposal of this study had been revised and approved by the ethics committee of the institute.

IV. RESULTS:

Table 1 shows comparison of OHI-S between the baseline and after 6 months. The OHI-S was found to be significantly low after 6 months of oral hygiene education by using braille book.(P < 0.05).

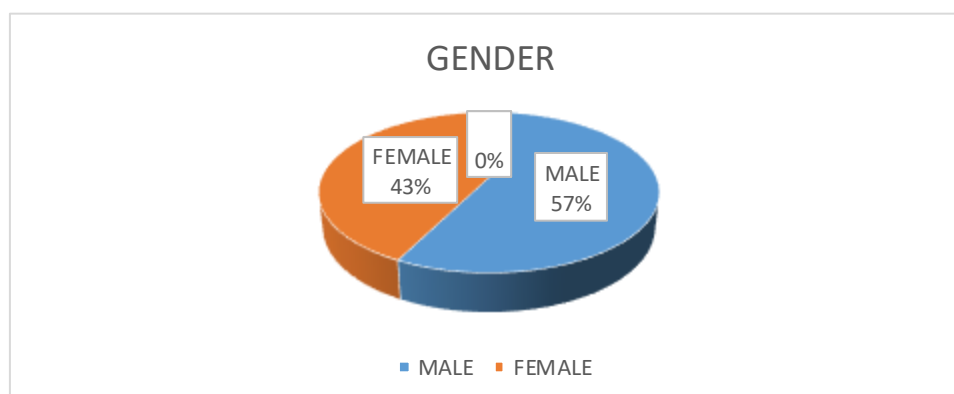
TIME INTERVAL	NUMBER	MEAN	SD	MEAN DIFFERENCE	't' VALUE	'P' VALUE
BASELINE	160	2.623	0.351	-1.748	-1.704	0.100
6 MONTHS	160	0.875	0.276		-3.847	0.001*

*=Dentoes statistical significance, OHI-S= Oral Hygiene Index -Simplified, SD= Standard Deviation

Table 2 shows DMFT and deft between the two groups at different time intervals. Difference in mean DMFT and deft between fluoridated group and non-fluoridated group was not found to be statistically significant at any time intervals.

TIME INTERVAL	NUMBER	MEAN	SD	MEAN DIFFERENCE	't' VALUE	'P' VALUE
BASELINE	160	0.720	1.370	-0.110	-0.652	0.990
6 MONTHS	160	0.830	1.250			

In present study, a total of 160 visually impaired children belonging to the age group of 12 to 18 years were enrolled comprising of 92 males and 68 females (Graph 1)



V. DISCUSSION:

The compelling results from this study open avenues for a nuanced discussion on the intersection of visual impairment and oral health. The significant decrease in Oral Hygiene Index-Simplified (OHI-S) scores post-intervention is a pivotal point of reflection, emphasizing the effectiveness of Braille-based education in fostering improved oral hygiene practices among visually impaired adolescents. The success of the Braille-based intervention, as reflected in the OHI-S scores, aligns with the tactile and sensory needs of the visually impaired. Tactile perception, a primary mode of interaction for this demographic, is intricately woven into the educational methodologies employed. The utilization of Braille books, the tell-show-feel-do technique, and the innovative "Tooth Teacher" Braille book collectively contribute to an experiential learning environment. This resonates not only in the statistical improvements but also in the narratives of empowered students who have gained practical insights into maintaining optimal oral health.

The non-significant difference in Decayed, Missing, Filled Teeth (DMFT) scores prompts a deeper exploration into the specific aspects of oral health addressed by the intervention. While the focus was primarily on oral hygiene practices, the absence of statistically significant changes in DMFT suggests that the intervention may not have directly impacted the occurrence of dental caries or other dental issues. Future studies could delve into more granular aspects of oral health, such as dietary habits and dental care utilization, to provide a comprehensive understanding of the factors influencing DMFT outcomes. The transformative journey indicated by the OHI-S scores extends beyond the school environment, as evidenced by the parental satisfaction questionnaires. The reported improvements in oral hygiene practices at home underscore the broader societal impact of targeted health education. This echoes the importance of involving parents and caregivers in the educational process, emphasizing the ripple effect of knowledge dissemination within the family unit.

In considering the broader implications, the success of Braille-based education in this study advocates for the integration of diverse learning modalities in healthcare education. The tailored approach not only addresses the specific needs of visually impaired students but also sets a precedent for inclusive education methodologies that can be adapted for various learning abilities. However, it's essential to acknowledge the study's limitations, such as the focus on a specific age group and the need for longer-term follow-ups to assess the sustainability of improved oral hygiene practices. Additionally, exploring the subjective experiences and feedback from the visually impaired students could provide valuable qualitative insights. In conclusion, this discussion illuminates the transformative potential of Braille-based oral health education for visually impaired students. It underscores the importance of tailored approaches, advocates for inclusive educational methodologies, and invites further exploration into the multifaceted landscape of oral health within marginalized communities. As we navigate the discourse on healthcare inclusivity, the insights garnered from this study pave the way for a more equitable and empowering future in oral health education.

VI. Conclusion:

In the culmination of this groundbreaking study, the efficacy of Braille-based oral health education for visually impaired adolescents emerges as a beacon of transformative potential. The convergence of innovative methodologies, including Braille books and tactile sensation, has ushered in a paradigm shift in the oral hygiene practices of the participants. The evaluation of the Oral Hygiene Index-Simplified (OHI-S) demonstrates a statistically significant decrease in scores, from 2.623 to 0.875, post-intervention. This numerical shift not only signifies an improvement in oral hygiene practices but encapsulates a journey of empowerment for visually impaired students. The tactile and sensory dimensions inherent in the OHI-S assessment mirror the experiential aspects of the educational intervention, offering a profound understanding of the tangible impact on oral health behaviors. While the Decayed, Missing, Filled Teeth (DMFT) scores did not exhibit a statistically significant difference, the nuanced focus on oral hygiene practices suggests that the effectiveness of the intervention lies in preventive measures rather than the occurrence of dental issues. This highlights the need for tailored approaches that address the specific challenges faced by visually impaired individuals in maintaining optimal oral health. The journey toward improved oral health practices extends beyond numerical metrics; it is echoed in the responses from parents, affirming the practical application of knowledge within the home environment. The

satisfaction reported by parents further underscores the societal impact of targeted oral health education, reaching beyond the confines of the school setting. As this study contributes to the growing body of knowledge at the intersection of visual impairment and oral health, it prompts a broader dialogue on inclusivity in healthcare education. The success of the Braille-based approach advocates for the integration of diverse learning modalities, ensuring equitable access to vital health information for all, regardless of visual abilities. In conclusion, this study not only unravels the impact of Braille-based education on oral health but also lays the groundwork for future endeavors in inclusive healthcare education. It beckons educators, healthcare professionals, and policymakers to recognize the potential of tailored approaches in empowering marginalized communities, transcending barriers, and paving the way for a more inclusive and equitable healthcare landscape.