

Original Research Article

Oral health status and treatment needs of children with sickle cell disease in Abha and Khamis Mushait cities of southern Saudi Arabia

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ABSTRACT

Background: This study aimed to assess the oral health status and dental treatment needs of children with Sickle Cell disease (SCD) in Abha and Khamis Mushait cities of southern Saudi Arabia.

Methods: A total of 82 children were included in the study, 41 children with SCD and 41 control group. A total of 82 children having age group of 2 to 13 years from Abha and Khamis Mushait cities of southern Saudi Arabia were examined. The clinical examinations were performed by experienced clinicians in those children who fulfilled the required inclusion criteria. Intraoral examination was done using Decayed-Missing-Filled Teeth Index (DMFT Index) and other dental conditions were examined. Statistical analysis was done with Chi square test and level of significance was set at $p < 0.05$.

Results: Prevalence of dental caries was shown between the 2 groups of children i.e., SCD and control. When SCD was compared with control group, the Mean \pm Standard deviation for decayed missing filled tooth was found to be DMFT = 6.95 ± 4.79 , 8.02 ± 4.33 respectively. Statistically no significant difference was found ($P = 0.290$). 17.1% of children with SCD group has gingivitis compared to control group which is 7.3%. Statistically no significant difference was found ($P = 0.177$). Dental trauma, deleterious oral habits and tooth brushing amount SCD children were shown no statistically significant compared to control group.

Conclusions: In the present study no significant difference was evident in dental diseases and treatment needs among SCD and Control group.

Keywords: Children, Dental caries, Gingivitis, Oral health, Malocclusion, Sickle cell disease

INTRODUCTION

Sickle cell disease (SCD) is an inherited autosomal recessive blood disease having molecular disorder of hemoglobin structure and morphologic changes in erythrocytes.¹ Children with SCD are at risk for serious morbidities related to vascular occlusion, hemolysis, and infection, which can impair their quality of life (QoL) and lead to early death. The pathological effects of SCD, seen in mineralized connective tissues, also occur in dental

tissues and the oral cavity, usually in late childhood and during adolescence.²

Sickle cell disease are very common in Saudi Arabia.³ Prevalence of SCD has been decreasing in every region of Saudi Arabia but remains higher compared to other countries. Moreover, SCD is endemic in southern and eastern Saudi Arabia. SCD in Saudi Arabia was first reported in the Eastern province in the 1960.⁴ This led to the initiation of multiple regional and national screening

studies to determine the clinical characteristics and frequency of SCD genes in different regions of Saudi Arabia.⁵ The Saudi premarital screening program estimated the prevalence of the sickle cell gene in the adult population at 4.2% for sickle-cell trait and 0.26% for SCD, with the highest prevalence noted in the Eastern province (approximately 17% for sickle-cell trait and 1.2% for SCD).⁶ The prevalence for sickle cell trait in Saudi Arabia ranges from 2% to 27%, and up to 2.6% will have SCD in some areas.⁷

In sickle cell anemia, the phenomenon of sickling of red blood cells is responsible for the episodes of vascular occlusion and hemolytic anemia that define the sickle cell crisis.⁸ This complication consists of acute painful episodes, mainly in the long bones and joints, anemia (low hemoglobin), organ damage, infections, and lung problems, and it can include the stomatognathic system, causing signs and symptoms in the dental-maxillofacial region.⁹ A number of orofacial manifestations have also been reported in patients with SCD, such as midfacial overgrowth, anesthesia of mandibular nerve, asymptomatic pulpal necrosis and gingival enlargement. A number of orofacial manifestations such as asymptomatic pulpal necrosis, anesthesia of mandibular nerve, gingival enlargement, midfacial overgrowth and osteomyelitis of the mandible have also been reported in patients with SCD. SCD has been linked to delayed tooth erosion, hypoplasia and hypomineralization, hypercementosis, pulp stones, and asymptomatic pulp necrosis due to thrombosis in the blood vessels.¹⁰

There is no consensus regarding the caries experience in SCD patients compared to healthy controls. The greatest risk of developing caries is also related to frequent hospitalizations due to health complications associated with greater consumption of medication, like antibiotics containing sucrose.¹¹ Regardless of the impact of SCD on dental tissues, the oral health of these individuals is essential to prevent dental infections that could precipitate a vaso-occlusive crisis or act as a bacterial source for development of osteomyelitis of the mandible, which has lost its blood supply.¹²

There has been an increased emphasis in recent years on developing a medical home for patients with SCD involving improvements in the level of care provided to patients, coordinated comprehensive care and by providing patients with a long-term regular source of care.¹³ These studies highlight the need for a better understanding of the role and involvement of all dental specialties on the comprehensive treatment of the SCD patient population.¹⁴

This study is done using a pretested Oral Assessment form to assess the dental status of child patients with sickle cell disease in Abha and Khamis Mushait cities of southern Saudi Arabia, with the hope that it may generate more studies and clinical trials on this neglected aspect of sickle cell disease in Saudi Arabia.

METHODS

A total of 82 children having age group of 2 to 13 years from Abha and Khamis Mushait cities of southern Saudi Arabia were examined. Out of 82 children (includes both males and females), 41 children were having sickle cell disease and remaining 41 children were considered as control group.

The clinical examinations were performed by experienced clinicians in those children who fulfilled the required inclusion criteria. The examiners received training and were calibrated against each other prior to this study. The study participants were given clear explanation about the objective of the study. Voluntary informed consent was obtained from the parents before examination of child. Information regarding demographic details, patient data (name, age in month, gender), chief complaint, aids used for oral care, and oral hygiene habits were recorded in those children who fulfilled the required inclusion criteria by multiple trained professionals in the specially designed structured format.

Data collection

- Dental caries: DMF/dmf was recorded. The prevalence of dental caries (using dentition status and treatment need index as described by WHO-Oral health survey manual, 2013). Teeth that were missing for any reason other than dental caries, according to subjects' self-reports were excluded.
- Dental fracture: Present or absent; present includes both anterior and posterior tooth fracture.
- Deleterious oral habit: Present or absent; following oral habits were considered as present: tongue thrusting, thumb sucking, lip biting, nail biting and other oral habits.
- Malocclusion: Includes class I with anterior or posterior crossbites, anterior or posterior open bite, rotations, class II and class III malocclusions
- Gingivitis: Present or Absent
- Tooth brushing: Present or Absent: Brushing with tooth paste (F) with fluoride (non) without fluoride/ brushing device (B) tooth brush (M) meswak / using mouth wash (W) not using mouth wash (non) other device like floss or pick if used if not it will be (non) were considered as present.

Treatment Category

- Code R: Routine dental care at next dental check-up.
- Code E: Early dental care needed; caries with no accompanying signs and symptoms.
- Code U: Urgent dental care needed. Caries with pain, infection or swelling.

Pain and dental trauma were considered as emergency and children requiring specialized treatments were immediately informed to the authorities and were referred

to the Department of Pediatric dentistry, College of Dentistry King Khalid University, Abha. Ethical clearance was obtained from ethical approval committee of the King Khalid University, Abha.

Data obtained was entered in an MS-Excel spreadsheet and categorical variables were compared using the Chi-square test. A level of $P \leq 0.05$ was considered statistically significant and $P \leq 0.001$ was noted as highly

significant and numerical variables were described as mean and standard deviations.

RESULTS

82 children (includes both males and females) were selected for the study, 41 children were having sickle cell disease and remaining 41 children were considered as control group.

Table 1: The mean DMFT/DMFT among sickle cell group and control group.

	Groups	Number	Mean	SD	DF	T-value	P-value
DMFT	Sickle	41	6.95	4.79	80	1.0645	0.2903
	Control	41	8.02	4.33			

SD- standard deviation, *P-Value was significant at ≥ 0.05

Table 1 shows prevalence of dental caries was shown between the 2 groups of children i.e., SCD and control. When SCD was compared with control group, the Mean

\pm Standard deviation for decayed missing filled tooth was found to be DMFT= 6.95 \pm 4.79, 8.02 \pm 4.33 respectively. Statistically no significant difference was found (P=0.290).

Table 2: Chi-square test for dental conditions among Sickle cell group and control group.

Groups	Dental fracture		Deleterious oral habits		Malocclusion		Gingivitis		Tooth brushing	
	Y	N	Y	N	Y	N	Y	N	Y	N
SCD	3(7.3)	38(92.7%)	13(31.7%)	28(68.3%)	10(24.4%)	31(75.6%)	7(17.1%)	34(82.9%)	37(90.2%)	4(9.76%)
Control	2(4.9)	39(95.1%)	14(34.1%)	27(65.9%)	10(24.4%)	31(75.6%)	3(7.3%)	38(92.7%)	35(85.4%)	6(14.63%)
Total	5	77	27	55	20	62	10	72	72	10
P value	0.644		0.814		1.000		0.177		0.499	

*P<0.001; Y=Yes, N=No

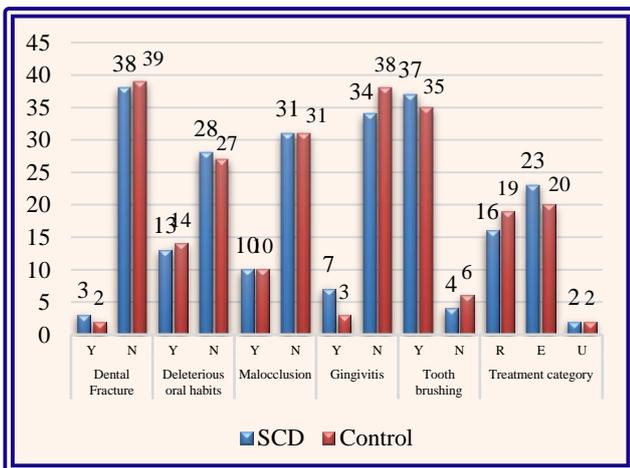


Figure 1: Distribution of different dental conditions between SCD and control group (percentage).

Table 2 and Figure 1 shows about dental fracture. 7.3% of SCD group had higher percentage of tooth fracture compared to control group (4.9%) of children. Statistically no significant difference was found (P=0.644).

Deleterious oral habits: Children in control group (34.1%) had higher prevalence of deleterious oral habits as compared to SCD group (31.7%). Statistically no significant difference was found (P=0.814).

Malocclusion: Prevalence of Malocclusion was same in both the groups (24.4%).

Gingivitis: 17.1% of children with SCD group has gingivitis compared to control group which is 7.3%. Statistically no significant difference was found (P=0.177).

Table 3: Status of dental treatment needs of children with Sickle cell group and control group.

Groups	Treatment category		
	R	E	U
SCD	16 (39%)	23 (56.1%)	2 (4.9%)
Control	19 (46.3%)	20 (48.8%)	2 (4.9%)
Total	35	43	4
P value	0.792		

Tooth Brushing: slightly higher number of children with SCD children (90.2%) children were doing brushing their

teeth regularly as compare to control group (85.4%) but were statistically no significant difference were found (P=0.499).

Table 3 Shows various dental treatment needs among SCD and control group of children.

Code R: Control group (46.3%) showed higher number of children under this category compared to SCD group (39%).

Code E: SCD group (56.1%) of children were considered under this treatment category compared to control group (48.8%).

Code U: Both the groups shown equal number of percentage of children under urgent dental care category (4.9%).

DISCUSSION

Oral health is an integral and critical part of general health. SCD is a rare disease with special oral health findings for importance for the clinician. Although the prevalence of the disease seems to have geographic and genetic epidemiological characteristics, the oral health problems are mainly caused by the poor oral hygiene maintenance among patients with SCD. Hence, this study was carried out to provide information about the oral health conditions and treatment needs of SCD children in Abha and Khamis Mushait cities of southern Saudi Arabia.

Although we found no significant difference in mean DMFT index between patients with SCD and control subjects. These findings are in line with study conducted in the city of Al-Qatif, Eastern province, Saudi Arabia, they investigated the prevalence of dental caries in Saudi SCD patients. They found that no significant difference in mean DMFT index between patients with SCD and control subjects. Known caries risk factors influenced oral health more markedly than did factors related to SCD.¹⁵ O'Rourke and Hawley, studying patient's ages 13-45years, found no difference between caries prevalence or severity between patients with or without SCD.¹⁶ In a pilot study, Laurence et al. found that patients with sickle cell anemia were more susceptible to dental caries than patients without the disease; the mean DMFT indices were 12.0 and 9.9, respectively.¹⁷

In our study, the experience of dental caries among children with SCD and their peer (without SCD), was similar to the experience observed by Maria et al, they found that children with SCD has less prevalence of dental caries.¹⁸ The results reinforce the importance of care related to oral health among children and emphasize the need to implement appropriate preventive measures for these patients taking into account factors that were associated with caries. A study was conducted by Okafor et al, prevalence of dental caries was higher in subjects without SCA (54%) as compared with those with SCA

(35.13%).¹⁹ These results may be explained by another study, in which the authors showed that long-term antibiotic therapy in patients with SCA reduces the acquisition of S mutans, thereby significantly reducing the caries rate in these patients.²⁰ However, recently, Passos et al reported that the risk factors known to cause dental caries are associated with oral health maintenance than with SCD.²¹

Malocclusion has been described in sickle cell disease. There are few published epidemiological studies on SCD and occlusal disorders, especially in children. In our study we found no significant difference of malocclusion between patients with SCD and control subjects. A study was conducted to evaluate the prevalence of malocclusion and its common characteristics in young male population of Aseer province, Saudi Arabia.²²

They observed high prevalence of malocclusion in the study population. Nearly half of them were suffering from crowding of teeth. Similar results were observed in a study conducted by Luna et al, concluded that high prevalence of malocclusion observed in children and adolescents with SCD. According to DAI score, the majority of the sample presented with very severe malocclusion and a compulsory treatment need.²³

Development of dental malocclusion may be contributed by craniofacial bone abnormalities in any individual. In SCD patients, these abnormalities may occur as a result of hyperplasia and expansion of the bone marrow to compensate for the short life of red blood cells as a result of disease progression.^{24,25}

The pathophysiology of malocclusion in SCD is not well known. It is thought that hypoxia secondary to sickling is associated with osteonecrosis of the jaw especially in the mandible causing mental nerve neuropathy. Bone marrow hyperplasia in facial bones is also associated with depression of nasal bridge, midfacial overgrowth and malocclusion. In some studies, dental abnormalities were also relatively common in control subjects without SCD and in one study the prevalence was higher in controls.²⁶ Thus, the pathophysiology of the association between SCD and dental complications is not clear and the scientific proof that SCD causes malocclusion is insufficient.²⁷

In present study, prevalence of gingivitis is seen higher in SCD children (17.1%) as compared to healthy children (7.3%) and the results was statistically insignificant. A study conducted by Esra Guzeldemir had found plaque and gingival indices were significantly higher in sickle cell anemic patients than in healthy individuals our results were disagreeing with the findings of Crawford, he suggested that sickle cell disease is not associated with increased levels of gingivitis.^{28,29} A study was conducted in Medina, Saudi Arabia, to determine the oral hygiene status among 12-year-old males. They concluded with

occurrence high prevalence of gingivitis due to poor oral hygiene.³⁰

In the current evaluation, no significant differences existed regarding deleterious oral habits between children with SCD and control group. In a population of Saudi schoolchildren aged 3-5years old in Riyadh, Saudi Arabia, the prevalence of sucking habits has been found to be (48.36%).³¹ In a sample of 1032 Saudi schoolchildren and adolescents in Jeddah, Saudi Arabia, it has been reported that the prevalence of breathing problems is (20.2%), bruxism (30.2%), thumb sucking (16.7%) and clenching (13.6%).³² A cross-sectional study conducted was conducted to determine the prevalence of parafunctional oral habits in school going children in Riyadh, Saudi Arabia. They observed an increased prevalence of oral habits among school children in Saudi Arabia.³³

Oral hygiene practices like tooth brushing, 90.2% of SCD group children were doing brushing regularly compared to 85.4% control group. A study was conducted to assess the oral health knowledge and practices among 9-12-year-old school children in a rural area of southern Saudi Arabia. The results of the study showed that more than half (58.4%) of the children brushed their teeth using tooth brush and paste, 32.1% used miswak, 7.2% used toothpicks and 2.3% used dental floss as a primary cleaning aid. Oral health knowledge is considered to be an essential prerequisite for health-related practices and studies have shown that there is an association between increased knowledge and better oral health.³⁴

A study conducted by Saber et al, revealed the prevalence of dental trauma in children and adolescents (under 18 years of age) to be 17.5%, but with variances among different geographic regions. Dental trauma occurs in children mainly because of their weak balance and just having learnt to walk.³⁵

Similar study was conducted in Riyadh, Saudi Arabia by Al-Majed, showed higher prevalence of dental trauma in 5-6 years (33%) and 12-14years (34%) old boys than the reported results of the United Kingdom children's dental health survey of the same age groups.³⁶ The prevalence of dental trauma in SCD group was found to be 7.3% and the result was statistical insignificant compared to control group. Which in line with the study conducted by Noori and Al-Obadi, among Iraqi primary school children, where the prevalence of dental trauma was found to be 6.1%.³⁷

Patients with SCD are not only more likely to suffer from pain-inducing dental disorders compared to the general population, they are also more likely to suffer from dental pain of undetermined or unspecified origin.¹⁶ Dentists should be aware of dental pain of unknown cause in SCD patients. Dental pain in the absence of caries may be caused by an intrapulpal infarct, asymptomatic pulp necrosis, or blockage of tiny pulp vessels by sickle cell

emboli.³⁸ Patients with SCD are at increased risk of general infection including risk of dental infection than patients without SCD. Dental infection through inflammatory mediators could potentially exacerbate an existing crisis and lead to an ED visit with subsequent hospital admission. Increased focus on preventive oral health including the early identification and treatment of dental infections, may reduce the need for admission following ED visits.¹³

Dental infection can influence systemic health among children with SCD, improved dental care for children with SCD can be established by integration of dental care into the medical home model. Oral health promotion program and periodic oral/dental health screening should be implemented in children with SCD in order to minimize (if not prevent) oral health related complications, thus providing a better quality of life for them.³⁹ These strategies should result in children with good oral health, growth, and development, less morbidity and fewer episodes of pain, infections, and sickle cell crises.

Patient with SCD, experience clinical and possibly emergency events, this may compel them to neglect oral health maintenance and focus more on achieving the basic standards of survival. It is also possible that patients with SCD focus on the treatment of their hematologic disorder and management of dental caries may be a secondary issue for these individuals. Oral health provider is responsible to contribute in the diagnosis and treatment of the oral and perioral infections and to control orofacial pain to help these patients with SCD.¹⁰

Earlier preventive measures, professional and regular dental care are required for children with sickle cell disease, because their health is compromised, and encounter emergency events leads to frequent hospitalization and dental neglect. These services should be provided especially for preschool children to have early intervention before their dental health deteriorates.

The main limitation of this study relates to the fact that it involves a specific population and a small number of cases which is not representative of the population, as detailed in the Materials and Methods section. Hence more studies are required in this field with increased sample sizes and considerably longer durations to validate our findings. Prospective studies which have larger and more diverse samples involving hospitalized patients, which can provide a better understanding of the relationship between the severity of SCD and oral health. Blood investigations should be done for the control group to ensure all of them are free of the disease and not relying on the family history alone.

CONCLUSION

In the present study, no significant difference was evident in dental diseases and treatment needs among SCD and

Control group. Furthermore, the significance of oral health maintenance should be provided through oral health promotion programs in patients with SCD and in the community. Routine dental checkups and regular oral hygiene maintenance may help minimize (if not prevent) oral health related complications in patients with SCD.

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