Planning and Implementing of School Oral and Dental Health Program in Omdurman Locality Primary Schools -2023

Abstract

The Community Dentistry Department – Karary University has consistently participated in the School Dental Health Program since 2014. The program is implemented by targeting second and sixth-grade students, with continuous follow-up at the same schools on a regular basis to ensure a tangible health impact. The purpose of this study is to evaluate the implementation and outcomes of a school-based oral health program in primary schools, aimed at improving oral health awareness, preventing dental diseases, and providing essential dental care to underserved student populations. The program engaged a multidisciplinary team, comprising dental public health specialists, residents, general practitioners, interns, and a cohort of 75 dental students. Of these, 60 students were specifically from the targeted 4th grade, as outlined in the curriculum module, while the remaining students came from various other grades, organized according to their respective knowledge levels. The children are examined for dental caries using DMFT index, SOHI for oral hygiene assessment, CPITN for periodontal health status and treatment needs after getting verbal consent and institutional approval from schools authorities . The Ministry of health standardized adopted oral health examination sheets is always used to record the dental caries, periodontal diseases and fluoride status according to above mentioned Indices. This data could inform evidence-based interventions. Implementing a school health program in Uganda, similar to the one conducted in Sudan, could effectively address these dental health challenges. By addressing these recommendations, the school dental health program can adapt to the current challenges while ensuring continued support and monitoring of dental health in the community in developing countries.

Keywords: Oral Health, Community Dentistry, School Health, Dental Caries, Periodontal Diseases, Fluoride Varnishes, Preventive Dentistry, Health Education, Program Evaluation

Introduction

School Health Programme is a comprehensive effort to provide each and every student with the resources needed to thrive within a healthful environment [1]. The development, implementation, and assessment of services in both the school and the community are encompassed in this. Within the school health program, Health Education equips every child with the necessary skills and information to make the best health

related choices for themselves. [2]. Successful planning of a school health education program requires active community involvement to ensure that the community's expectations and concerns are addressed by the school health education curriculum [2].

The oral health program based in schools is a public health initiative aimed at enhancing the oral health of children and teenagers [3, 4]. This initiative offers eligible school children examinations, sealants, cleanings, and fluoride [3, 5]. By concentrating on prevention and programming strategies to connect students with a dental home, schools can significantly contribute to reducing missed school days and enhancing the success of their students [4].

The school dental health program is benchmarked with several components including; Health Education, Preventive services and Referral whenever needed.

School health program can be launched by different health services agencies including; health ministries, dental colleges and health services organization. In dental college at Karary University; The Faculty's participation in the School Health Program begins in February on annual basis as a part of community based education strategy of college, coordinated collaboratively with Oral Health Directorate in Khartoum state's Ministry of Health (KSMOH). The School dental health program aims to provide preventive oral and dental health services to students of the primary level in Omdurman Locality. The program was conducted among eight primary schools; selected in coordination with the Oral and Dental Health Administration. Considering the fact of that ; establishing early preventive measures, such as fluoride varnish application and health education, is crucial to reducing the long-term burden of dental diseases in primary school children. Furthermore , Integrating oral health programs into school curricula provides an accessible platform to address common dental health problems, promoting lifelong oral hygiene habits and reducing disparities in dental care.

The Community Dentistry Department – Karary University has consistently participated in the School Dental Health Program since 2014. The program is implemented by targeting second and sixth-grade students, with continuous follow-up at the same schools on a regular basis to ensure a tangible health impact. Since the establishment of the school dental health program at Karary University, it has been an annual program consistently. Despite some few years, the program was postponed due to political instability in Sudan as well as COVID-19 strikes over the past few years, yet the program has continued through the years as an obligatory practical program within the module of preventive dentistry for 4th-grade dental students.

The program of 2023 was launched in collaboration between College of Oral and Dental Medicine, KSMOH and Omdurman Military Hospital.

Time Period: February / March of each year for two weeks

Target Group: Students of the primary schools at Omdurman Locality, Khartoum start - Sudan (second and sixth grades students), That particular group was selected due to many criteria, including: the dentition sequences of eruption since second grade are characterized with mixed dentitions; meanwhile sixth grade students have permanent dentition solely. The program covers 6 schools annually.

Program Objectives:

1. Raising awareness among students, teachers and the surrounding community about the importance of public health and environmental health.

2. Educating the community about oral diseases, their risks, and how to prevent them to achieve proper oral health (as the mouth is the gateway to many diseases).
3. Combating the spread of oral diseases, especially chronic ones, and encouraging the school community to abandon harmful habits that lead to them, such as smoking, tobacco, and other negative habits.
4. Providing free screening and preventive procedures (fluoride varnish) for students in the second and sixth grades.
5. Referring students to receive all dental services at Karary University Hospital Dental clinic, free of charge.
6. Reflecting a positive image of the student's community at Karary University to the citizens of the region.
7. Attracting international attention and external support from medical organizations and charitable institutions so that similar experiences can be repeated in all Sudanese states.
8. Exchanging cultures and civilizations, as this field health program brings together doctors from all over Sudan, in addition to their interaction with the local people.
9. Enhancing the clinical practice and maximize the training benefits for dental students, Dental public health residents (DPH Residents) and dental interns.

Fig 1: Dental screening process

Fig 2: Social Activity: Awareness session

Methodology:

Implementation plan of the School Health Program:

A.Distribution and Composition of Field Health Program Personnel:

The program engaged a multidisciplinary team, comprising dental public health specialists, residents, general practitioners, interns, and a cohort of 75 dental students. Of these, 60 students were specifically from the targeted 4th grade, as outlined in the curriculum module, while the remaining students came from various other grades, organized according to their respective knowledge levels.

To streamline the implementation of the program, the dental students were divided into two primary groups, each tasked with delivering the program in distinct schools. Within these main groups, smaller subgroups were established to facilitate effective coordination and targeted interventions at each school site. This systematic approach aimed to enhance the program's outreach and impact, ensuring that each dental student could contribute effectively based on their educational background and experience. The structure was designed to promote collaboration, optimize resource allocation, and address the specific needs of the school communities involved.

1- Table 1: Dental students distribution:

Dental students grade	Assigned tasks	Level of partipation
1st/2nd grade	Documentation, Assisting dentists and child management.	10%
3rd grade	Conducting Health educations and leadership role	5%
4th grade	Health promotion , preventive and curative services	100%

2- Administrative and Supervisory Staff Structure:

- **Leadership Committee**
- Senior DPH Specialists
- **Clinical Oversight Team**
- Clinical Supervisors (including DPH Residents)
- **Educational Coordination Team**
- Teaching Assistants
- DPH Specialists
- **Outreach and Engagement Group**
- Community Outreach Coordinators
- DPH Residents
- **Evaluation and Research Team**
- Data Analysts

- DPH Specialists
  Administrative Support Team
- Administrative Staff
  Others; Dental students in ch arge of clinical examinations and Health education activities

Fig 3: Dental Students conducting clinical examination for the school children

B. Program Modules:

B.1. Treatment Module:

In 2023, the school health program targeted six schools, offering a range of preventive services that included fluoride varnish application, fissure sealants, and A traumatic Restorative Treatment (ART). Additionally, simple extractions were performed exclusively for mobile retained deciduous teeth, utilizing topical and local anaesthesia as needed to prevent potential orthodontic complications.

Criteria of patient's indications for different treatment options are guided by the clinical practice guidelines for using fissure sealants of American Dental Association [6]:

Fissure Sealants:

Indicated for caries prevention in high-risk populations (children and adolescents).

Recommended for newly erupted molars and premolars.

Fluoride Varnish (FIC):

Applied to high-risk patients, especially children, to reduce caries incidence.

Recommended at least twice a year in conjunction with regular dental visits.

A traumatic Restorative Treatment (ART):

Suitable for managing dental caries in primary teeth in underserved populations.

Emphasized for use in settings where conventional dental treatment may not be accessible.

Maxillofacial surgeries and periodontal emergencies were addressed with caution when indicated; in cases where these treatments were not applicable, children were referred for complimentary care within the clinical settings on campus. This comprehensive approach aimed to ensure that students received appropriate dental care while minimizing risks and complications.

B.2. Health Education Module: (prevention is better than cure)

The primary aim of this initiative was to educate the school population about the importance of oral and dental health as integral components of overall well-being. By fostering a deeper understanding of the connections between oral hygiene and general health, the program sought to empower students to make informed choices that promote their health and prevent disease.

To achieve the highest possible level of health within the school community, various educational methods and strategies were employed. These included interactive workshops, community outreach events, and the distribution of informative materials covering essential topics such as proper oral hygiene techniques, the significance of regular dental check-ups, nutrition's role in oral health, and the prevention of common dental issues.

Additionally, the program leveraged technology, utilizing social media and online platforms to engage students effectively. By incorporating practical demonstrations, hands-on activities, and culturally relevant messaging, the initiative aimed to ensure that the information was accessible and resonated with the diverse student body.

Ultimately, the goal was not only to increase awareness but also to foster a culture of preventive care and health literacy, leading to improved oral health outcomes and an enhanced quality of life for students.

Health Education Tools: Brochures and posters containing essential information and guidelines in public health, environmental health, and oral health were distributed free of charge to the community. An accompanying exhibition was organized as part of the health program, featuring informative panels, vibrant images, and interactive models. Throughout the duration of the mobile clinic, doctors and dental students provided explanations and answered questions from visitors daily.

In addition to the exhibition, individual awareness sessions were conducted within the treatment unit, allowing personalized education for each patient. A dedicated section focused on combating harmful habits particularly, those associated with school children and raising awareness about serious diseases, emphasizing preventive measures and health literacy.

To further enhance outreach, the program utilized various media channels, including local and national newspapers, radio, and television, to disseminate crucial information and engage a wider audience. This multifaceted approach aimed to ensure that the community received comprehensive health education and support.

B.3. Social Module:

The initiative aimed to strengthen the relationships between dental staff—including supervising dentists, dental students, and nurses—and the school community, encompassing staff, students, and parents. By bridging the gap between healthcare and society, the program sought to foster collaboration and enhance communication, ultimately building greater trust in dental care within the community.

A key objective was to address and correct misconceptions and unfounded fears associated with dental visits. Through open dialogues and interactive sessions, the initiative encouraged positive interactions, aiming to demystify the dental profession. By cultivating these connections, the program not only enhanced understanding of dental health but also created a supportive environment where students and families felt more at ease seeking dental care. This holistic approach was designed to promote a culture of health literacy and encourage proactive engagement with dental services.

C. Practical Requirements:

- Follow-up and evaluation papers (Patients record sheets)
- Ministry of Health forms for patient registration (To record the clinical findings)
- Preventive dental materials and equipment (GIC , Fluoride and Fissure sealants)
- Health education materials (posters, casts and oral hygiene tools)

- Verbal consent from school authorities & institutional approval regarding clinical assessment phase. Also; written consent regarding clinical intervention cases (signed by school authorities in coordination with parents)

D. Assessment Plan:

D.1- PATIENTS ASSESMENT:

It is essential to regularly assess children's oral health through dental screening to protect, improve, and promote the oral health. Early detection of oral conditions is crucial to prevent short-term and long-term effects of advanced disease.

School dental screening is aimed at identifying and addressing diseases at an earlier stage than when children would typically seek treatment, by making both children and parents aware of the condition and its potential future complications. While treating oral diseases can be expensive, screening can lead to reduced treatment costs and productivity losses, resulting in potential cost benefits in terms of reduced morbidity [5]. The school is an ideal place for screening children's oral health. Early diagnosis and intervention can lead to long-term oral health benefits for both childhood and adulthood. WHO 2003 supports school dental screening as a successful method to reach over one billion children globally, as well as their families and communities [5].

D.1.1 The screening process:

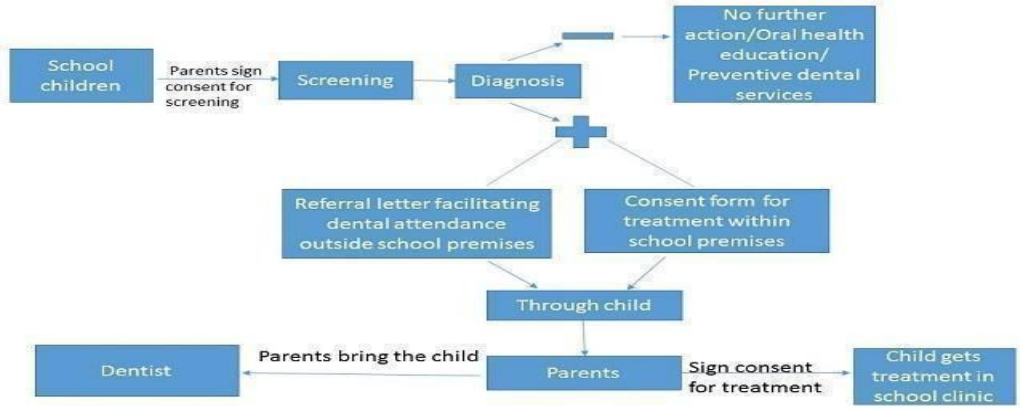


Figure 4 : The screening process for children

D.1.2 the Clinical assessment of the school children:

After gaining verbal approval by the school authorities for clinical assessment phase , The children of the school will be screened for dental caries, periodontal diseases and fluorosis.

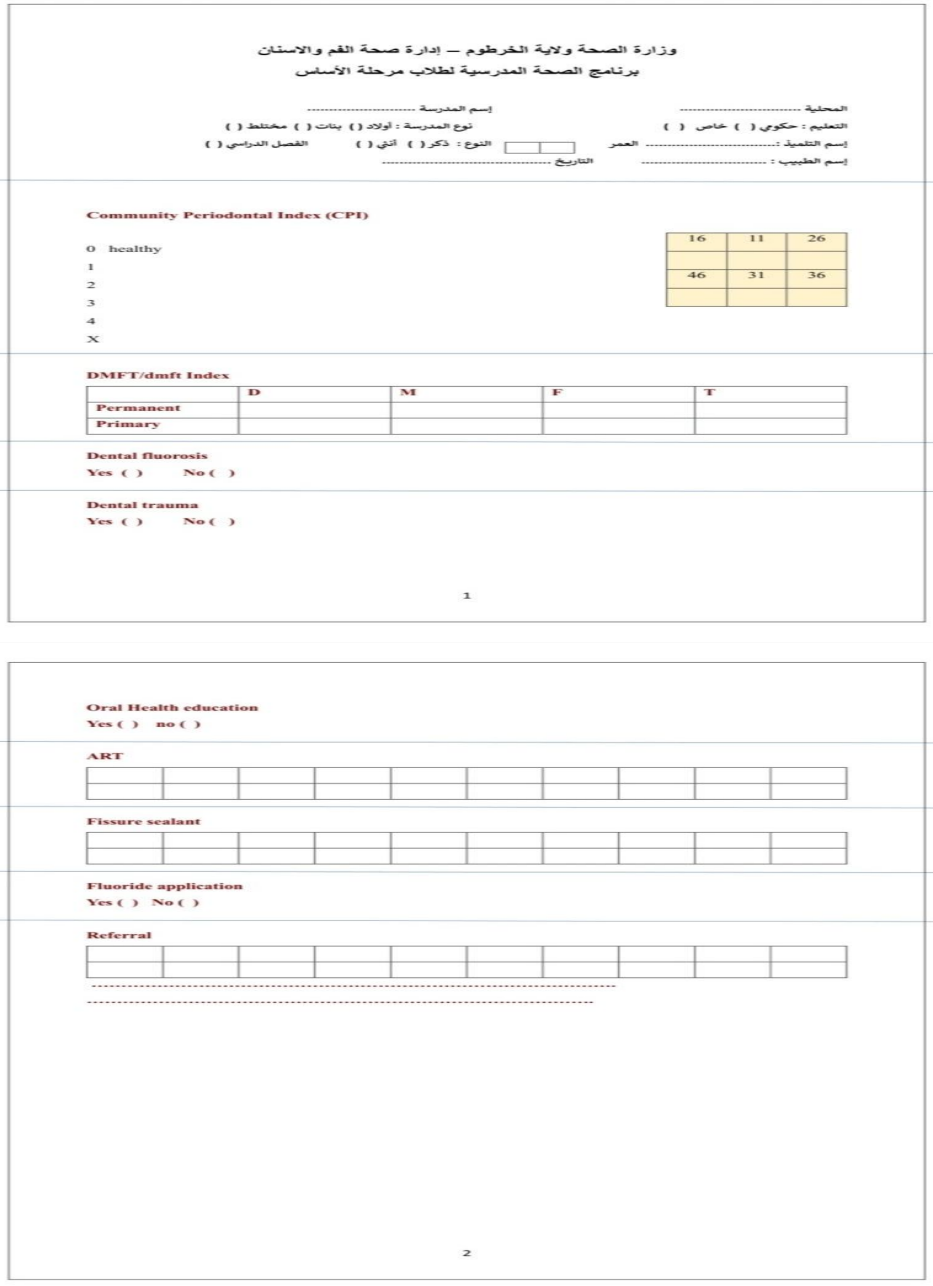
The process of school dental screening, also known as "oral health examination," "dental assessment," dental certificates," or "dental check-up," involves a quick visual inspection

of children's mouths in a school [7]. Afterward, parents are informed about their child's current oral health condition and any necessary treatments.

The children are examined for dental caries using DMFT index, SOHI for oral hygiene assessment, CPITN for periodontal health status and treatment needs. The Ministry of health standardized adopted oral health examination sheets is always used to record the dental caries, periodontal diseases and fluoride status according to above mentioned Indices.

Referral plan: patients need further intervention in terms of surgical, endodontic and other treatment modalities are referred to dental clinics of Karary University.

Fig 5: Dental students of 4th grade record the clinical findings on examination form



وزارة الصحة ولاية الخرطوم – إدارة صحة الفم والاسنان
برنامج الصحة المدرسية لطلاب مرحلة الأساس

إسم المدرسة ---------- المحلية ----------
نوع المدرسة : أولاد ( ) بنات ( ) مختلط ( ) التعليم : حكومي ( ) خاص ( )
الفصل الدراسي ( ) النوع : ذكر ( ) أنثى ( ) العمر ---------- إسم التلميذ: ----------
التاريخ ---------- إسم الطبيب : ----------

Community Periodontal Index (CPI)

0 healthy
1
2
3
4
X

16	11	26
46	31	36

DMFT/dmft Index

	D	M	F	T
Permanent				
Primary				

Dental fluorosis
Yes ( ) No ( )

Dental trauma
Yes ( ) No ( )

1

Oral Health education
Yes ( ) no ( )

ART

Fissure sealant

Fluoride application
Yes ( ) No ( )

Referral

2

Fig 6: Ministry of HEALTH Examination form (The Arabic section of paper format describes the demographic data of School name ; place & type, student's grade , type of education , the doctor's name , the student name & gender , and the date)

Also **patient's record sheets** were used for addressing patients' total dental treatment needs.

Those record sheets are standardized for all outreach field programs of community dentistry department, in order to record medical data of the community for further assessment, academic and research purposes as well as longitudinal studies in oral health surveillance programs e.g. in school health program longitudinal assessment .

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KARARY UNIVERSITY

Collage of Oral and Dental Medicine

Community Dentistry Department

Patient's Record Sheet

- *(The patient's Record sheet is filled primarily and signed by Outpatient unit)*
- *(Accordingly the patient should be referred to other departments)*
- *(Clinical supervisor assess the record sheet and recommend TTT options for patients)*
- *(Record sheets are collected, signed and submitted to Community Dentistry department by the end of day for documentation, with printed copies submitted to other clinical departments)*

Date …. /…. /……. **Sheet Number (……….)**

- **Patient name:** …………………………………………………………………………
- **Gender…………/ Age……../ Occupation…………………/ Marital status………………..**
- **Level of Education:** ……………………………………/ **Tribe**………………………………
- **Address:** ……………………………/ **Contact Number**…………………………………

- P.M.H/ Drugs History:

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

- P.D.H:

……………………………………………………………………………………………
……………………………………………………………………………………………

- Social History / Habits:

……………………………………………………………………………………………
……………………………………………………………………………………………

- General Appearance / Examination findings:

……………………………………………………………………………………………
……………………………………………………………………………………………

- Patients Complaints / History of Present Illness:

……………………………………………………………………………………………
……………………………………………………………………………………………
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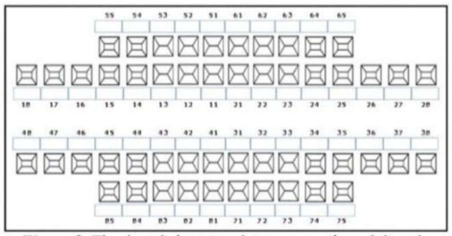


- **Differential diagnosis:**
  ……………………………………………………………………………………
  ……………………………………………………………………………………
- **X. Ray (If needed)**
  ……………………………………………………………………………………
- **Definitive Diagnosis:**
  ……………………………………………………………………………………
  ……………………………………………………………………………………
- **TTT Plan:**
  ……………………………………………………………………………………
  ……………………………………………………………………………………
  ……………………………………………………………………………………

Departments:	Please Tick
Paedodontics- قسم الأطفال	
Periodontics - قسم أمراض اللثة	
OMFS - قسم جراحة الفم و الأسنان	
Conservative - قسم العلاج التحفظي (الحشوات)	
Other/s Specify ……………………	

Name of outpatient doctor……………………………………Signature………………

Patient name : ……………………………………………………Date…../…./……….

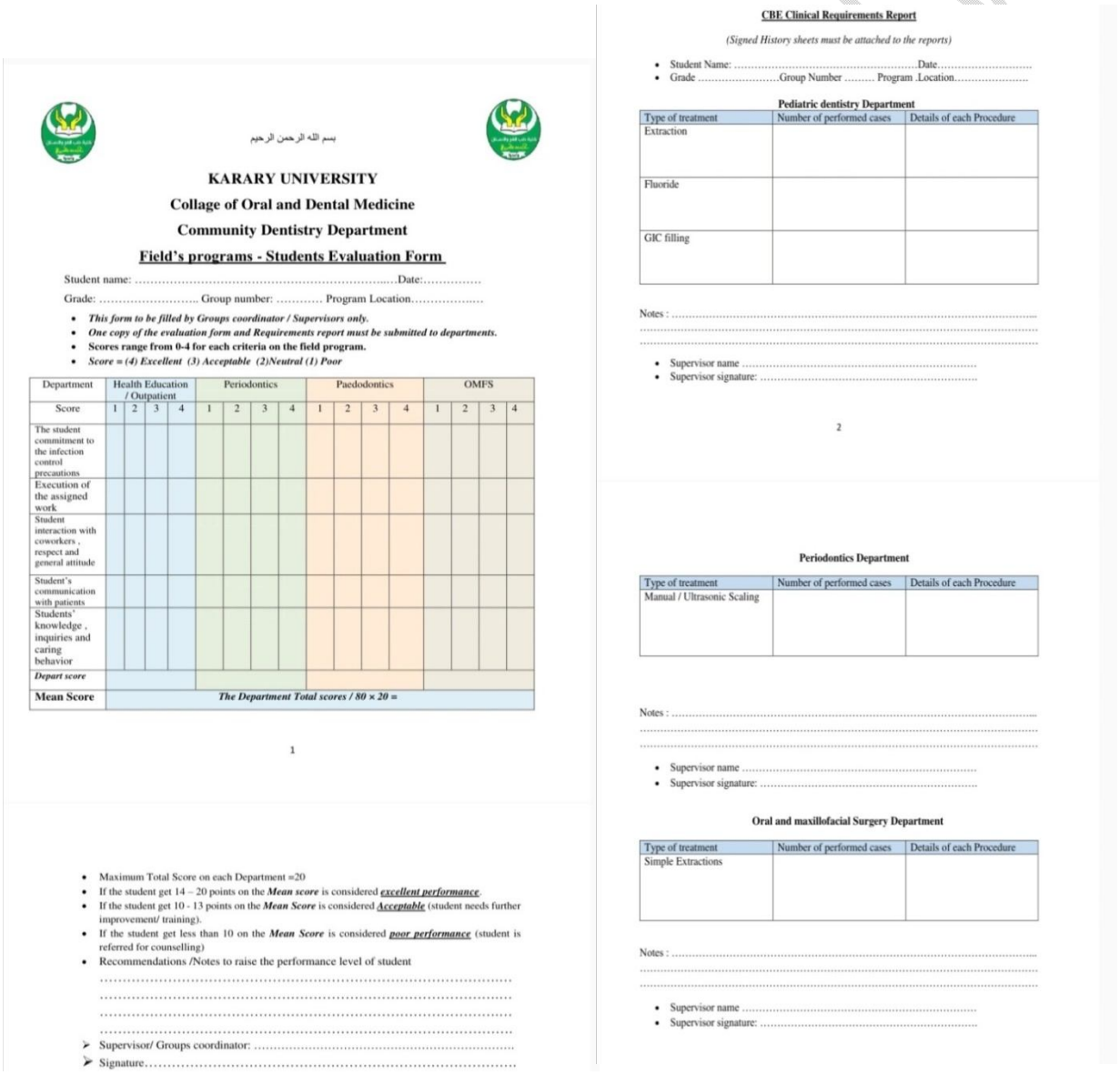
Department/s *(one or more)*	Treatment done	Postoperative instruction	Student name	Supervisor Name / signature

- **Referral (Referred to / cause of referral):**
  ……………………………………………………………………………………
  ……………………………………………………………………………………
  ……………………………………………………………………………………

Fig 7: Patient's record sheet (Given to patients as internal referral)

D.2- PRACTITIONARS ASSESMENT:

The clinical examination and health education are carried out by semi-final and final dental students, so effective monitoring of their performance is required to ensure proper clinical assessment, intervention, and communication, as well as adherence to infection control and safety measures; the evaluation of the students' performance is yielded by effective mentorship and supervision by the supervisors (Teaching Assistants) using a specific student evaluation form. These checklists are standard community-based education checklists designed by the Community Dentistry Department, with a scoring system to track individual dental students' achievement in addition to their total Community Based Education (CBE) clinical requirements across departments.



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Community Dentistry Department

Field's programs - Students Evaluation Form

Student name: ……Date:……

Grade: …….. Group number: …… Program Location……..

- ***This form to be filled by Groups coordinator / Supervisors only.***
- ***One copy of the evaluation form and Requirements report must be submitted to departments.***
- **Scores range from 0-4 for each criteria on the field program.**
- ***Score = (4) Excellent (3) Acceptable (2)Neutral (1) Poor***

Department	Health Education / Outpatient				Periodontics				Paedodontics				OMFS			
Score	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
The student commitment to the infection control precautions																
Execution of the assigned work																
Student interaction with coworkers , respect and general attitude																
Student's communication with patients																
Students' knowledge , inquiries and caring behavior																
Depart score																
Mean Score	***The Department Total scores / 80 × 20 =***															

1

- Maximum Total Score on each Department =20
- If the student get 14 – 20 points on the ***Mean score*** is considered ***excellent performance***.
- If the student get 10 - 13 points on the ***Mean Score*** is considered ***Acceptable*** (student needs further improvement/ training).
- If the student get less than 10 on the ***Mean Score*** is considered ***poor performance*** (student is referred for counselling)
- Recommendations /Notes to raise the performance level of student

……

……

……

……

➢ Supervisor/ Groups coordinator: ……

➢ Signature……

CBE Clinical Requirements Report

(Signed History sheets must be attached to the reports)

- Student Name: ……Date……
- Grade ……Group Number …… Program .Location……

Pediatric dentistry Department

Type of treatment	Number of performed cases	Details of each Procedure
Extraction		
Fluoride		
GIC filling		

Notes : ……

……

……

- Supervisor name ……
- Supervisor signature: ……

2

Periodontics Department

Type of treatment	Number of performed cases	Details of each Procedure
Manual / Ultrasonic Scaling		

Notes : ……

……

……

- Supervisor name ……
- Supervisor signature: ……

Oral and maxillofacial Surgery Department

Type of treatment	Number of performed cases	Details of each Procedure
Simple Extractions		

Notes : ……

……

……

- Supervisor name ……
- Supervisor signature: ……

Fig 8: Student's evaluation form

D.3 FOLLOW-UP PLAN:

The following types of follow-up techniques exist: Traditional techniques, such as providing a referral card, information letter, or consent form [8]

Additional techniques: for instance, Zarod 1992 offered rigorous follow-up through personalized letters, while Reiss 1982 offered phone call reminders and incentives.

In addition to identifying kids with dental health issues, the goal of a school dental screening program is to connect these kids with oral health resources [9] In order to assess the efficacy of screening in terms of increased service uptake, such as dental attendance and registration, it is essential to follow up with the screened children.

Our school dental screening program strives to not only detect oral health issues in kids, but also to connect them with oral health treatment options. It is critical to monitor children who have undergone screening in order to assess the efficacy of the screening process in terms of improved service utilisation, such as dental attendance and registration; thus, the Ministry of Health's formal screening checklist is used in conjunction with prior patients' record sheets.

In terms of the long-term follow-up, it was decided that reassessments would be conducted at the same listed schools every four years to guarantee that the oral health of those second graders improved by the time they reached the sixth grade level. Additionally, analytic cross-sectional surveys that compare the oral health findings and treatment needs of the new upcoming second graders with the former ones could be conducted.

RESULTS:

The implementation of the school dental health program across six primary schools aimed to enhance oral health awareness and provide essential dental services to students. This initiative involved a comprehensive approach that not only focused on preventive treatments but also assessed the overall oral health status of the participating children.

In this section, we present the results of the program, highlighting various key components beyond the numerical data captured in the accompanying table. This includes the performance and contributions of dental students, who played a crucial role in delivering care and educating the school community. Their involvement not only facilitated immediate treatment but also fostered an environment of learning and engagement.

Additionally, the clinical diagnosis reports provide a detailed analysis of the oral health status among school children. Key indicators such as the Decayed, Missing, and Filled Teeth (DMFT) index, the Community Periodontal Index (CPI), and fluoride levels were evaluated. These metrics offer valuable insights into the prevalence of dental caries, periodontal health, and the effectiveness of fluoride interventions among the student population.

The following results will illuminate the overall impact of the program, the engagement of dental students, and the clinical findings regarding the oral health of school children, thus contributing to a more comprehensive understanding of the initiative’s effectiveness in promoting dental health within the community.

Table 2: Overview of the School Dental Health Program Implementation

School Name	Grade Level	Number of Students	Total Examined Cases	Fluoride Treatments	Other Treatment Services (GIC ART & Fissure sealants)	Referred Cases
School 1 Selah Almohandseen (Boys)	2nd Grade	90	64	20	4 (2GIC/2FS)	84
	6th Grade	109	100	33	8 (8 FS)	
School 2 AL sheikh Ahmed Wd Suliman (Boys)	2nd Grade	110	100	21	3 (2GIC/1FS)	152
	6th Grade	127	120	35	2 (1GIC/1FS)	
School 3 Almaarif (Boys)	2nd Grade	150	143	30	10 (7GIC/3FS)	194
	6th Grade	218	200	45	3 (3 FS)	
School 4 Almaarif (Girls)	2nd Grade	237	214	62	12 (8GIC/4 FS)	359
	6th Grade	320	300	100	0	
School 5 Selah Almohandseen A (Girls)	2nd Grade	119	110	28	7 (6GIC/1FS)	133
	6th Grade	132	95	12	4 (3GIC/1FS)	
School 6 Selah Almohandseen B (Girls)	2nd Grade	60	55	9	2 (1GIC/1FS)	111
	6th Grade	115	98	11	5 (1GIC/4FS)	
Total		**1787**	**1599 (89.4%)**	**406**	**60**	**1033**

- **Fluoride Treatments**: Includes applications of fluoride varnish.
- **Other Treatment Services**: May encompass services such as fissure sealants, simple extractions, and A traumatic Restorative Treatment (ART).
- **Referred Cases**: Indicates the number of students who required further treatment beyond what was provided during the program.

This table provides a comprehensive overview of the program's impact and can serve as a useful tool for public health reporting.

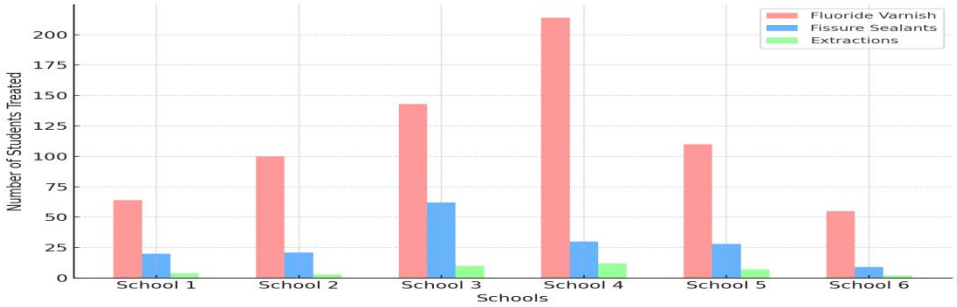

Figure (9): Distribution of Dental Services.
The figure above showed variation in fluoride varnish, fissure sealants and extraction procedures across different schools as School 4 (Almaarif for Girls) showed the highest fluoride varnish service need.

Table 3: Summary of Dental Health Metrics across Six Schools

School Name	Grade Level	Examined cases	DMFT Score (Avg)	CPI Score (Avg)	Dental Fluorosis Prevalence (%)
School 1: Selah Almohandseen (Boys)	2nd Grade	64	1.5	1.2	0.5
	6th Grade	100	2.0	1.5	
School 2 : AL sheikh Ahmed Wd Suliman (Boys)	2nd Grade	100	1.8	1.3	0.3
	6th Grade	120	2.3	1.7	
School 3 : Almaarif (Boys)	2nd Grade	143	1.6	1.4	0.4
	6th Grade	200	2.1	1.6	
School 4 : Almaarif (Girls)	2nd Grade	214	1.7	1.5	0.2
	6th Grade	300	2.5	1.8	
School 5 : Selah Almohandseen A (Girls)	2nd Grade	110	1.4	1.3	0.1
	6th Grade	95	2.0	1.4	
School 6 : Selah Almohandseen B (Girls)	2nd Grade	55	1.9	1.2	0.3
	6th Grade	98	2.4	1.6	

Total		1599	1.69	1.49	0.27%

- **DMFT Score (Avg)**: Average scores for Decayed, Missing, and Filled Teeth.
- **CPI Score (Avg)**: Average Community Periodontal Index scores.
- Fluoride **Applications**: Total number of students who received fluoride treatments.
- **Referrals for Treatment**: Total number of students referred for further dental care.
- **GIC & Fissure Sealants**: Total number of students who received Glass Ionomer Cement treatments or fissure sealants.

This table illustrates the findings for the dental health program, showcasing the overall oral health status of the student population across the six schools.

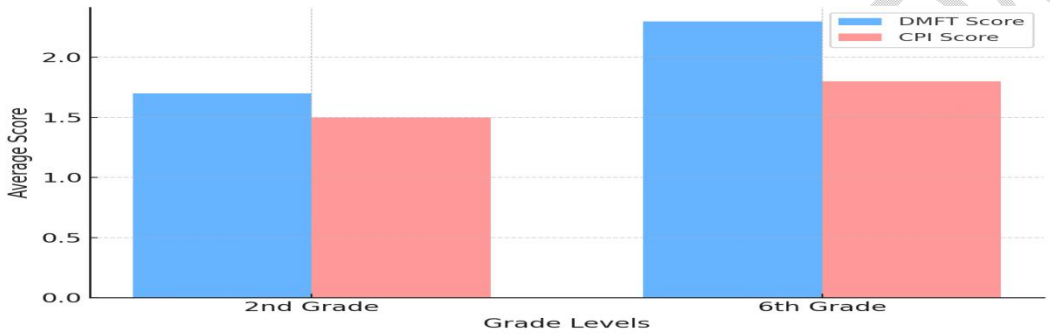

Figure (10): Oral Health Status of students by grade level.
The figure above demonstrated higher DMFT scores and CPI scores among 6th grade students.

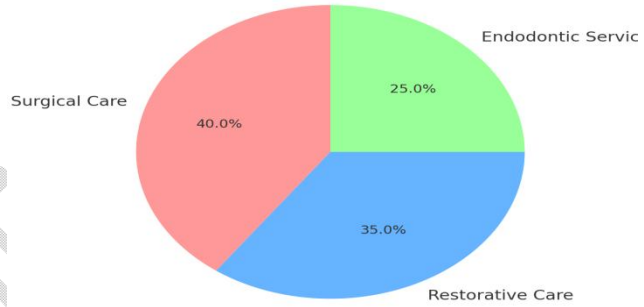

Figure (11): Referral rates and Type of follow up care.

The figure above showed that most of the follow up and referral cases were for dental extraction followed by Restorative and endodontic care.

DISCUSSION

The findings from the school dental health program reveals service coverage of 89.4% of the school students as illustrated in Table 2, significant levels of dental caries (indicated by DMFT scores) and periodontal diseases (reflected in CPI scores) among the student population. With an estimated average DMFT score of 1.69 and a CPI score of 1.49 indicating mild gingivitis, the prevalence of dental issues is concerning, particularly in the context of a developing country like Sudan as shown in Table 3.

The treatment services were provided to 1599 school child ranged from topical fluoride varnish treatment to other different set of preventive treatment modalities e.g. Fissure sealants and GIC for A Traumatic restoration, the treatment provided indicated that; the older the children needs more fissure sealant than ART compared to younger children of second grade.

Certain schools, particularly School No. 3 and School No. 4, exhibited a higher number of examined cases and a greater demand for fluoride varnish and preventive dental services among students (Fig 9). Additionally, 6th-grade students displayed elevated average scores for DMFT and CPI (Fig 10). Referrals for inpatient dental care at the university clinic primarily involved surgical procedures, as well as restorative and endodontic treatments (Fig 11). The reported prevalence of dental fluorosis remains low, estimated at around 0.27%. This suggests that while preventive measures like fluoride application have been introduced, their implementation has not led to a significant rise in fluorosis cases, indicating a controlled use of fluoride in the community.

The findings from the school dental health program reveal service coverage of 89.4% of the school students, as illustrated in Table 2. Significant levels of dental caries (indicated by DMFT scores) and periodontal diseases (reflected in CPI scores) were identified among the student population. With an estimated average DMFT score of 1.69 and a CPI score of 1.49 indicating mild gingivitis, the prevalence of dental issues is concerning, particularly in the context of a developing country like Sudan, as shown in Table 3.

Treatment services were provided to 1,599 schoolchildren, ranging from topical fluoride varnish to other preventive treatment modalities, such as fissure sealants and GIC for atraumatic restorative treatment (ART). Notably, the older children required more fissure sealants than ART, compared to younger children in the second grade. Certain schools, particularly School No. 3 and School No. 4, exhibited a higher number of examined cases and a greater demand for fluoride varnish and preventive dental services among students (Fig. 9). Additionally, sixth-grade students displayed elevated average scores for DMFT and CPI (Fig. 10). Referrals for inpatient dental care at the university clinic primarily involved surgical procedures, as well as restorative and endodontic treatments (Fig. 11). The reported prevalence of dental fluorosis remains low, estimated at around 0.27%. This suggests that while preventive measures like fluoride application have been introduced, their implementation has not led to a significant rise in fluorosis cases, indicating a controlled use of fluoride in the community.

These findings are consistent with global trends in school-based oral health programs. For instance, a study conducted by Petersen in 2003 emphasized the critical role of school-based oral health interventions in addressing the burden of dental caries globally. The study highlighted that integrating preventive measures like fluoride varnish application and fissure sealants within school settings could significantly reduce oral health disparities, especially in underserved populations [10]. Similarly, the World Oral Health Report emphasized the importance of such programs in fostering oral health literacy and reducing missed school days due to dental issues, aligning closely with the objectives of this initiative.

Furthermore, comparisons with regional data reveal the pressing need for enhanced preventive measures. For example, a study conducted in Tanzania reported a dental caries prevalence of 66% among schoolchildren, far exceeding the rates observed in this program. The Tanzanian study underscored the role of socioeconomic factors and access to fluoride in shaping oral health outcomes, suggesting the need for targeted water fluoridation initiatives and community-based preventive strategies [11]. Such comparisons reinforce the value of expanding similar school-based programs to other regions, including neighbouring countries like Uganda, to address disparities in oral health care.

Conclusion

The current context of conflict in Sudan, which is likely to hinder service coverage, accessibility to dental care, and increase neglect of dental health, immediate and strategic interventions are necessary:

1. Telehealth Initiatives: Establishing telehealth services can provide remote consultations, education, and follow-up care for students and families, particularly in areas where physical access to dental services is compromised, particularly in regard to current contexts in Sudan.

2. Community Health Workers: Training community health workers to provide basic dental education and preventive care can bridge gaps in service delivery. These workers can engage with families, raise awareness about oral health, and assist in monitoring dental health indicators.

3. Mobile Clinics: Deploying mobile dental clinics can help reach underserved areas. These clinics can provide essential dental services, including screenings, preventive care, and education, while adapting to the challenges posed by the current conflict.

4. Partnerships with NGOs: Collaborating with non-governmental organizations (NGOs) focused on health care can enhance resource mobilization, logistics, and the sustainability of the program amidst ongoing challenges.

5. Monitoring and Continuous Assessment: Implementing a robust monitoring framework is crucial for assessing the effectiveness of the program. This could include regular surveys to gather data on oral health indicators and program outcomes, enabling timely adjustments to strategies based on real-time data, which has already been implemented since the start of the school dental health program.

6. Community Awareness Campaigns: Launching awareness campaigns focused on the importance of dental health and available services can empower the community to prioritize oral health, even in challenging circumstances.

7. Fostering of schools water fluoridation initiatives: Establishing systematic school water fluoridation initiatives can help in solving the lack of fluorides besides providing service for only targeted groups without adverse effects of systematic community water fluoridation accompanied by other public policy constraints.

Given the high prevalence of dental caries in neighbouring equatorial and East African countries, such as Uganda where estimates reach 66% [12], and similar trends in Rwanda, Kenya, Tanzania, and Somalia, there is a pressing need for targeted studies to evaluate water fluoridation levels. This data could inform evidence-based interventions. Implementing a school health program in Uganda, similar to the one conducted in Sudan, could effectively address these dental health challenges.

Recommendations :

By addressing these recommendations and drawing lessons from global and regional programs, the school dental health program can adapt to current challenges while ensuring continued support and monitoring of dental health in the community in developing countries.

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1. **Tele health Initiatives**: Establishing telehealth services can provide remote consultations, education, and follow-up care for students and families, particularly in areas where physical access to dental services is compromised particularly in regard to current contexts in Sudan.
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4. **Partnerships with NGOs**: Collaborating with non-governmental organizations (NGOs) focused on health care can enhance resource mobilization, logistics, and the sustainability of the program amidst on-going challenges.
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By considering these recommendations, the school dental health program can adapt to the current challenges while ensuring continued support and monitoring of dental health in the community in developing countries.

Figure 12: Dental students of 4th grade Participating in school dental health program

Authors contribution:

Dr.Motaz Ibrahim Suliman (Corresponding Author) : Principal investigator and supervisor of the field survey. Dr. Motaz conceptualized the study, managed the overall planning & implementation process, and ensured the completion of the field survey.

Dr. Alaa Abuelgasim Mohammed (Co author) : Designed the study methodology and provided mentorship for the program. Dr. Alaa contributed to the development of research instruments and guided the implementation process.

Dr. Ahmed Obaid : Provided academic supervision, facilitated field reporting, and delivered technical support throughout the program.

Dr. Omer Babiker : Contributed to academic supervision, ensured accurate field reporting, and offered technical support for program activities.

Dr.Ammar Hussien : Assisted with academic supervision, field reporting, and technical support to maintain the integrity of program operation.

Dr. Alameen O. Abusham : Played a key role in academic supervision, field reporting, and the provision of technical support to the program.

Dr Braa Malik : Supported academic supervision, contributed to field reporting, and provided technical assistance throughout the program.

Ethical Approval and Consent:

The children are examined for dental caries using DMFT index, SOHI for oral hygiene assessment, CPITN for periodontal health status and treatment needs after getting written consent and institutional approval from schools authorities.

Disclaimer: (Artificial intelligence)

We hereby declare that AI technologies such as ChatGPT, have been used during the preparation of this manuscript in the way described below : Details of the AI usage are provided below:

1. Name and Version: ChatGPT, model version GPT-4.

2. Source: OpenAI

3. Purpose and Extent of Use: The AI technology was employed solely for paraphrasing and contextualizing the initial draft to enhance clarity and ensure adherence to scientific communication standards. No new data, concepts, or scientific claims were generated by the AI.

Also , we declare that Models like Quilbot and Grammarly applications have been used for paraphrasing and grammar corrections.

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