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Effectiveness of Educational Intervention on Knowledge and Practice of School Teachers and Day Care Workers Regarding Dental Emergencies in School Children: A Quasi Experimental Study.

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Abstract
Background: *Dental emergencies are frequently encountered among children, especially in school environments where teachers and caregivers act as first responders.*
Aim: *To evaluate the effectiveness of an educational intervention in improving knowledge and practical response of school teachers and daycare workers regarding dental emergencies.*
Materials and Methods: *A quasi-experimental pre-test and post-test study was conducted among 76 participants. A structured questionnaire assessed baseline knowledge and practices. An educational lecture along with informational leaflets was delivered, followed by reassessment after two weeks.*
Results: *Baseline findings revealed limited knowledge and inadequate practical response among participants. Post-intervention, a significant improvement was observed in both knowledge (93.42%) and practice (94.73%) scores ($p < 0.05$).*
Conclusion: *Educational intervention significantly enhanced awareness and preparedness of teachers and daycare workers. Regular training programs are recommended.*
Keywords: *Dental trauma, avulsion, school teachers, emergency management, educational intervention*

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I. Introduction:

Dental emergencies are common injuries affecting children of school going age. These injuries include tooth fracture, enamel fracture, luxation, avulsion, lip injuries, toothache, swelling etc.[1] Epidemiological studies show the annual incidence of dental injuries globally is at about 4.5%. Approximately one-third of children and toddlers (primary dentition) and one-fifth of adolescents and adults (permanent dentition) sustained a traumatic dental injury.[2] Because of the high prevalence, dental emergencies have become a public health concern affecting not only functional but also aesethics of growing children having debilitating effect on the quality of life.[3] Children are mostly indulged in physical activities in school like sports, falls, fights amongst themselves, etc. leading to trauma to teeth and surrounding structures.[4] School teachers and day care workers play an important role in dealing with such emergencies as they are the first responders to any injury a child sustains be it traumatic injuries or a simple toothache.[5]

Educational interventions have demonstrated significant improvement in both knowledge and practical approach towards dental emergency management. Structured awareness programs can help teachers and day care workers recognize different dental emergencies, understand immediate first aid measures, and seek timely professional care.[4]

An Indian retrospective clinical study also demonstrated that falls remain the most common cause of traumatic dental injuries in children, with maxillary central incisors being the most frequently affected teeth.[5] This finding reinforces the importance of training school personnel, since many such injuries occur during school hours and supervised play. Recent international evidence supports similar concerns. A 2025 survey among primary school health teachers and parents demonstrated that although many teachers had previously encountered dental trauma, only a small proportion recognized immediate replantation as the correct emergency

response, and fewer than one-third identified the ideal treatment window of 30 minutes.[6] This indicates that practical knowledge gaps persist globally.

The present interventional study was undertaken to assess the knowledge and practice approach of school teachers and day care workers regarding dental emergencies in children and to evaluate the impact of an educational intervention on improving their preparedness.

II. Materials and Methods:

This study was conducted as a non-randomized pre-test and post-test quasi-experimental study among school teachers and day care workers in Pune city. The study population included school teachers who were currently employed and in direct contact with children below the age of 12 years, as well as school caretakers and day care workers who were responsible for children within the same age group. Only those participants who provided informed consent were included in the study. Individuals who had previously received training in the management of dental emergencies and those who were absent during the period of data collection were excluded from participation.

Sample size estimation

The sample size for the present study was calculated based on the primary outcome variable using data from previously published literature. Assuming a confidence level of 95% and a statistical power of 80%, the minimum required sample size was determined to detect a clinically significant difference between the study groups. The effect size was estimated from earlier studies with similar methodology.

The calculation was performed using standard sample size formulae

$$n=d2(Z\alpha/2+Z\beta)2\sigma d2$$

in OpenEpi software, accounting for possible attrition. After adjusting for an anticipated dropout rate of 10–15%, the final sample size was increased to ensure adequate power. Thus, a total of 76 were included in the study.

Method of Data Collection:

Data were collected using a structured, self-administered questionnaire adapted from a previously validated study.[16] The questionnaire was designed in both English and Hindi to ensure clarity and ease of understanding among participants. It comprised two sections: the first section included five questions related to demographic details, while the second section consisted of ten multiple-choice questions assessing participants' knowledge regarding the prevention of dental trauma and the practical management of dental emergencies.

Primary and secondary school teachers, along with caretakers responsible for children, who met the inclusion criteria and were willing to participate, were invited to complete the questionnaire. The responses were recorded to evaluate baseline knowledge and to assess changes following the intervention.

Intervention:

Following the collection of completed baseline questionnaires, an educational intervention was conducted among school teachers and day care workers in the form of a structured didactic lecture, supplemented by a PowerPoint presentation and an informational leaflet. The educational material encompassed evidence-based information regarding the prevention and emergency management of dental traumatic injuries. The lecture content included a detailed discussion on the etiology and management of tooth avulsion, the critical duration of tooth displacement from the socket influencing the survival of periodontal ligament cells**,** and appropriate measures for the management of intraoral and extraoral swelling and pain. Additionally, emphasis was placed on the composition of a dental emergency kit and its appropriate utilization in emergency scenarios. The informational leaflet reinforced key concepts by outlining essential "Do's and Don'ts" in the management of dental emergencies. Interactive engagement was encouraged, and participants' queries were addressed to facilitate better comprehension and retention of knowledge. A follow-up assessment was conducted after an interval of two weeks, wherein the same questionnaire was re-administered to evaluate the post-intervention knowledge levels. This allowed for comparative analysis of pre- and post-intervention responses to assess the effectiveness of the educational program in improving knowledge and practical approaches toward the management of dental emergencies.

III. Method of Data Analysis:

The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software SPSS version 25.0. Descriptive statistics were computed to summarize the data, with continuous variables expressed as mean ± standard deviation and categorical variables presented as frequencies and percentages. For inferential analysis, pre- and post-intervention were analyzed using the Wilcoxon signed-rank test. A p-value of less than 0.05 was considered statistically significant.

IV. Results:

Table 1: Demographic Characteristics Of Study Participants

Variable	Category	Frequency(n)	Percentage(%)
Age	≤30	35	45.5
	>30	41	53.2
Gender	Male	1	1.3
	Female	75	97.4
Education	Bachelors	56	72.7
	Masters	20	26.0
Type of school	Government	10	13.0
	Private	66	85.7

Table 1 presents the demographic characteristics of the study participants. A total of 76 participants were included in the study. Regarding age distribution, 41 participants (53.2%) were older than 30 years, while 35 participants (45.5%) were aged 30 years or younger, indicating a slightly higher representation of participants above 30 years of age.

With respect to gender, the majority of participants were female, accounting for 75 individuals (97.4%), whereas only 1 participant (1.3%) was male, demonstrating a predominantly female study population.

In terms of educational qualification, most participants held a bachelor's degree, comprising 56 individuals (72.7%), while 20 participants (26.0%) had a master's degree.
Regarding type of school, 66 participants (85.7%) were associated with private schools, whereas 10 participants (13.0%) were from government schools, showing that most respondents belonged to private educational institutions.

Table 2: Responses to Questionnaire Pre & Post Intervention

Question	***Pre intervention N(%)***	***Post intervention N(%)***
1. Do you know what an avulsed tooth is?		
Yes	59 (74.68)	70(92.10)
No	17(17.79)	6(7.89)
2. Have you experienced an accident where the tooth of a child was avulsed?		
Yes	56(73.68)	56(72.72)
No	20(26.31)	20(26.31)
3. Have you received any advice on what to do at the time of any kind of dental trauma?		
Yes	65(85.5)	76(100)
No	11(14.4)	0(0)
4. Do you think it is important to have an educational program on management of dental trauma?		
Yes	74(97.3)	73(96)
No	2(2.6)	3(3.9)

5. What will you do immediately after a traumatic dental injury of a child		
a. Refer the child immediately to dentist with the broken tooth	28(36.8)	38(50)
b. Put back the tooth into the socket and rush to the dentist	14(18.4)	3647.3)
c. Wash the child's mouth with tap water and take the tooth in a wet cloth	34(44.7)	2(2.6)
d. Would not be concerned about the broken tooth	0	0
6. How would you hold the tooth?		
1. From the crown	28(36.8)	73(96)
2. From the root	30(39.4)	3(3.9)
3. Anywhere	18(23.6)	0
7. Knowledge regarding the time for the dentist's opinion needed after trauma		
1. Immediately within 30 minutes	32(42.1)	75(98.6)
2. Within few hours	24(31.5)	0
3. Within 24 hours	10(13.1)	1(1.3)
4. Don't know	10(13.1)	0
8. How will you clean the avulsed teeth?		
1. Scrub the tooth to remove the dirt	13(17.1)	2(2.6)
2. Rinse with tap water	35(46)	49(64.4)
3. Wash with sterile saline	13(17.1)	25(32.8)
4. Wash with hydrogen peroxide	3(3.9)	0
5. Wipe the tooth with tissue paper	5(6.5)	0
6. Nothing to do	7(9.2)	0
9. How will you store and carry the avulsed tooth to dentist?		
1. Ice	8(10.5)	2(2.6)
2. Tap water	2(2.6)	0
3. Wet tissue	6(7.8)	0
4. Sterile saline	9(11.8)	13(17.1)
5. Cotton pad	10(13.1)	0
6. Child's mouth	2(2.6)	23(30.2)
7. Any aseptic solution	3(3.9)	1(1.3)
8. Milk	2(2.6)	38(50)
9. Don't know	34(44.7)	0
10.In case of swelling, what will you do		
1. Apply cold compress	14(18.4)	72(94.7)
2. Apply hot compress	22(28.94)	1(1.3)
3. Apply clove oil	13(17.1)	2(2.60
4. Apply aspirin	27(35.5)	1(1.3)

Table 3: Comparison of knowledge & practice pre & post intervention

		Pre intervention	Post intervention	p value
Knowledge	Good	32(41.11%)	71(93.42%)	
	Poor	44(57.89%)	5(6.57%)	<0.05
Practice	Good	29(38%)	72(94.73%)	
	Poor	47(61.84)	4(5.26%)	<0.05

p<0.05 considered statistically significant

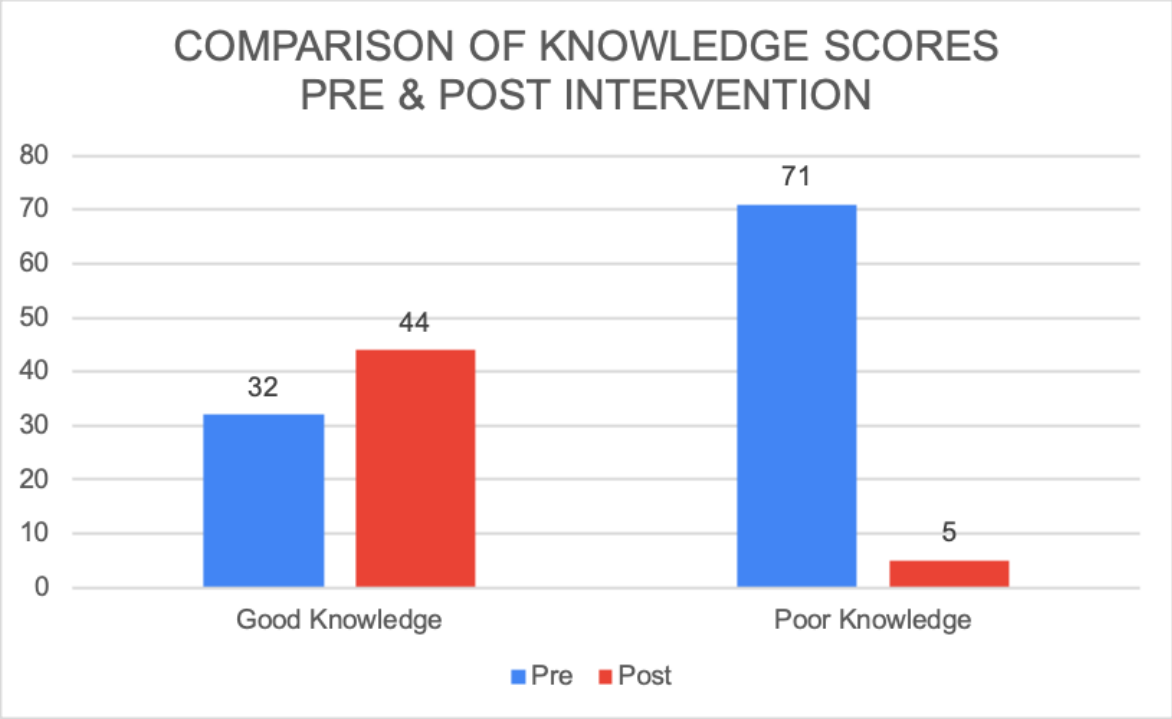

Fig. 1: Effect of Intervention on Knowledge scores

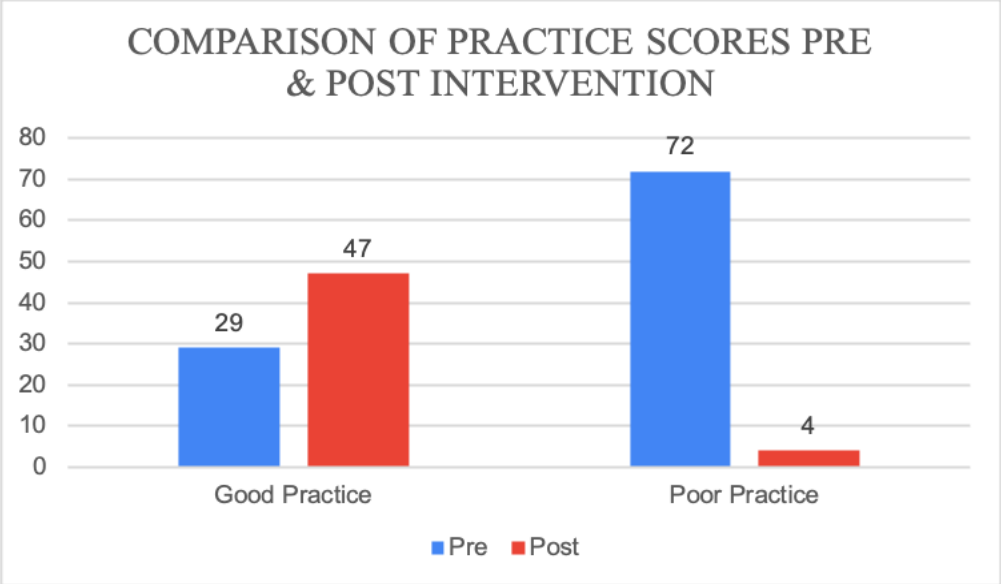

Fig. 2: Effect of Intervention on practice scores

Figure 1 & 2: Presents the comparison of participants' knowledge and practice scores before and after the intervention. A substantial improvement in knowledge was observed following the intervention. Before the intervention, 32 participants (41.11%) demonstrated good knowledge, whereas 44 participants (57.89%) had poor knowledge. After the intervention, the proportion of participants with good knowledge increased markedly to 71 (93.42%), while only 5 participants (6.57%) remained in the poor knowledge category.

A similar improvement was noted in practice scores. Prior to the intervention, 29 participants (38%) demonstrated good practice, while 47 participants (61.84%) showed poor practice. Following the intervention, good practice increased considerably to 72 participants (94.73%), whereas poor practice decreased to 4 participants (5.26%).

Overall, both knowledge and practice scores improved substantially after the intervention, indicating that the educational program had a positive effect on participants' awareness and practical behavior.

Fig. 3: Information leaflet – Hindi & English language provided during intervention

V. Discussion:

School children are actively involved in sports and recreational activities, making dental trauma highly prevalent in school environments where teachers and caretakers often become the primary responders.[7] Because the immediate prognosis of traumatic dental injuries depends greatly on early first-aid measures, it is of utmost importance that primary responders possess adequate knowledge to safeguard a child's dentition and prevent long-term complications.[8] The prognosis of traumatic dental injuries is particularly dependent on immediate intervention at the site of injury. In avulsion cases, periodontal ligament cell vitality rapidly decreases when the tooth remains dry outside the socket, making extra-oral time a critical determinant of survival.[9] Immediate replantation, when possible, or preservation of the avulsed tooth in an appropriate storage medium such as milk, saline, or saliva can significantly improve long-term treatment success.[10] However, lack of awareness regarding these emergency measures often results in delayed referral and poor prognosis. Several Indian studies have demonstrated that teachers frequently lack adequate practical knowledge regarding emergency dental trauma management. Chandukutty et al. reported that although many school teachers recognized anterior teeth as the most commonly affected during trauma, only 14.2% correctly identified the ideal storage medium for an avulsed tooth, while very few knew that a permanent tooth could be replanted.[11] Similar findings were observed in Navi Mumbai, where only 6.6% of school teachers had previously received any formal training regarding dental trauma despite regular supervision of children during sports activities.[12] Comparable observations were made in South Jaipur, where most teachers were uncertain regarding management of avulsed teeth and emergency referral protocols.[13] Likewise, Singh et al. in Mathura found that although teachers with greater teaching experience performed comparatively better, overall practical knowledge regarding extra-alveolar time, tooth handling, and urgency of referral remained inadequate.[3] A survey among physical education instructors in Bangalore further revealed that even staff directly supervising sports activities lacked sufficient knowledge regarding management of fractured and avulsed teeth.[8] Since sports injuries are a major cause of traumatic dental injuries among school-going children, inadequate preparedness among sports teachers may significantly affect immediate outcomes.

The present study adopts a similar educational model through personal visits to schools and daycare centers, allowing direct face-to-face teaching, leaflet distribution, and immediate clarification of practical doubts. This method offers an important advantage over passive educational approaches because participants can engage actively during the session and better understand emergency steps.

Educational interventions have shown consistent success in improving knowledge among school personnel. Arikan and Sönmez demonstrated that informative leaflets significantly improved teachers' understanding of avulsion management, storage media, and referral urgency.[14] Similar intervention-based studies using lectures and audiovisual teaching methods have shown statistically significant improvement in post-intervention knowledge scores.[15]

The present study adopts a similar educational model through personal visits to schools and daycare centers, allowing direct face-to-face teaching, leaflet distribution, and immediate clarification of practical doubts. This method offers an important advantage over passive educational approaches because participants can engage actively during the session and better understand emergency steps.

An important strength of the present study is inclusion of daycare workers in addition to school teachers. Younger children in daycare settings are highly prone to falls and accidental oral injuries during early motor development, yet daycare personnel remain underrepresented in available Indian literature. Therefore, extending educational intervention to daycare workers addresses an important gap in preventive pediatric oral health. Overall, evidence from both Indian and international literature clearly demonstrates that baseline knowledge regarding traumatic dental injury management among teachers and child caregivers remains inadequate, whereas educational intervention consistently improves awareness and preparedness. Strengthening emergency response knowledge among teachers and daycare workers may therefore contribute significantly to better prognosis, reduced long-term complications, and improved oral health outcomes in children.[3] These findings strongly justify the present study design, where personal visits to schools and daycare centers allow direct interaction, clarification of misconceptions, and immediate reinforcement through pre-test and post-test assessment. Inclusion of daycare workers additionally addresses an important gap, since most previous intervention studies have focused only on school teachers despite younger children in daycare settings being highly prone to falls and oral injuries.

Study limitations: The pre-test post-test design of this study contributed to low internal validity. Without randomization, it is difficult to determine if the intervention has actually caused the change in the outcomes, allowing alternative explanations. Future studies should follow randomization along with control or comparison group to improve the generalizability of study findings.

Conclusion:

Within the limitations of this study, it can be concluded that educational intervention significantly enhanced awareness and preparedness of teachers and day-care workers regarding management of dental trauma. Regular training programs are recommended.

Clinical Significance: The findings of this study hold important clinical relevance in improving patient outcomes and preventive strategies. The demonstrated effectiveness of the intervention suggests that incorporating such methods into routine clinical and community dental practice can enhance awareness and early management of oral health conditions. This may contribute to reduced incidence of complications and improved long-term prognosis. Furthermore, the results support the integration of simple, cost-effective educational tools into public health programs for better patient compliance and disease prevention.

Ethical approval: NIL

Data availability declaration: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author contribution CRediT statement: Conceptulization – N.K, U.D, A.M; Methodology – A.M, Z.M, A.S; Data compilation – A.M, U.D; Data analysis: U.D; Reporting – N.K, A.M, Z.M, A.S

Conflict of interest: None

AI disclosure: ChatGPT 4.0 was used to refine the text for appropriate vocabulary.

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