

Prevalence of molar-incisor hypo mineralisation of school going children's in Nanded district.

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Abstract

Molar Incisor Hypo mineralisation (MIH) prevalence have been carried out in European countries and data from Asia especially south Asian populations are lacking.

Aim: To investigate the prevalence and clinical characteristics of MIH in children residing in Nanded District, Maharashtra, India.

Method: A cross-sectional survey including 1088 children from 7–10 years, studying in primary schools was carried out. The dental examination was performed by a single well-trained and calibrated examiner in day light conditions. Full mouth inspection of wet teeth was

conducted using the EAPD 2003 criteria for diagnosis of MIH. Prevalence was compared according age, gender, arch, tooth affected and severity. Results were recorded and statistically analysed using Chi-square test and Fisher's exact test.

Results: Prevalence of MIH was 7.90% in the examined population. Males and females no statistically significant difference. Maxillary molars and mandibular molars show no significant difference among the prevalence of MIH. While maxillary incisors have significantly higher prevalence than laterals and mandibular incisors. In the maxillary arch 7.72% children showed defective central incisors followed by first molars 7.54% and lateral

incisors 6.07%. In the mandibular arch, 7.90% children showed defective first molars followed by central incisors 5.88% and lateral incisors 5.33%.

Conclusion: All new and old cases of molar incisor hypo mineralisation in the kids of municipal schools of Nanded district was 7.90%. Girls experienced greater MIH 4.41 % as compared to boys 3.49 %. The information about all new and old cases of MIH increases with age and the peak value or ratio of MIH was 26 percentage in 8 to 9yrs of age and 24 percentage in ten yrs. Demarcated opacities are the most common in MIH with both arches followed by PEB and atypical restoration

Keywords: Molar Incisor Hypo mineralisation, MIH, Prevalence. India.

Introduction

Enamel of tooth is a strongly mineralized structure. The development of tooth is controlled genetically.^{1,2} But the development is sensitive to environmental defects. The defects at the stage of calcification may produce anatomically normal but quality wise defective enamel. It is called as Hypomineralisation.³ Once teeth formed there is no chance for reformation.^{4,5}

Weerheijm et al in 2001 was first to introduce the term molar incisor hypo mineralisation. Various terms have been used to refer to hypo mineralized molars, such as nonfluoride enamel opacities, internal enamel hypoplasia, nonendemic mottling of enamel, opaque spots, idiopathic enamel opacities, enamel opacities, and cheese molars. Molar incisor hypo mineralisation (MIH) is defined as the clinical appearance of morphological enamel defects involving the occlusal and/or incisal third of one or more permanent molars and is frequently associated with similar defects in permanent incisors.^{6,7}

There has been a wide disparity in the prevalence reports of MIH. Various studies done worldwide have shown

the prevalence of MIH, ranging from 2.4% to 40.2% due to the different criteria used.⁸ This is because of differences in the criteria used to diagnose MIH in earlier studies. The first judgment criterion for MIH was given by EAPD in 2003 further modified in 2008.^{9,10} There is not much published data on MIH in India.^{11,12,13} In national epidemiological surveys on the prevalence of dental caries in India, children are not routinely examined for the presence of MIH. This study was to know rate of all old and new cases of molar incisor hypo mineralization in school going students of Nanded District, Maharashtra, INDIA.

Materials and Method

This study was carried out on school going children. Total 1088 children had participated in this study. Children were of 7 to 10 years age group. This is a cross sectional study. In this study male and female children's which are studying in primary schools had participated. These primary schools were located in the Municipal Corporation & Zilla Parishad of Nanded city. Stratified random sampling technique was used to select sample.

Sample Size Determination

The size of sample is determined with the help of following formula. Size of Sample = $Z^2P(1-P)/C^2$

Where: Z = Z value (number of standard deviations an observation is away from the mean, e.g., 2.05 for 96% confidence level)

p = percentage, expressed as decimal and c = confidence interval, expressed as decimal (e.g., .04 = ±4).

Confidence level of 96%, confidence interval of 3 and percentage population of 37% (based on literature report) were considered to determine sample size for the survey.

Sample size = $(2.05)^2 \cdot 0.37(1-0.37) / (0.03)^2 = 1088$.

Hence 1088 children were surveyed in the present study for MIH prevalence. Random samples were obtained

using a list including all of the schools enrolled in each area. The second stage included the selection of 7 to 10-year-old children in four educational classes. Furthermore, lists of names were provided by the school administrators and a random sample consisting of 100 students was obtained from each class for a sum of 1088 students of 7–10-year-old (548 boys and 540 girls) being examined.

Inclusion Criteria

- 1) Children of 7 to 10 years age group of any sex & any socio-economic status.
- 2) The children's who were co-operative for study.
- 3) Schools with minimum student population of 100.

Exclusion Criteria

- 1) Children's with any systemic diseases & transmissible diseases are excluded from this study.
- 2) Children's with incompletely erupted incisors.

Dental Examination: In this process of oral examination, tooth surfaces of all tooth were examined by naked eyes and the defective or affected part of tooth surface was examined with the help probe. The defect which is less than 1mm seen on tooth surface was not taken on record. The association of paediatric dentistry of Europe has given the points for the identification of MIH in 2003.

- 1) For the identification of MIH defect, 1st permanent molars and permanent incisors have included in oral check-up.
- 2) Oral check-up must be carried out on wet teeth after completion of oral prophylaxis.
- 3) Every tooth surfaces must be checked for: Pointed opaque spots seen or not seen, Enamel tooth surface loss after tooth eruption, Improper tooth filling, Removal of tooth due to MIH and No eruption of molar or incisor.

For correct diagnosis Weerheijm et al, 2003 have given some criteria's as follows, Figure 1 shows the example of MIH

- 1) Present or absent of demarcated opacities on enamel.
- 2) Post eruptive loss enamel surface
- 3) Improper tooth filling
- 4) Removal of first permanent molars due to defect.
- 5) No eruption of molars or incisors

While severity was graded as following coding:

Code 1: pointed opaque spots,

Code 2: loss of tooth structure after eruption

Code 3: improper filling

Code 4: removal of tooth



Figure 1: maxillary molars affected with mih

Results

Statistical analysis

Prevalence of molar incisor hypo mineralisation (MIH) was evaluated according to sex, age, and tooth. Data analysis consists of descriptive statistics. Statistical significance for the association between the occurrence of MIH and gender was carried out using fisher exact and chi-square test.

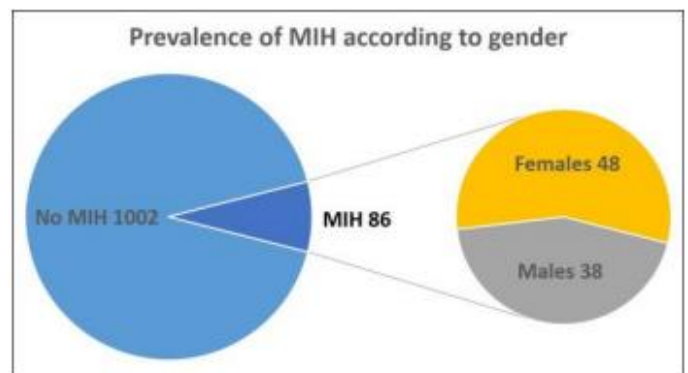


Figure 2: Prevalence of mih according to gender

Figure no. 1 shows all old and new cases of MIH in municipal (Zilla Parishad) school going students. 7.90% children were found with MIH, among which girls are more (4.41%) compared to boys (3.49%). Male female ratio is 7:9. The data was analysed by "Fisher's exact test" to understand the effect of gender on the MIH prevalence. Although MIH prevalence is different in males and females, the difference is statistically less significant ($p = 0.4336$).

Prevalence of MIH according to age

Equal number of children were found to be with affected teeth in the age group of 8 and 9 years. While prevalence is less in the 7-year-old compared to children of 8, 9 and 10-year-old as shown in figure 2.

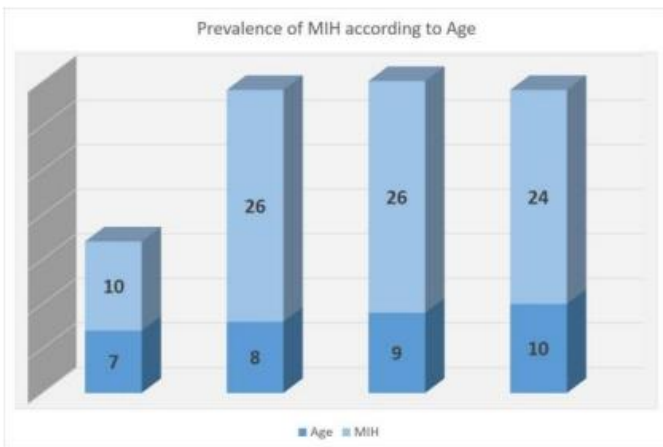


Figure 3: Prevalence of mih according to gender

Prevalence of MIH by teeth arch/type (maxillary & mandibular teeth)

Table no 1 shows maxillary central incisors affected were 76 in number while mandibular central incisor affected were 44 in number ($p= 0.0034$) shows significance. Maxillary lateral incisors were 14 in number and mandibular lateral incisor affected were 16 ($p=0.8545$) shows no significance after applying Fisher's exact test. Maxillary first molars affected were 68 in number while mandibular first molars affected were also 68 in number ($p=1$) shows no significance by Fisher's exact test.

Table 1: comparison of prevalence of mih by teeth and arch type.

Central Incisors	MIH Prevalence		Fisher's exact test	
	No MIH	MIH	P value	P value summary
Maxillary	1012	76	0.0034	Significant
Mandibular	1044	44		
Lateral Incisors	MIH Prevalence		Fisher's exact test	
	No MIH	MIH	P value	P value summary
Maxillary	1074	14	0.8545	Not significant
Mandibular	1072	16		
First Molars	MIH Prevalence		Fisher's exact test	
	No MIH	MIH	P value	P value summary
Maxillary	1020	68	1	Not significant
Mandibular	1020	68		

Prevalence of central and lateral incisor

Figure no 3 shows percentage of central incisors affected with MIH and more % of incisors affected is two (58%). Correlation between central incisors and MIH prevalence was found to be statistically significant as per the Chi square test ($P = 0.0036$). Correlation between maxillary and mandibular central incisors was also statistically significant according to the result of Fisher's exact test ($P = 0.0034$).

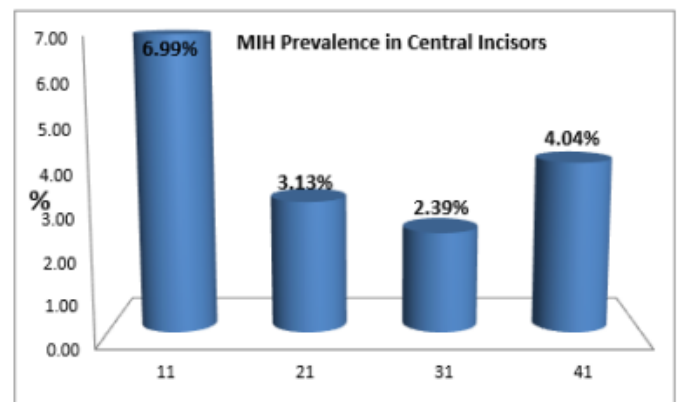


Figure 4: Prevalence of mih in central incisor

Figure no 4 shows percentage of lateral incisors affected with MIH and more percentage of single lateral incisor affected with 56%. Correlation between lateral incisors and MIH prevalence was found to be statistically not significant as per the Chi square test ($P = 0.8541$) Correlation between maxillary and mandibular lateral incisors was also statistically not significant according to the result of Fisher's exact test ($P = 0.8545$).

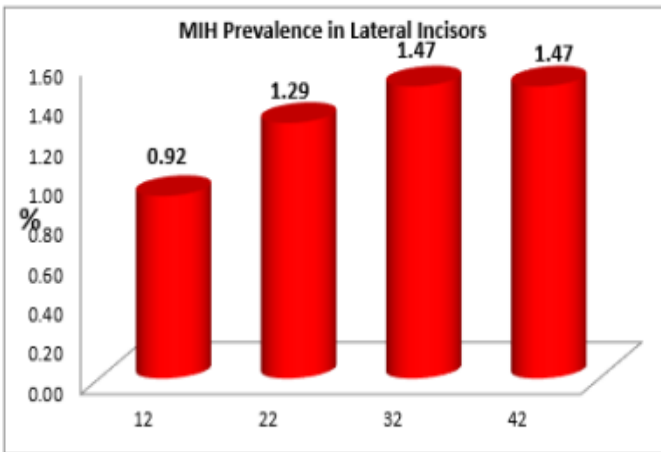


Figure 5: Prevalance of mih in later all incisor.

Prevalence of defect for permanent first molars

Figure no 5 shows % of first molars affected with MIH and Prevalence of MIH and tooth number are not significantly related with each other.

And correlation was found to be statistically not significant as per both the Chi square test (P = 1) and Fisher’s exact test (P = 1).

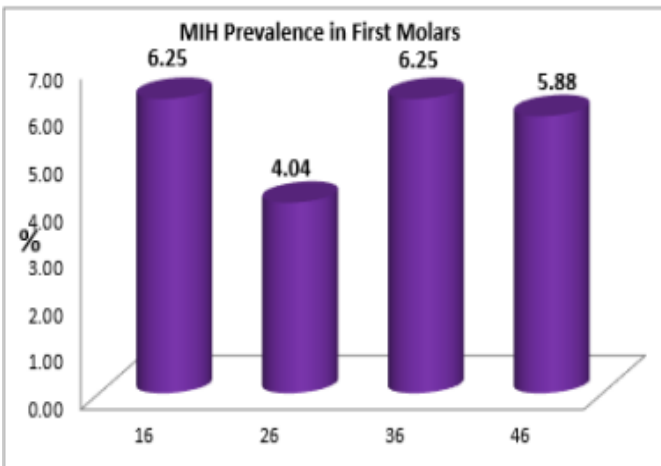


Figure 6: Prevalance of mih in first permanent molar

Comparison of incisors and molars for MIH prevalence

Figure no 6: Comparison of incisors and molars in which number of tooth affected can be seen as only one tooth affected in lateral incisor while at least two affected in central and molar.

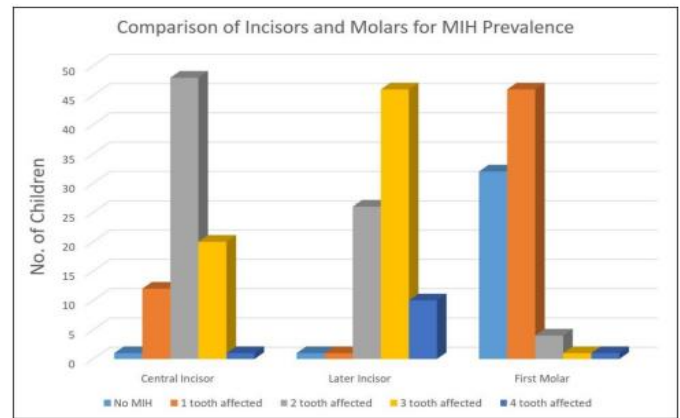


Figure 7: comparison of prevalence of mih in incisor and molars.

Code analysis of MIH Prevalence in maxillary and mandibular teeth

Table 2 and 3 shows the severity of MIH in maxillary and mandibular arch respectively. In the present study

- No child was observed whose only mandibular arch or only maxillary arch was affected.
- All the MIH affected children were found with the defective teeth both in maxillary as well as mandibular arch; as shown in the above table.
- In the maxillary arch, more children showed defective central incisors (84 children, 7.72%) followed by first molars (82 children, 7.54%) and lateral incisors (66 children, 6.07%).
- In the mandibular arch, more children showed defective first molars (86 children, 7.90%) followed by central incisors (64 children, 5.88 %) and lateral incisors (66 children, 5.33 %).

Table 2: severity of mih in maxillary arch.

Maxillary						
Code	Central Incisor		Lateral Incisor		First molar	
	Number	%	Number	%	Number	%
MIH free	1004	92.28	1022	93.93	1006	92.46
1	84	7.72	66	6.07	76	6.99
2	0	0.00	0	0.00	0	0.00
3	0	0.00	0	0.00	4	0.37
4	0	0.00	0	0.00	2	0.18
Total	1088	100	1088	100	1088	100

Table 3: severity of mih in maxillary arch.

Mandibular						
Code	Central Incisor		Lateral Incisor		First molar	
	Number	%	Number	%	Number	%
MIH free	1024	94.12	1022	93.93	1002	92.10
1	64	5.88	66	6.07	80	7.35
2	0	0.00	0	0.00	2	0.18
3	0	0.00	0	0.00	4	0.37
4	0	0.00	0	0.00	0	0.00
Total	1088	100	1088	100	1088	100

Discussion

The first case of MIH was identified by a dental surgeon from Sweden in 1970. These dentists also observed that there was increase in cases of MIH without any etiological factors. At that time the MIH defects were associated with hypoplasia of enamel present on cusps of tooth. In 1987, Koch find out the prevalence of hypo mineralisation of enamel which was idiopathic in permanent teeth. This prevalence was 3.6% to 21.5%. This variation was depending upon the years in which the child was born.¹⁴

In 2008, Murat Begovic et al¹⁵ calculate all old and new cases of the MIH in 12 years age group children of Bosnia & Herzegovia. According to him all old & new cases of MIH in Bosnia & Herzegovina students was 9.7% and also, he came to know that this prevalence was similar to the prevalence of MIH of 11 years age group children’s which participated in Danish study. The minimum 5.6% prevalence of MIH seen in germen children’s & 2.9% in Libyan children.

On the bases of systematic review studies it is observed that, there was wide range presents in the prevalence of MIH defect, starting from 2.4% to 40.2% & hence suggested that there is difficulty in comparison of these different studies. This difficulty was due to use of different index & criteria, differences in examination method, differences in method of collection of data & differences in age group.

Hence, for our knowledge prevalence of MIH was not fully studied or not fully diagnosed in India. Hence this research study was fully planned to know all old and new cases of MIH in school going students on Nanded district for this study participated children are selected from primary schools & secondary high school of different areas of Nanded district

Hypoplasia of enamel occurs due to the deficient formation of enamel matrix. The deficient formation of enamel matrix takes place because of disturbance in the ameloblast activity during the secretory phase. Enamel hypoplasia is a developmental. In MIH affected molars the borders of formed enamel are irregular & the enamel matrix was initially formed in its normal shape & size. Demarcated enamel opacities which are broken after eruption due masticatory forces is not known as enamel hypoplasia.

According to Noren et al in 1994, there was difference in histological appearances between post eruptive break downs of enamel & enamel hypoplasia. The post eruptive enamel loss is correctly known as post eruptive enamel breakdown (PEB).¹⁶

There are some systemic disturbances which occurs in first twelve month of kid’s life, in the same time period the mineralisation of tooth structure of 1st permanent molars & incisors takes place. According to Koch, Jalevit and Weerheijm, when MIH defect involve more molars, the chances of involvement of incisors increases. Hence, the demarcated opacities presents on erupting incisors should be one of the reason for the development of MIH defects in molars.^{17, 18}

Basically, MIH defects in molars can develop discomforts in children. According to Fagrell et al in 2008,¹⁹ the bacteria in oral cavity may enter through hypo mineralised enamel surface into dentinal tubules and starts the inflammatory activities in the pulp tissues.

Due to this there was hypersensitivity of tooth presents in MIH affected molars. The teeth which are affected by the MIH defect are sensitive to air cold or hot. Some children's also give complain of sharp shooting pain when they eat ice-cream or at the time of cold-water gargles or also on breathing cold air. Due to mechanical forces like tooth brushing causes the enamel which is not breakdown may show loss of enamel surface & which leads to sensitivity & tooth pain in those teeth. Due to the complex pathogenesis the MIH defects becomes a challenge to rule out the etiological factors of MIH & proper treatment of MIH

In 2002, Jal Vik & Klingberg 20 while doing study on MIH, they observed that the time required for the therapy of MIH involved molars is ten times more as compare to the treatment of normal non affected molars. In MIH affected children's early diagnosis plays an important role and there is need for proper counselling about the coming problems & difficulties associated with these defects to the parents of child & also to the child. Also, the dentists must give assurance about the

treatment and probable loss of enamel surface after complete eruption of tooth in oral cavity. When MIH defects involves the incisors means when MIH defects involves the incisors means when demarcated opacities seen on permanent incisors, the child require careful observation till all 1st permanent molars erupt in oral cavity.

In this study, the prevalence rate of MIH was 7.90% in school going children of 7 to 10 years age group in the area of Nanded District. A total 1088 children were examined in this study. 48.3% were boys & 51.7% were girls. These results are in accordance with study carried out in India by Mittal NP, Goyal A, Gauba K, Kapur A gives prevalence rate of 6.3%.¹¹ This study was carried out in 2013 and the study carried out in 2012 by Dr Parikh, Ganesh M, Bhaskar V. gives prevalence rate of 9.2%.¹³ while higher rate of Prevalance have been reported in Delhi by Singh et al of about 15%.²¹ Other studies carried out at various part around the world are given in table 4.

Table 4: studies giving all old and new case of molar incisor hypo mineralization.

No	Study	Year	Country	Age of study sample in years	Number of children	Prevalence reported
1	Koch et al ⁴	1987	Sweden	8-13	2,252	6.3%-15.4%
2	Alaluusua et al ²²	1996	Finland	6-7	137	5.7%
3	Kunzel ²³	1997	Germany	13-14	1600	5.5%
4	Leppaniemi et al ²⁴	2001	Finland	7-13	488	19.3%
5	Jalevik et al ²⁵	2001	Sweden	8	516	18.4%
6	Calderara et al ²⁶	2005	Italy	7.3-8.3	227	13.7%
7	Balmer et al ²⁷	2005	U.K	8-16	25	40%
8	Fteita D et al ²⁸	2006	Libya	7-8.9	378	2.9%

9	Preusserl ²⁹	2007	Germany	6-12	1022	5.9%
10	Jasulaityte et al ³⁰	2007	Lithuania	7-9	1277	9.7%
11	Chawla et al ¹²	2008	Australia	7-13	182	70%
12	Arrow ³¹	2008	Australia	7	511	22%
13	Wogelius et al ³²	2008	Denmark	6-8	647	37.50%
14	Cho etC al ³³	2008	Hong Kong	11-14	2635	2.8%
15	Kemoli ³⁴	2008	Kenya	6-8	3,591	13.73%
16	Jasulaityte et Al ³⁵	2008	Netherland	9	442	14.3%
17	Schluter et al ³⁶	2008	New Zealand	9	612	14.7%
18	Kuscu et al ³⁷	2008	Turkey	7-9	147	14.9%
19	Soviero et al ³⁸	2009	Brazil	7-13	249	40.2%
20	Mahoney & Morrison ³⁹	2009	New Zealand	7-10	522	14.9%
21	Kuscu et al ⁴⁰	2009	Turkey	7-10	306	9.1%
22	Da costa-silva et al ⁴¹	2010	Brazil	6-12	903	16.2%
23	Biondi et al ⁴²	2011	Argentiana	11	1098	15.9%
24	Mahoney et al ⁴³	2011	Wellington	7-10	235	18.8%
25	Zawaideh et al ⁴⁴	2011	Amman	7-9	3241	17.6%
26	Souza et al ⁴⁵	2012	Brazil	6-12	903	17.8-24.9%

27	Ahamadi et al ⁴⁶	2012	Iran	7-9	433	12.7%
28	Parikh et al ¹⁴	2012	India	8-12	1366	9.2%
29	Balmer et al ⁴⁷	2012	England	12	3233	15.9%
30	Ghanim et al ⁴⁸	2012	Iraq	7-9	823	18.5%
31	Ghanim et al ⁴⁹	2013	Iran	9-11	810	20.2%
32	Sonmez et al ⁵⁰	2013	Europe	7-12	4049	7.7%
33	Souza et al ⁵¹	2013	Brazil	7-12	1151	12.3%
34	Mittal et al ¹¹	2013	India	6-9	1792	6.31%

Conclusion

The following conclusion was drawn from the present study

1. All new and old cases of molar incisor hypo mineralisation in the kids of municipal schools of Nanded district was 7.90%.
2. Girls experienced greater MIH 4.41 % as compared to boys 3.49 %
3. The information about all new and old cases of MIH increases with age and the peak value or ratio of MIH was 26 percentage in 8 to 9yrs of age and 24 percentage in ten yrs.
4. The teeth most commonly involved with MIH were upper central incisors followed by upper and lower molar.
5. Demarcated opacities are the most common in MIH with both arches followed by PEB and atypical restoration.
6. The colour commonly observed is white opaque spot followed by yellow and brown.

The present retrospective study was an attempt for knowing information about all new and old cases of MIH in boys and girls of municipal schools of Nanded district of seven to ten yrs. It is evident that the data

gathered from this study stressed upon conducting educational programs directed at parents to create awareness about the importance of handling the MIH. The finding of the survey can be employed in an organized municipal effort to educate parents, teachers and school children about the management and awareness about MIH. There is a need of more epidemiological studies with representative populations using standardized trauma classification are required.

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