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RESEARCH ARTICLE

PREVALENCE OF MOLAR INSISORHYPOMINERALIZATION OF CHILDREN IN MALAPPURAM, KERALA, INDIA

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Abstract

Background: Molar incisor hypo mineralization is the hypomineralization of systemic origin of one to four permanent first molars, frequently associated with affected incisors. The prevalence rates vary from 2.4 to 40.2%. The aim of this study was to assess the prevalence and the possible etiological factors of Molar incisor hypo mineralization in 6 □ 12 year old children of Malappuram district, kerala, India.

Methods: A total of 2000 (808?males and 1092?females), 6-12 year-old children were examined who had their first permanent molar and incisors evaluated using the criteria for molar incisor hypomineralization described in the European meeting held in Athens in 2003.The potential aetiological factors were retrieved through detailed questionnaire supplemented with interviews and with medical histories provided by the schools. Statistical analysis was performed with a chi-Square test.

Results: A total of 135 children were diagnosed Molar incisor hypomineralization with representing an overall prevalence of 6.75% Conclusion: Although the reason is not completely known, MIH is thought to occur as a result of the multifactorial reasons during the child□s prenatal term or systemic diseases and malnutrition during the child□s first 3 years of age.

Introduction:-

The term molar incisor hypomineralization (MIH) was introduced in 2001 to describe the clinical appearance of enamel hypomineralization of systemic origin affecting one or more permanent first molars (PFMs) that are associated frequently with affected incisors.[1] Also referred to as "hypomineralized" PFMs,[2] "idiopathic enamel hypomineralization,"[3,4] "dysmineralized" PFMs,[5] "nonfluoride hypomineralization,"[6,7] and "cheese molars,"[8,9] the condition is attributed to disrupted ameloblastic function during the transitional and maturational stages of amelogenesis.[3,10].A wide variation in the reportedprevalence of MIH exists with rates varying from 3.6% to37.5% [11]

MIH is considered to have a multifactorial aetiology, having been linked to systemic problems that alter odontogenesis around birth, as well as the administration of some drugs; however, further evidence is needed to specify the predisposing factors.[13]MIH affects mainly the first permanent molars, which begin to develop during the fourth month of gestation and begin to calcify around the time of birth. In these stages, growth and developmental processes are extremely sensitive to environmental disturbances[14]

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Clinically, the hypomineralized enamel can be soft, porous, or resembling discolored chalk or old Dutch cheese. The enamel defects can vary in color from white to yellow or brown, but they always show a sharp demarcation between the affected and sound enamels. The porous, brittle enamel can easily chip off under masticatory forces. Occasionally, loss of enamel can occur so rapidly after eruption that it seems as if the enamel was not formed initially and giving a picture resembling hypoplasia. The latter, however, has smooth margins to the surrounding enamel, whilst in MIH the borders appear to be irregular [15].

MIH causes sensitivity and pain during chewing, makes tooth brushing difficult, and predisposes individuals to dental caries. The increased susceptibility to caries is explained by the fragility and porosity of the affected enamel, which causes greater retention of dental biofilm.[16]Data on the worldwide prevalence of this altered enamel development are variable: reported prevalence are 8.9% in India,[17] 10% in Greece,[18]12.6% in Brazil,[19] 16% in Argentina,[20] and 16.9% in Malaysia.[21]

The aim of the present study was to evaluate the prevalence and possible etiological factors associated with MIH in school chidren aged between 6-12 years of agechildren in Malappuramdistrict, Kerala

Materials and Method:-

This cross-sectional study involved 2000 schoolchildren aged 6–12 years who were enrolled in two upper primary schools in Malappuram District, Kerala, India. Ethical committee of Malabar dental college & Research centre approved the study protocol. Permission was taken from the school authorities and parents to carry out an oral examination of the children. Only childrenwith the first four erupted permanent molars, whose parentshad provided written consent and completed the medicalhistory questionnaire, were included. Children wearing fixed appliances, which interfere with evaluation of index teeth, were excluded.The oral examination was carried out by two trained examiners under natural daylight with mouth mirror and blunt probe. The teeth were notdried .Every surface of the incisors and permanent first molar were examined and the relevant diagnostic code was recorded on the odontogram.

Children were considered to have MIH ifone or more FPMs with or without the involvement of theincisors met the diagnostic criteria shown in Table 1.The following conditions were excluded from the study:(1) dentitions with generalized opacities present on allteeth (e.g., several forms of amelogenesis imperfecta)rather than those limited to the FPMs and permanentincisors;(2) cases of fluorosis which generally tend to be diffusedand generalized (affect other than target teeth);(3) the opacities occurring in permanent incisors but notin at least one FPM.

Table.1:- Showing diagnostic criteria used in diagnosing MIH∗.

Demarcated opacity	Alterations in the translucency of the enamel,variable indegree.The defective enamel is of normal thickness with asmooth surface and can be white, yellow, or brown in color.
Posteruptive enamel breakdown (PEB)	A defect that indicates deficiency of the surface after eruption of the tooth. Loss of initially formed surface enamel after tooth eruption. The loss is often associated with a preexisting demarcated opacity.
Atypical restoration	The size and shape of a restoration are not conforming tothe temporary caries picture. In most cases in molars therewill be restorations extended to the buccal or palatalsmooth surfaces. At the border of the restorationsfrequently an opacity can be noticed. In incisors a buccalrestoration can be noticed not related to trauma.
Extracted molar due to MIH.	Absence of a first permanent molar should be compared tothe other teeth of the dentition. Suspected for extractiondue to MIH are opacities or atypical restorations in theother first permanent molars combined with absence of afirst permanent molar. Also the absence of first permanentmolars in a sound dentition in combination withdemarcated opacities on the incisors is

	suspected for MIH.It is not likely that incisors will be extracted due to MIH.

∗Based on criteria described in the European meeting held in Athens in 2003

The severity of MIH was classified based on the molar or incisor with greatest involvement in each child using criteria described by Mathu-Mujuetal.11 (Table 2)

Table 2:- Showing Mathu-Mujucriteria.

Mild	Moderate	Severe
Opacities delimited in areas free of occlusal forces Isolated opacities No enamel loss in opaque areas No history of dental hypersensitivity No activities related to caries of affected enamel Alterations of incisors are mild, if present	Atypical and intact restorations may be present Opacities delimited in the occlusal/incisal third of the tooth, without loss of the structure after eruption Loss of posteruptive enamel and carious lesions that are limited to 1 or 2 areas, without participation of cusps Tooth sensitivity Often, aesthetic complaints are expressed by the patient or parents	Posteruptive losses are present and usually occur when the tooth erupts History of tooth sensitivity Often, extensive carious lesions are associated with the affected enamel Coronary destruction can advance quickly and involve the dental pulp The presence of defects in atypical restorations Aesthetic complaints are expressed by the patient or parents

To investigate predisposing systemic medical conditions during the perinatal period and the first 3 years of life, a detailed questionnaire was designed to obtain the following information from subjects' medical histories: complications during birth, premature birth, type of delivery, and illnesses and conditions during the 3 first years of life (respiratory and urinary tract infections, chickenpox, allergies, and antibiotic treatment). The questionnaire was supplemented with interviews and with medical histories provided by the schools.

Statistical analysis:
All statistical procedures were performed using Statistical Package for Social Sciences (SPSS) 20.0. Calculations for power (80%) of study were performed before commencement of the study. All Qualitative variables were expressed in percentages. Chi square test was done to check the association between variables. Probablility value ($p<0.05$) will be considered statistically significant

Results:-

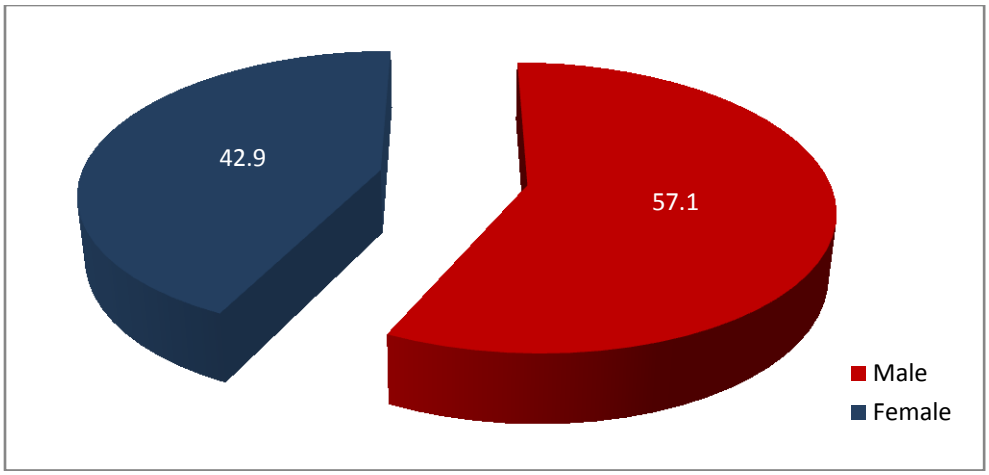
A total of 2000 children (808males and 1092 females) were examined.A total of 135 children were diagnosed with MIH representing an overall prevalence of 6.75% (Table 3).The condition was found more among males (57.1%) than females (42.9%) (Table 4).With respect to severity(Table 5) , 89.6% of cases were classified as mild, 5.9 % as moderate, and 4.5 % as severe. Health history showed that46.2% of children had the history of antibiotics usage at the first 3 years of life and 53.8% had a history of childhood illness (Table 6).

Table 3:- Showing prevalence of MIH.

No of children examined	Males	Females	No.of Children diagnosed with MIH	Prevalence
2000	808	1092	135	6.75%

Table 4:- Showing MIHdistribution based on gender.

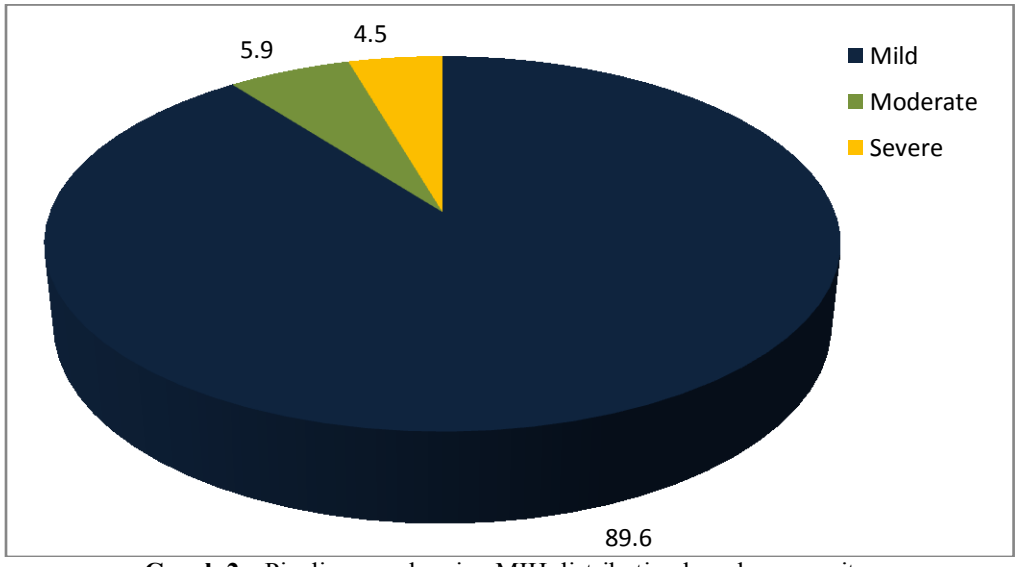
Gender	N	%
Male	77	57.1
Female	58	42.9
Total	135	100



Graph1:- Showing MIHdistribution based on gender.

Table 5:- Showing MIH distribution based on severity.

Severity	N	%
Mild	121	89.6
Moderate	8	5.9
Severe	6	4.5

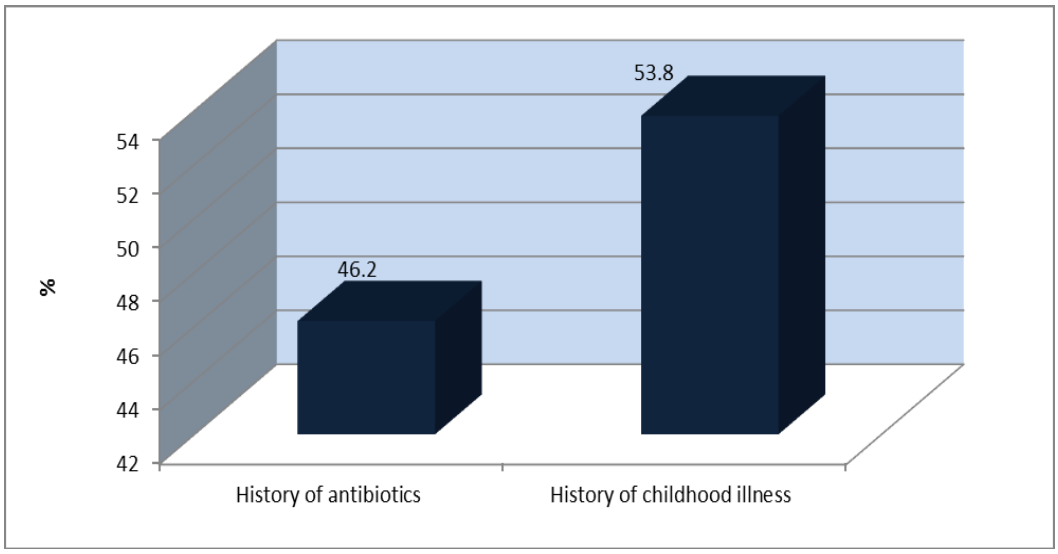


Graph 2:- Pie diagram showing MIH distribution based on severity.

Table 6:-Showingassociation between medical history of patients with MIH.

	n	%	P value
History of antibiotics at the first 3 months of life	48	46.2	0.001**
History of childhood illness (respiratory tract infections)	56	53.8	

($p<0.05$ - Significant*, $p < 0.001$ - Highly significant**); chi square test



Graph 3:- Graph showing distribution based on medical histrory of patients with MIH.

Discussion:-

The prevalence of MIH in this studyis 6.75%. and is slightly less than those reported prevalence in India(8.9%)[17.] The condition seems to have been first recognized in the late 1970s by Swedish dentists working within the Public Dental Services. They reported an increasing number of patients that were presenting with hypomineralisation of the enamel of the incisors and first permanent molars to which they could not assign an aetiology.[16] However, it is possible that it has been unrecognized for considerably longer; Ogden et al. felt that in the past it may have been masked by high caries rates and is only becoming more "visible" because of a reduced caries prevalence. In addition, they pointed out that MIH may turn out to be related to a condition they termed cuspal enamel hypoplasia in "sub-adults" found in the teeth of skulls from a 16th -18th century London graveyard.[22]

Koch et al. investigated the prevalence of idiopathic enamel hypomineralisation in permanent teeth.[11] It is important to note that this was undertaken prior to the definition of MIH [Weerheijm et al., 2001][9], however it is possible to extract approximate prevalence figures for MIH from their data; these were about 3.6% to about 21.5% depending upon the year that the child was born.The highest prevalence found till date is in Brazil of 40.2% in 2009.[17]
The majority of published research studies seem to show that there is no difference in prevalence between the sexes.[24,25] However, other authors do show an increased prevalence amongst girls but fail to state whether this was significant.[18] In this study the condition was found more among males (57.1%) than females (42.9%).

There seems to be agreement in the literature that possible aetiological factors are systemic, indeed the definition byWeerheijm et al. [2001] actually states it.[9] However, recently in a questionnaire to members of the Australian and New Zealand Society of Paediatric Dentistry just over half of the respondents thought that there was a genetic component to MIH [26]. Whatling and Fearne seem to agree that there may be a genetic susceptibility, and suggested that family studies may provide further information. The fact that susceptibility seems to vary from one person to the next even though each may havebeen subjected to the same possible causes could indicate a multi-factorial aetiology. Due to the developmental history of the first permanent molar and maxillary and mandibular anterior teeth, the search for an aetiology has focused around the time of birth and early childhood.[27]

Lygidakis et al. attempted to correlate illness of the child and mother (whilst in late pregnancy) with the development of MIH. They found that 14.5% of cases of MIH were not correlated to any illness, 19.2% had late maternal prenatal problems, 44.3% perinatal problems and 21.8% had neonatal problems. He found that for medical aspects of etiology of MIH 12.2% presented without any relevant medical history, the remaining 87.8% recorded various medical problems associated with MIH, as compared with only 18.9% in a control group of children.[18]

There have been a large number of studies that have attempted to single out a specific etiology for MIH.A review by William et al. stated that although an etiology is not known at this time, children who had poor generalhealth in their first three years of life who were born pretermor were exposed to certain environmental contaminantsmay be at

risk for MIH.[28]All of the studies investigating possible etiology have beenperformed retrospectively; obviously these relied upon individual memory, which can lead to inaccuracies. It has been pointed out that prospective studies starting around birth and extending to the time of eruption of the FPM are needed to help clarify these issues . Bearing in mind the development period for the teeth involved in MIH it has to be suggested that the expectant mother, and her health during pregnancy, would need to be included in the study as a subject. Thus, at this time it is still not possible to give a definitive etiology for MIH.[29]

This study showed that various medical factors may be associated with MIH development**.**The study showed that 46.2% of children had the history of antibioticsusage at the first 3 years of life and 53.8% hada history of childhood illness and 81% had no relevant medical history.The association ofMIH with antibiotics use is somewhat unclear. Because antibiotics are commonly used with upper respiratory infections, it is not possible to confirmwhether the associationwas caused by the disease or the drug.

One limitation of this study was that information wasobtained from parents' questionnaire responses. To obtain more accurate results, the performance ofprospective studies with control groups is essential.Discrepanciesamong studies regarding the possible etiologicalfactors of MIH highlight the importance of conducting furtherresearch on this pathology. Moreover, the early diagnosisof MIH is extremely important to enable the provision ofspecific, minimally invasive protective treatment to preventthe post-eruptive loss of enamel and associated repercussionson oral health and quality of life in schoolchildren.

Conclusion:-

MIH is a common condition that can have far reaching consequences for both the child and the dentist treating them. In this study, 6.75 % of schoolchildren presented with MIH, and medical conditions in the first three years of life were more prevalent in children affected by MIH. The primary etiological factors were history of antibiotics at the first 3 years of life and history of childhood illness.Further research is required to answer a number of important questions. Is MIH increasing? It seems that maybe clinicians are seeing more patients attending dental centers with MIH; this could be a true reflection of the situation or it may be due to the fact that referring dentists are becoming more aware of it and are referring it more. However, more research involving larger populations of children is needed in order to clarify the etiology.

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