





# YouTube™ as a Tool to Teach Dentists about Molar Incisor Hypomineralization (MIH): Analysis of Quality Content

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## ABSTRACT

**Objective:** To evaluate the quality of information about Molar incisor Hypomineralization (MIH) on YouTube™. **Material and Methods:** Only videos in Portuguese aimed at dentists were included. The selected videos were analyzed by two calibrated evaluators, who extracted the information (classification, etiology, diagnosis, and treatment of MIH) and the quality was evaluated through a 20-point-checklist, according to the International Association of Pediatric Dentistry and European Academy of Pediatric Dentistry. Descriptive analysis and statistical tests were applied to assess the association (ANOVA and Kruskal-Wallis) or correlation (Spearman) between the final scores of the videos and their demographics. **Results:** Nineteen videos with  $13.8 \pm 4.76$  mean points were considered eligible. Most of the videos did not report the possible involvement of other groups of teeth ( $n=12$ ), presence of atypical restorations ( $n=8$ ) and hypersensitivity ( $n=7$ ); and the different treatments for MIH were very variable. Twelve videos discussed differential diagnosis and 78.95% possible etiological factors; however, all of them presented clinical images. Data related to the video source and viewer interaction were not related to its quality ( $p>0.05$ ). The number of likes ( $r=0.26$ ), views ( $r=0.34$ ) and video time ( $r=0.58$ ) show a weak and moderate correlation, respectively, with video score. **Conclusion:** Videos on YouTube™ about MIH presented moderate or high quality, with heterogeneous information, and can act as a complementary aid source of information.

**Keywords:** Dental Enamel; Internet Use; Health Education, Dental.

## Introduction

Molar Incisor Hypomineralization (MIH) is defined as a qualitative developmental enamel defect that affects at least one permanent molar and/ or permanent incisor [1]. In addition, this condition has been identified in primary teeth at the second primary second molars and is known as Hypomineralization Second Primary Molar (HSPM) [2]. A study shows that the global prevalence of MIH is approximately 14.2% [3], while in Brazil, this prevalence varies from 2.5% to 40.2% in different regions [4].

MIH is characterized by demarcated opacities, which may vary from white/yellowish to brown [5] with asymmetric both in presence and severity [6]. Another characteristic of MIH is the high porosity of the tooth enamel involved, thus contributing to tooth sensitivity, the development of caries and favoring possible fractures during mastication. Due to the possible consequences, patients with this diagnosis require frequent periodic consultations to favor better control [7].

Although dentists report MIH as routine in their clinical practices, studies have shown that few professionals know how to diagnose this condition correctly and only 16% do so with confidence [8]. Dentists routinely seek knowledge in external courses; however, due to the social isolation imposed by the COVID-19 pandemic, the availability of presential courses has decreased and there has been an increased search for such knowledge on the internet.

YouTube™ is an online platform that can spread knowledge about different subjects, including MIH, in a democratic way. Although there are many channels that can be used for dental education on the YouTube™ platform, the information provided must be peer-reviewed, validated, and based on scientific evidence. Thus, the present study aimed to evaluate the quality of information provided to dentists in videos, in Portuguese, on YouTube™ about MIH.

## Material and Methods

### Search and Selection Criteria

A structured and systematic method was used to search YouTube™ as adopted by other similar studies [9-13]. First, the Google Trends application was used to identify the most searched term on MIH: 'molar incisor hypomineralization'. The search was performed with default settings and a filter of up to 12 months.

Previous studies have suggested that most YouTube™ users scan their first 60 videos several thousand times per day [14]. Therefore, the first 60 videos that appeared on the pages were evaluated for inclusion and exclusion criteria.

The inclusion criteria were i) videos only in Portuguese; ii) videos aimed at dentists that address the classification, etiology, diagnosis and/or treatment of MIH. The exclusion criteria were videos; i) aimed at laypeople, ii) entertainment videos (music and advertisements) and iii) duplicates.

The videos were evaluated by two examiners in December 2021 as to their eligibility. The examiners underwent theoretical training (20-minute class) and calibration for content assessment (inter-examiner kappa = 0.82; Kappa with expert = 0.92 and 0.84). The expert (F.M.F.S) is a PhD and MIH researcher, and previously calibrated for MIH diagnostic. Training and calibration were performed with 20% of the total sample. The videos considered eligible were independently analyzed by the same authors to extract the demographic data from them, including video duration, upload date and source (higher education institution, dentist/clinic YouTube™ page, or company), number of views, likes and dislikes. Any disagreements between examiners on the score were resolved with the help of a third reviewer.

### Quality Assessment of the Videos

Based on the recommendations and guidelines of the International Association of Pediatric Dentistry (IAPD) [15] and the European Academy of Pediatric Dentistry (EAPD) [16], a checklist with 20 parameters and divided into four blocks was created: diagnosis and clinical aspects (3 parameters), severity classification (6 parameters), treatment (8 parameters) and other aspects (2 parameters) (Table 1). Each video was evaluated for its contents, where each parameter received a binary score of 1 (present) or 0 (absent). Considering that 20 parameters were evaluated, the score could range from 0 to 20. Considering the instrument's range of punctuation, we propose the following criteria for classifying the quality of videos about MIH: punctuation 5 very low quality; punctuation between 6 to 10 low quality; punctuation between 11 to 15 moderate quality and punctuation between 16 to 20 high quality. This division was proposed in the attempt of getting an integer value and the same range between classifications.

**Table 1. Parameters evaluated in videos available on YouTube™.**

| Parameters   | Yes | No |
|--|-----|----|
| <b>Diagnosis and Clinical Aspects</b>  |     |    |
| Groups of affected teeth: first permanent molars and/or not incisors   |     |    |
| Report other groups of teeth? (permanent canines or primary second molars)   |     |    |
| Qualitative defect with white/cream or yellow-brown color  |     |    |
| <b>Severity Classification</b>   |     |    |
| <b>Mild</b>  |     |    |
| Only demarcated opacities  |     |    |
| Presence of tooth sensitivity to external stimuli (air and ice water)  |     |    |
| <b>Severe</b>  |     |    |
| Presence of enamel breakdown   |     |    |
| Presence of atypical caries (teeth with MIH)   |     |    |
| Presence of atypical restoration (teeth with MIH)  |     |    |
| Spontaneous tooth sensitivity  |     |    |
| <b>Treatment to MIH</b>  |     |    |
| Hypersensitivity control with sensitivity pastes and/or fluoride varnish.  |     |    |
| Sealing of occlusal surfaces with resin sealant (complete erupted teeth) or glass ionomer (incomplete erupted teeth)         |     |    |
| Severe case on anterior teeth, microabrasion or resin to improve esthetics.  |     |    |
| Cases of mild MIH in anterior teeth, a combination of acid etching, whitening, and sealing of the affected areas.            |     |    |
| Resin and glass ionomer restorations on posterior teeth  |     |    |
| Steel crowns for severe posterior teeth cases  |     |    |
| Extraction when more than one tooth is affected with severe MIH and pain, considering the patient's age (between 8-9 years). |     |    |
| Periodic consultations   |     |    |
| <b>Other points</b>  |     |    |
| Differential diagnosis (fluorosis, opacities, hypoplasia and/or amelogenesis imperfect)                                      |     |    |
| Etiology   |     |    |
| Presence of clinical images  |     |    |

### Statistical Analysis

The views rate was calculated using the following formula: Viewing rate = (number of views/number of days since upload) × 100%.

Data were descriptively reported. The parametric distribution of data was evaluated through the Shapiro-Wilk test. And non-parametric tests to evaluate the association between the video's final score and its source (ANOVA and Kruskal-Wallis), as well as the correlation (Spearman) between the video's final score and

the number of likes, views and time of the video were performed with the Jamovi 1.6.15 software. The significance of 5% ( $p < 0.05$ ) was adopted in all analyses.

## Results

The search on YouTube™ was carried out on November 26, 2021. Among the 60 videos identified, 41 were excluded for the following reasons: for parents of children with MIH or laypeople ( $n=12$ ), about the experience of mothers of MIH patients ( $n=1$ ), a language other than Portuguese ( $n=8$ ), other subjects related to dentistry ( $n=16$ ), subjects not related to dentistry ( $n=3$ ) and hypomineralization in general ( $n=1$ ).

### Demographic Data

The video upload source came from educational institutions ( $n=10$ ), companies related to dentistry ( $n=6$ ) and dental clinics/dentistry professionals ( $n=3$ ). Health professionals provided the content in most videos ( $n=14$ ) and five videos provided the content through undergraduate dentistry students. The purpose of the videos was: online conference or video classes ( $n=8$ ), face-to-face conference filmed and broadcasted online ( $n=2$ ), work presentation ( $n=7$ ) and presentation of clinical cases "live" ( $n=2$ ). Demographic data for the included videos are shown in Table 2.

**Table 2. Demographics data of the videos.**

| Demographics of the Videos | Average (Minimum and Maximum Values) |
|----------------------------|--------------------------------------|
| Number of likes            | 16.5 (0-59)                          |
| Number of dislikes         | 0                                    |
| Visibility                 | 770 (19-6406)                        |
| Post days                  | 523 (17-3197)                        |
| Viewing rate               | 195% (11.2-1487)                     |
| Time in minutes            | 40.7 (2.38-116)                      |
| Final video Score          | 13.8 (3-19)                          |

### Content of the Videos

Regarding diagnosis and clinical aspects, most videos ( $n=12$ ) did not report the possible involvement of other groups of teeth (canines or deciduous second molars) with hypomineralization lesions. Relate to severity classification, the least reported aspects were the presence of atypical restorations and dentin hypersensitivity. A total of 44.44% and 36.84% of the videos ( $n=8$  and  $n=7$ , respectively) did not report on these points.

The YouTube™ videos provided a variable coverage of the different treatments for MIH. Treatment possibilities for cases of mild MIH in anterior teeth were the least discussed aspect ( $n=4$ ), followed by extraction ( $n=11$ ), steel crowns ( $n=12$ ), treatment possibilities for cases of severe MIH in teeth anterior and sealing of occlusal surfaces ( $n=13$ ). The most frequently reported aspects were the control of hypersensitivity and the importance of return appointments ( $n=15$ ).

A total of 63.16% ( $n=12$ ) of the videos discussed the differential diagnoses with other enamel developmental defects; 78.95% ( $n=15$ ) reported on the possible etiological factors and all videos presented clinical images to enable a clearer understanding. Misleading content was not detected. The total number of each question evaluated is shown in Figure 1.

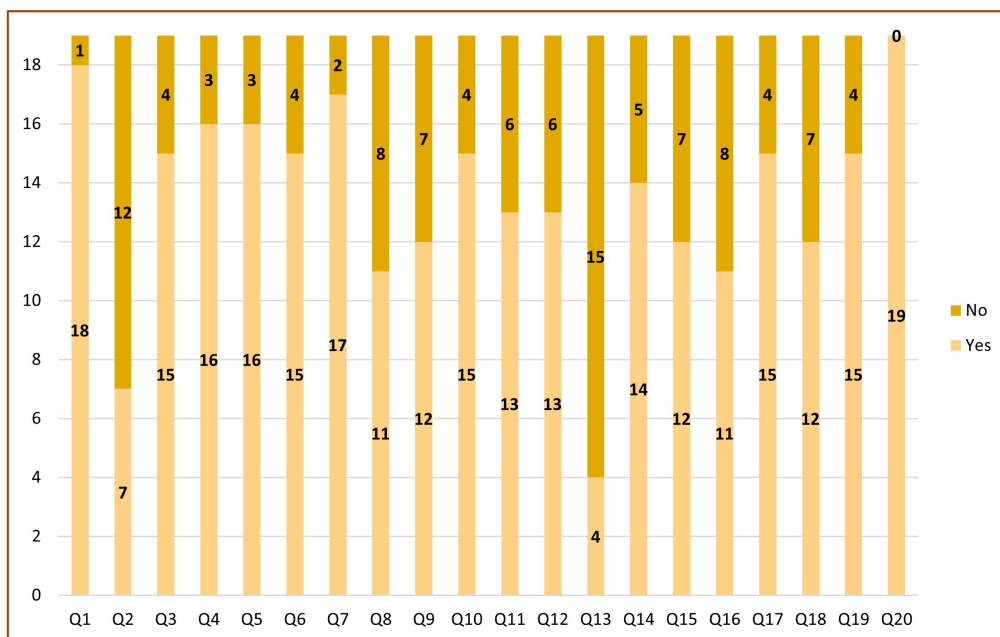


Figure 1. Data was based on the recommendations and guidelines of the International Association of Pediatric Dentistry (IAPD) and the European Academy of Pediatric Dentistry (EAPD). Q1. Groups of affected teeth: first permanent molars and/or not incisors; Q2. Other groups of teeth; Q3. Qualitative defect with white\cream or yellow-brown color; Q4. Only demarcated opacities; Q5. Presence of tooth sensitivity to external stimuli; Q6. Presence of enamel breakdown; Q7. Presence of atypical caries; Q8. Presence of atypical restoration; Q9. Presence of spontaneous tooth sensitivity; Q10. Hypersensitivity control; Q11. Sealing of occlusal surfaces; Q12. Treatment of severe case on anterior teeth with MIH; Q13. Treatment of mild case on anterior teeth with MIH; Q14. Restorations in posterior teeth; Q15. Steel crowns; Q16. Extraction; Q17. Periodic consultations; Q18. Differential diagnosis; Q19. Etiology; Q20. Presence of clinical images.

#### Quality of the Videos

Nine videos were classified as high quality, seven with moderate quality, three with low quality and none with very low quality.

#### Viewer Interaction

Video upload source ( $p=0.19$ ) and video objective ( $p=0.05$ ) are not significantly related to the final score of the video content. On the other hand, the number of likes ( $r_{\text{spearman}}=0.26$ ,  $p=0.32$ ), views ( $r_{\text{spearman}}=0.34$ ,  $p=0.15$ ) and video time ( $r_{\text{spearman}}=0.58$ ,  $p=0.01$ ) show a weak and moderate correlation, respectively, with the score end of the video.

### Discussion

The use of YouTube™ videos for patient education in health promotion has been studied on a variety of topics in dentistry [11,13]. However, as an educational tool for dentists, there is a gap in scientific evidence. Additionally, to date, no study evaluating the information from MIH videos has been conducted. The present study showed that the quality of content related to diagnosis and clinical aspects, classification, and treatment of MIH in videos on YouTube™ range from low to high and is very heterogeneous.

Most of included videos presented moderate and high quality, with scores ranging from 3 to 19. This result disagrees with studies that evaluated YouTube™ videos on other health issues where the content was considered insufficient or had low scores [11,13]. In addition, there have been reports of deceptive content in videos posted on other subjects [11,13]; no deceptive content was detected in the videos on MIH. These

differences may be related to the target audience and the source for uploading the videos, since the videos included in this work were intended for dentists and most came from educational institutions and companies related to dentistry. Probably, there is an evaluation and correction of the content of the videos by professors and researchers in the field before their posting.

The methodology applied in this study evaluated the first videos that appeared on YouTube™, this indicates the relevance ranking applied by the platform and could reflect the true content of the videos. Besides, since most of videos present moderate and high quality, this could not be confirmed.

A previous study that evaluated how dental students from eight Universities (Athens, Birmingham, Brescia, Cardiff, Melbourne, Paris, Sao Paulo and Valdivia) are using online video content showed that 80% of students use YouTube for their learning. Additionally, 54% of these students report a range from 5 to 15 minutes of video duration as the ideal time [17]. So, the teachers should train their synthesis and didactic skills while creating videos aimed at dental professionals. The important information must be previously selected and transmitted in a direct and explanatory way, so that excessively long videos are not created, since these videos can become less attractive to the target population.

Studies on enamel defects report that there is still a great difficulty in diagnosing MIH among dentists [8]. The present study demonstrated that most videos do not present the possible involvement of other groups of teeth affected by MIH. This can be due to the low quality of the videos and the higher prevalence of MIH in molars and permanent incisors [5,18].

Furthermore, atypical restorations related to the diagnosis of MIH were addressed in very few videos. In restorations related to MIH, the size and shape of the restorations were not in accordance with the usual picture of caries. In most cases, in posterior teeth, restoration will extend to the smooth buccal or palatal surfaces and affected residual enamel may be visible on the margins. In anterior teeth, vestibular restoration is not related to trauma and is frequently observed in patients without caries [19]. It is important that professionals know how to differentiate the etiology of restorations for the correct diagnosis of the patient's condition.

The treatment for cases of mild MIH (demarcated opacities with cream\yellow coloration without structural damage) in anterior teeth was the least discussed aspect in the videos. However, the literature shows that defects in enamel development cause a negative impact on the perception of affected individuals and their parents [20,21]. In addition, these changes may have a negative perception in relation to social judgment [22]. Thus, a broader approach is important when dealing with treatment of anterior teeth [8].

Brazil, in recent decades, has adopted a more conservative philosophy (minimally invasive dentistry), where tooth extraction is considered one of the last treatment options [23] and should be avoided whenever possible, as has been reported in YouTube™ videos. This philosophy is used in other countries since extraction followed by orthodontic alignment of the second and third molars is more cost-effective compared to restoration with composite resin or metallic crowns [24]. However, this management should be considered with caution since recent research has shown that the presence of severe defects in the first permanent molars (indicative of extraction by some institutions) was associated with enamel defects in the second permanent molars [25-27].

Most of the videos included showed the etiological factors of MIH. This point is important for a better understanding by professionals, especially during the patient's anamnesis. Among the possible causes of MIH are health complications in periods of mineralization of incisors and permanent first molars, which begins at the end of pregnancy and lasts through the first four years of the child's life [1,2]. These complications can include prematurity and/or low birth weight, some so-called childhood illnesses (such as chickenpox) and episodes of fever [1].



All videos presented clinical images to give the target audience a clearer picture of MIH. According to Barbosa et al. [28], photographic memory is an important factor in education and in the development of skills as of elementary school. Ramos [29] complements those congruent multisensory stimuli to improve learning based on the basic principles of education, which are based on Neuroscience (Brain-Based Learning). Thus, the use of stimuli, including visual stimuli, not only arouses interest and curiosity, but can help the learner retain the content better.





The IAPD and the EAPD council developed consensus recommendations and/or guidelines with the aim of being an updated tool and guide for clinical practice in pediatric dentistry, enabling excellent care, based on scientific evidence, for children worldwide [15,16]. The present study considered these recommendations to determine the quality of information present in the available videos. The 20-points parameters considered in the present study were composed by 4 blocks (3 questions related to diagnostic, 6 to classification, 8 to treatment and 3 to other aspects). So, it is important to highlight that the video could present accurate information in one, two or three blocks, but not for all guidelines recommendations. Viewers need to direct the video approach before and during their selection/visualization in order to powerful this video free tool with a vast amount of information, but that must be used critically so that the experience can be optimized.

The dynamism resulting from the constant upload and deletion of YouTube™ videos can be considered a limitation of the present study, as results depend on the time and date. Future studies may consider a longitudinal approach, considering YouTube™ as a source of education about HMI for health professionals. Although the authors of the present review included only videos for dentists, it is important to point out that YouTube™ is an open platform and the videos could be viewed and judged by any audience (dentists and not dentists). So, engagement of videos could not be calculated and the likes should be interpreted with caution.

## Conclusion

Based on the analysis and the results obtained, the authors concluded that the content presented in the videos on MIH aimed at healthcare professionals is very heterogeneous, with moderate and high quality. However, most videos have some miss important information. In addition, data related to the video's source and viewer interaction were not related to its quality.

## Authors' Contributions

|      |   |   |   |
|------|---|---|---|
| DFS  |  | <a href="https://orcid.org/0000-0002-2359-7802">https://orcid.org/0000-0002-2359-7802</a> | Conceptualization, Formal Analysis, Data Curation and Writing - Original Draft.   |
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| MBM  |  | <a href="https://orcid.org/0000-0003-3618-190X">https://orcid.org/0000-0003-3618-190X</a> | Conceptualization, Methodology, Formal Analysis, Data Curation, Writing - Review and Editing, Supervision and Project Administration. |

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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## Conflict of Interest

The authors declare no conflicts of interest.

## Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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