



General dentists' perceptions and clinical management of hypomineralised second primary molars (HSPM) in Ireland

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Abstract

Purpose This questionnaire aimed to explore how general dentists in the Republic of Ireland perceive and manage hypomineralised second primary molars (HSPM).

Methods Following ethical approval, a validated structured questionnaire containing 19 questions was sent to Irish dentists using Survey Monkey. Questions on awareness, dentist's experience, barriers to care and clinical scenarios with different treatment options were included. Binary outcomes and independent variables were compared using logistic regression analysis ($\alpha=5\%$).

Results Responses from 279 general dentists were analysed. The majority of dentists were aware of HSPM (72%) and most dentists felt confident in diagnosing HSPM (71%). Dentists who had practiced for ≥ 15 years were significantly more likely to document HSPM frequently compared to those with less experience (OR 0.29; $p=0.012$). No significant association was found between confidence in HSPM diagnosis and other variables, such as age group, years of practice and workplace. Dentists not working in private practice reported to be less comfortable in the management of HSPM (OR 0.49; $p=0.030$). The most cited barrier to management of HSPM was child's behaviour. A broad variation was observed in the clinical scenarios, in particular when treatment planning more severe HSPM.

Conclusions In general, Irish dentists are aware of HSPM and are confident in diagnosis and management. Variation existed in treatment options reflecting the disparity that exists in clinical management.

Keywords Hypomineralised second primary molars · Awareness · Management · Treatment

Introduction

HSPM is defined as hypomineralisation affecting between one and four second primary molars (SPM), including the presence of demarcated opacities, post-eruptive breakdown (PEB), atypical caries/restorations, and extractions due to HSPM (Elfrink et al. 2008; Ghanim et al. 2013). Several surveys have been published regarding dentists' perception and clinical management of Molar Incisor Hypomineralisation (MIH) (Ghanim et al. 2011; Alanzi et al. 2018; Wall and Leith 2020). There is a lack of information related to dentist's knowledge and perception of HSPM. The majority of studies have addressed the prevalence and aetiology

of HSPM with little emphasis on how clinicians perceive and manage the condition. This is unfortunate as the detection and awareness of HSPM is related to its recognition by dental practitioners. Determination of how Irish dentists currently perceive and manage HSPM may be of benefit in identifying gaps in knowledge, possibly indicating a need for further training and continued professional development (CPD), and also understanding the clinical challenges that exist.

The aim of the present study was to explore how general dentists in the Republic of Ireland perceive and manage HSPM.

Materials and methods

This was a cross-sectional questionnaire-based study. Ethical approval was granted by the Research Ethics Committee at the Dublin Dental University Hospital.

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The questionnaire was formulated based on previous questionnaires (Wall and Leith 2020; Gambetta-Tessini et al. 2016; Kopperud et al. 2016; Alanzi et al. 2018) and modified to determine HSPM awareness/clinical management and comprised three sections (Appendix 1). The survey was distributed online using Survey monkey® as the host and remained open for 4 weeks.

The first section focused on participant characteristics, including participants age, duration of practicing dentistry, place of work and area of practice. The second section addressed the areas of HSPM awareness, perceived prevalence, frequency of noticing the defect, confidence in diagnosis and preferred restorative material choices. The third section focused on the clinical management of teeth affected by HSPM and also participants awareness of HSPM as a predictor of MIH. Clinical photographs of HSPM affected teeth were provided with a short description, including information on the child's age, behaviour, clinical and radiographic details. The participants were asked what treatment they would provide with a list of available options. The questionnaire was piloted to ensure validity and reliability prior to distribution with five general dentists with backgrounds in private dental practice and community dentistry invited to participate. Questions were categorised according to six key areas: readability, clarity, layout, sequence, relevance/representativeness and appropriateness.

A link to the questionnaire was emailed to members of the Irish Dental Association following a paediatric dentistry online webinar. In addition, Principal Dental Surgeons (Health Service Executive) were contacted and a request was made to distribute the survey to their employees in the public dental sector. Survey monkey software was used to automatically collate survey responses. Data were exported from Survey monkey to an excel spreadsheet and re-organised before exporting to SPSS (IBM SPSS Statistics Version 26) for statistical analysis. Missing data (where participants did not provide an answer) were accounted for on SPSS in the missing values section of the variable data view. The total number and percentages were calculated for each categorical variable. Following this, certain dependant variables (confidence, perceived frequency) and independent variables (age, years of practice and place of work) were collapsed into smaller categories to facilitate logistic regression analysis. Binary logistic regression models including univariate and adjusted analysis were performed to determine if any association existed between the dependant variables (HSPM awareness, confidence in diagnosis, comfort in management, perceived frequency and awareness of HSPM as predictor for MIH) and the independent variables (age, years of practice and place of work) ($\alpha = 5\%$).

Results

The total number of respondents was 356; of which 66 were specialists from different disciplines (including 17 paediatric dental specialists). These 66 specialists were excluded from the main analysis and eleven of the returned surveys were incomplete, leaving a final figure of 279 responses for analysis. This sample represented general dental practitioners.

In 8 of the questions (12–19) there were missed answers. While survey settings were set, so that all questions required an answer, in some instances, participants exited the questionnaire prematurely resulting in a partially completed survey being submitted. The answered components of each submission remained included and missing values were accounted for in the statistical analysis.

According to the Dental Council of Ireland, there are an estimated 2100 dentists practicing in the Republic of Ireland. Using this as a total figure, the response rate was estimated as 17% (356 dentists out of an estimated total of 2100 email recipients). Regarding age, the majority of the sample were aged between 36 and 45 years (26%) and between 46 and 55 years (26%). The third largest group were aged between 26 and 35 years (24%). 16% of the sample were aged over 55 and 8% were less than 25 years. Most respondents (43%) had more than 20 year experience in dentistry; this was followed by 16% who had between 5 and 10 year experience. The remaining categories (<5 years, 10–15 years, 15–20 years) were evenly dispersed; 14%, 14% and 13%, respectively. Of the 279 general dentists that completed the survey, 188 worked in private practice (67%). The remaining 91 respondents represented those working in the public sector, university, and a combination of private practice/public sector/university.

Most dentists (72%) reported that they were aware of HSPM as a condition. Regarding the frequency of noticing the condition, 37% of participants reported that they observed HSPM on a yearly basis, while 28% observed it monthly and 10% weekly. 3% reported never seeing the condition, and 15% answered they were not sure regards its frequency.

A similar number of participants believed the prevalence of HSPM to be between 5% and 10% (36%) and <5% (33%). A higher prevalence (between 10% and 20%) was noted by 17% of the sample. A small percentage (3%) believed the prevalence to be greater than 20%, while 11% of participants were unsure regarding HSPM prevalence in their community.

Yellow/brown demarcated opacities were noted most frequently by 53% of participants, followed by PEB with associated demarcated opacities (24%) and white demarcated opacities (23%).

A majority of dentists (71%) either felt extremely or very confident in diagnosis of HSPM. In contrast, 28% felt unconfident in diagnosis with only 1% very unconfident. Most of the participants (96%) recognised the difference between atypical caries associated with HSPM and the classical caries pattern. When asked about commonly used materials in the treatment of HSPM affected teeth (multiple responses allowed), the most common response was conventional glass ionomer (GI) (55%) followed closely by resin modified glass ionomer (RMGI) (41%). Composite resin (29%) and preformed crowns (30%) represented the next most frequent material choices.

Respondents assessed five case scenarios with associated questions on clinical management. Multiple options were available for selection in each scenario. Case scenario A (Questions 12–14) described a 5 year child with hypomineralisation and PEB of all SPMs (Fig. 1). Participants were



Fig. 1 Case A representing a 5-year-old child with hypomineralisation and PEB of all SPMs (all SPMs are asymptomatic, radiographic findings are normal and the child is very cooperative)

asked would they be comfortable providing care for this case with the majority responding yes (75%). For those who responded as not being comfortable, 92% said they would refer to a paediatric specialist.

When asked regarding barriers to care (where multiple answers were allowed), the majority (84%) indicated the child's behaviour as a barrier to clinical management, followed by young age (41%). Less commonly reported reasons included repeated failure of restorations (33%), dental treatment that needs a long time to be accomplished (20%), insufficient training to treat children with this condition (24%) and difficulty deciding how to restore teeth/what materials to use (15%) (Table 1).

Case scenario B asked participants what treatment they would provide for a hypomineralised, caries free SPM with demarcated opacities. This case involved a 5-year-old child with good oral hygiene and co-operation. The most popular choices were non-operative approaches, including fluoride varnish application (56%) and GI fissure sealant (40%) (Fig. 2).

Case scenario C asked participants what treatment they would provide for a hypomineralised, asymptomatic SPM with PEB and atypical caries. The child was 5 years with good cooperation and hygiene. The most popular choices included placement of a Stainless Steel Crown (SSC) using the Hall Technique (45%) and restoring with GI (38%) (Fig. 3).

Case scenario D (question 17) asked participants what treatment they would provide for a caries free, hypomineralised SPM with PEB. The child was 8 years with good oral hygiene and cooperation. The most popular treatments were fluoride varnish (55%) and no treatment with preventive advice (28%) (Fig. 4).

Case Scenario E (question 18) asked participants what treatment they would provide for a hypomineralised SPM with PEB and atypical caries (Fig. 5). The tooth was described as asymptomatic with no signs of clinical/radiographic infection. In terms of restorative treatment, 41% of participants selected the Hall technique as a suitable treatment option which was followed by GI restoration (26%), composite restoration (12%) and conventional SSC (11%).

Table 1 Reported barriers in managing HSPM (Case A)

Barriers	No	%
Young age	103	41.03
Child's behavior	210	83.67
Dental treatment that needs long time to be accomplished	51	20.32
Difficulty deciding how to restore teeth and what materials to use	38	15.14
Repeated failure of restorations	84	33.47
Insufficient training to treat children with this condition	60	23.90
Other	20	7.97

n = 251; 28 not answered. Multiple options can be selected

Fig. 2 Treatment options selected for case B

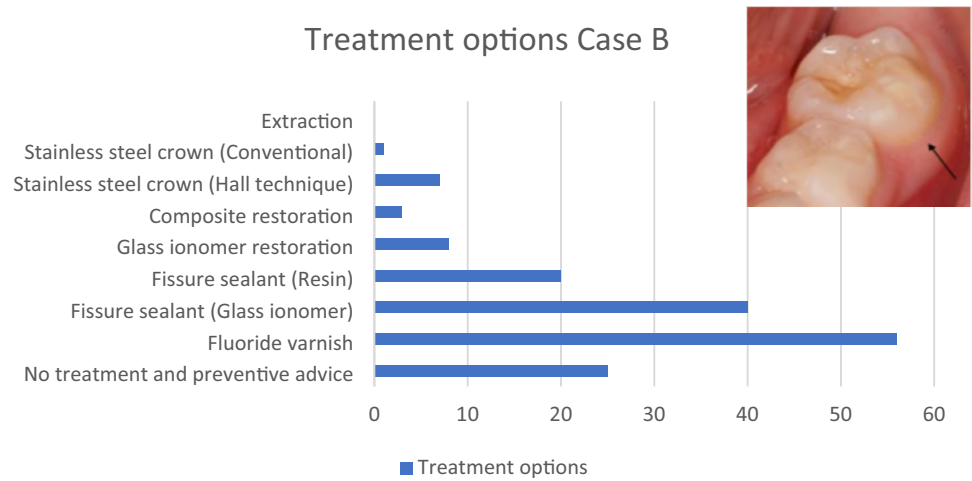


Fig. 3 Treatment options selected for case C

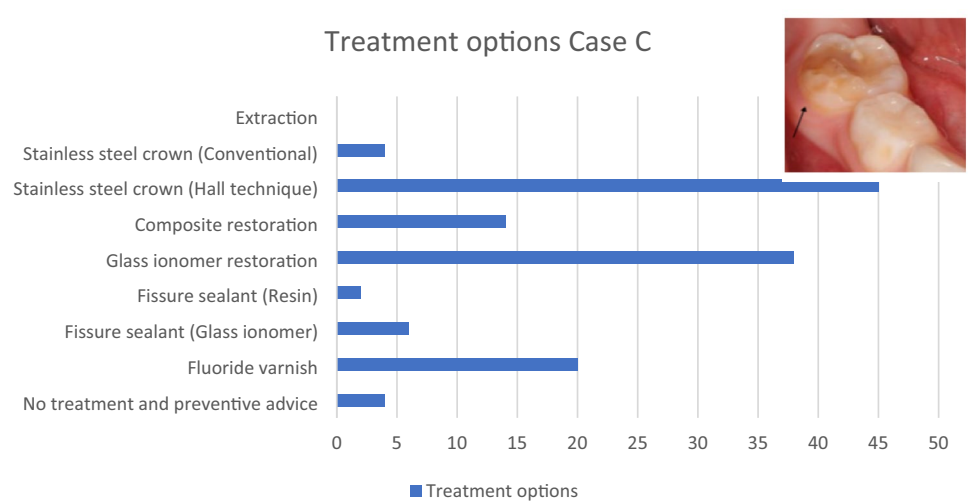


Fig. 4 Treatment options selected for case D

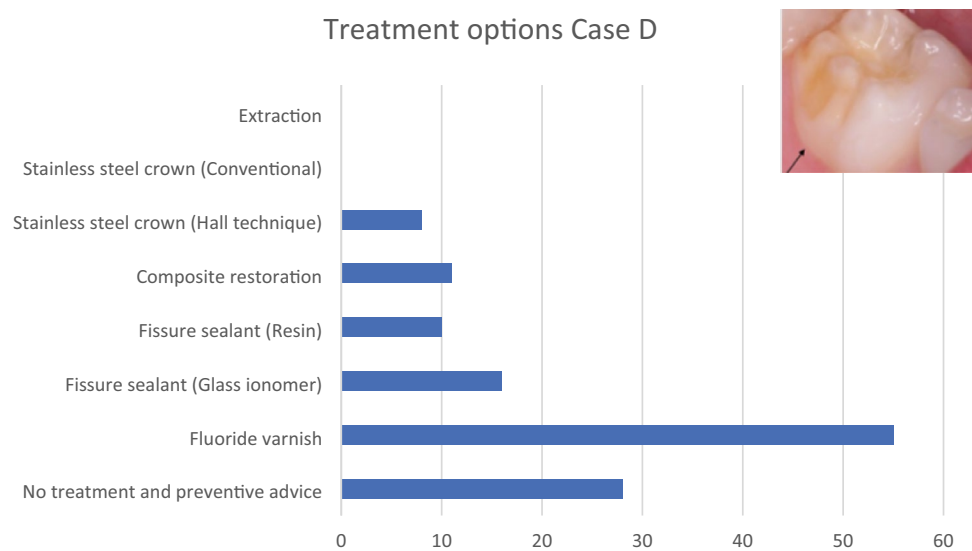
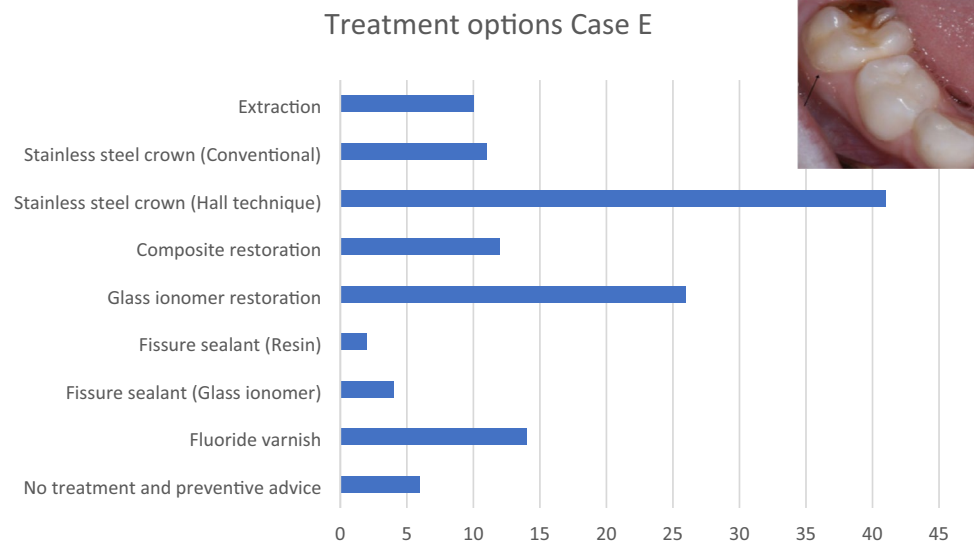


Fig. 5 Treatment options selected for case E



No statistically significant relationship was found between awareness of HSPM and participants age, years of practice or place work ($p \geq 0.05$). Binary logistic regression was also performed to determine if any association existed between participant's confidence in HSPM diagnosis and independent variables. Confidence outcomes were collapsed down into two categories: very and extremely confident (reference group) and unconfident/very unconfident. Following univariate and adjusted analysis no significant association was found to exist. A statistically significant relationship was found to exist between years of practice and perceived frequency. Those practicing for between 5 and 15 years were less likely to note frequent HSPM compared to those practicing for greater than 15 years ($p = 0.012$). No significant association was found to exist in the areas of age and place of work.

The relationship between comfort/competency in HSPM management and independent variables was also explored. A statistically significant relationship was found to exist between place of work and competency with those not working in private practice less comfortable in managing HSPM compared to those working in private practice exclusively ($p = 0.030$).

Only 58% of respondents were aware of the predictive value of HSPM for MIH development. The relationship between independent variables and awareness of HSPM as a predictor of MIH was assessed. In the univariate analysis, a statistically significant relationship was found to exist between all independent variables (age, years in practice and place of work). However, after bringing forward these variables for adjusted analysis, years of practice and place of work only remained significant. Those working for < 5 years were less likely to have awareness on the predictive nature of HSPM for MIH ($p = 0.030$) compared to those working

for ≥ 15 years. Furthermore, those whose workplace was not exclusive to private practice were less likely to have awareness compared to those who worked exclusively in private practice ($p = 0.006$).

Discussion

This questionnaire only included general dentists. The inclusion of 17 paediatric dentists may have introduced bias as patients with HSPM are often referred to specialist practice and may present with a more severe form of the defect (Crombie et al. 2008). In addition, we wished to gain an understanding of the viewpoint of general dental practitioners whose treatment approach may differ when compared to paediatric specialists and other specialties.

The response rate was 17% and this is comparable when one looks at other MIH and HSPM perception studies (Ghanim et al. 2011; Alanzi et al. 2018; Meer et al. 2020; Wall and Leith 2020).

Most general dentists (72%) were aware of the condition HSPM with other independent variables having no influence. This was comparable to the findings by Meer et al. (2020), where 60% of participants reported encountering HSPM defects (Meer et al. 2020). Dentists with ≥ 15 years of experience were significantly more likely to report detecting HSPM. This is an interesting finding as HSPM was not defined during the undergraduate training of this cohort. However, a greater number of years of experience and engagement with CPD may influence their familiarity with the clinical presentation of HSPM.

Respondents who had less than 5 years of experience were less likely to have awareness that HSPM was predictive for MIH when compared to those with ≥ 15 years of

experience ($p=0.030$). This finding is surprising as one may have assumed that those more recently graduated would be more up to date in this emerging area. This study did not evaluate the actual prevalence of HSPM but the perceived prevalence by general dentists. Interestingly, the findings (5–10%) were similar to a recent systematic review and meta-analysis, where a global HSPM child prevalence of 6.8% was reported (McCarra et al. 2022).

Most respondents reported they would be comfortable providing restorative care (75%) with those working exclusively in private practice most comfortable in HSPM management when compared to other practitioners ($p=0.03$). This may be because private practitioners are not as constrained by resources in the same way as the public sector in Ireland is.

It was a welcome finding that the vast majority of dentists (96%) recognised that the caries pattern caused by HSPM is different from the classical caries pattern. This is in agreement with another Irish study, where 98% of respondents acknowledged the difference between MIH breakdown resulting in atypical caries and conventional caries (Wall and Leith 2020). There is a lack of evidence when it comes to dental material survival in HSPM-affected teeth, and therefore, no definitive recommendations can be made. It was, therefore, not surprising that a great disparity was reported amongst the material selection and treatment options. GI/RMGI was a popular choice perhaps due to its quick application and ease of use (Chisini et al. 2018). A recent study reported that the use of SSCs was lower for HSPM management (11%) (Meer et al. 2020). Surprisingly, 30% of respondents selected SSCs (conventional and Hall technique) as a commonly used material which differs to the anecdotal evidence that SSCs are vastly underused by general dentists. (McKnight-Hanes et al. 1991; Tran and Messer 2003).

The main barriers to care were the child's behaviour and young age. This is not surprising considering the clinical scenario involved a very young child. In addition, dental treatment that needed a long time to be accomplished was also reported by several respondents (20.32%) which may also be related to behavioural factors. Almost a quarter of respondents reported insufficient training to treat children as a barrier. This finding highlights a need for clear management guidelines and CPD, including hands-on, practical training in HSPM management.

Across the clinical scenarios, there was a broad disparity in the general management of HSPM but less variation was seen in the management of milder cases (Cases B and D). This is not surprising as milder cases require less invasive treatment and behaviour support than more severe presentations (Cases C and E). For example, responses in case E varied from 'tooth extraction' to 'no treatment and 'preventive advice only', and also included every other treatment option

in the spectrum (fissure sealants, restorations and crowns). Again, this highlights the need for further clinical studies for treatment of severe HSPM, so that more standardised recommendations for treatment can be made.

The use of SSC using the Hall technique was the most frequently selected treatment option for severe HSPM (Case C and E). On a national level, online webinars and publications discussing the Hall technique have increased recently which may have led to more dentists being aware of this approach. As discussed, difficult behaviour and young age were the most commonly selected barriers to care, and therefore, the Hall technique may provide a suitable alternative to the more traditional treatments often requiring local anaesthetic and tooth preparation (Nazzal and Duggal 2019).

There are some limitations in the present study, including the self-reported nature of the questionnaire may have resulted in a degree of response bias impacting the validity of these results. Respondents may have wished to provide academically desirable answers and, therefore, may not have answered honestly. For example, in the clinical scenario questions, respondents may have chosen what they perceived to be best practice management instead of what they would actually carry out in everyday circumstances. Another example would be in relation to the awareness results that hypomineralised SPMs may be predictive of MIH in the first permanent molar. The way in which the question was formulated may have led to potential response bias. Furthermore, as with any survey, the most interested clinicians who engage with CPD are more likely to participate also leading to potential response bias. The true results for general dentists across Ireland may be different from the results found in this study.

This paper shows how general dentists in Ireland perceive and manage HSPM and a broad variation in the results was identified. This disparity was most apparent in relation to treatment approaches. Development of evidence-based treatment guidelines for HSPM would help dentists in their clinical decision making and provide clarity in what can be a challenging part of everyday practice.

Conclusions

HSPM is well-recognised by general dentists in the Republic of Ireland with a high level of awareness and confidence in diagnosis reported. Variation existed in the clinical management of HSPM which is reflective of the lack of clinical guidelines. Dentists should take into consideration the broad range of HSPM presentations and the individual patient needs when managing children with HSPM.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40368-023-00840-z>.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Ethical approval for the survey/questionnaire was sought and approved by the Dublin Dental University Hospital ethical committee.

Informed consent Participation was voluntary and anonymous.

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