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Use of Pediatric Non-pharmacological Behavior Management Techniques and Related Factors among Sri Lankan Seventh Semester Dental Undergraduates: A Cross-sectional Pilot Study

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ABSTRACT

Objectives: This study aimed to explore the use of pediatric non-pharmacological behavior management techniques (NPBMT) among Sri Lankan seventh semester dental undergraduates, with gender and treatment type comparisons.

Materials and Methods: A descriptive, cross-sectional pilot study was conducted among seventh semester dental undergraduates. Data was collected using a self-administered questionnaire and 48 completed questionnaires were analyzed. Data entry and analysis were conducted using IBM SPSS-26 statistical software package. Frequency distributions were presented and comparisons were made using Fisher's exact test.

Results: The majority (75.0%) of seventh semester dental undergraduates used NPBMT. 'Tell-show-do' technique (41.7%), followed by distraction with questioning and storytelling (16.7%) reported to be the most used whilst distraction by a 'video-clip' was less used (2.1%). Child's past dental experience and language of communication were identified as barriers for effective practice of NPBMT. Significant differences could not be detected in NPBMT use by gender of the dental undergraduate ($p = 0.917$), gender of the pediatric patient ($p = 0.283$) and the type of dental treatment ($p=0.721$).

Conclusions: Sri Lankan dental undergraduates practiced simple communication based NPBMT for diverse pediatric dental treatments. Given the small sample size, this pilot study could not detect differences in NPBMT use by gender and treatment type, necessitating future research with larger sample sizes. Nevertheless, our findings indicate the potential of communication based NPBMT amidst language barriers in making first-visit, pediatric patients cooperative for receiving dental treatment.

Keywords: Non-pharmacological behavior management techniques, Dental undergraduates, Pediatric dentistry, Communication, tell-show-do.

1. Introduction

According to the American Academy of Pediatric Dentistry (AAPD), behavior management techniques (BMTs) denote continuum of behavior guidance/management interaction between a child, child's family, and a health care professional in a clinical setting when striving to achieve safe and effective oral health education and dental treatment (1). Children

demonstrate a broad range of physical, intellectual, emotional and social attributes accompanied by a diverse range of attitudes and temperament (2). The anxiety and cooperation in dental clinics for receiving dental treatment heavily relies on temperament and certain related factors, such as sociability of children (3). Therefore, providing pediatric dental treatment is centered around understanding and managing behaviors of children and not solely clinical skills in dentistry. Successful pediatric dental treatment requires BMT tailored to each specific child and his/her family. This ensures that the child's dental experience is positive for the child, parents and dentist (1). Providing safe, efficient and quality dental treatment by successful implementation of BMT fosters nurturing positive dental attitudes and good oral health among children (1-3). Theoretical, didactic and clinical training in applications of non-pharmacological BMT with empathy for anxious pediatric dental patients has become pivotal in dental undergraduate training (4-7). Thus, the AAPD has endorsed an increased focus to BMT during the entire duration of dental education (1). Dental anxiety and fear manifested as uncooperative behavior for dental treatment garnered recognition as a crucial concern in pediatric dentistry (3). This is a vicious cycle, as uncooperative behavior results in a negative experience during treatment. This in turn reduces dental visits, which subsequently increases the dental treatment needs.

BMT training and investigating applications of and perceptions on BMT among dental undergraduates allows molding the attitudes and skills of future dentists in managing uncooperative children (6,7). Transformation of the dental education should embrace patient centered care and perceptions of parents as primary caregivers of children need consideration in using BMT in different socio-cultural contexts (8). Positive reinforcement, music or video distraction, use of euphemism, tell-show-do, stimulating child's imagination, providing an exact explanation, allowing the child to stop treatment, rewarding, modelling, voice control by the dentist, and distraction are among the commonly used, safe BMT (1,8). There is evidence to speculate that acceptance of BMT varied by racial, ethnic and cultural background (9,10). Therefore, integrating cultural competence underpinned by parental preferences into practice can enhance communication, improve patient compliance, and promote equitable care (9,10). Thus, undergraduate training modules in pediatric dentistry should prioritize culturally accepted BMT in different socio-cultural contexts.

Early Childhood Caries is the most common chronic childhood disease in lower-middle-income countries (LMICs) like Sri Lanka gripped by health resource constraints (11). Extractions under general anesthesia is the most common hospital admission for children aged 6-10 years even in high-income countries (HICs) like UK (12). Dental treatments under N_2O-O_2 inhalation sedation in pediatric dentistry offers a safe method used for patients with dental anxiety (13). Nevertheless, such treatment options are not widely available in LMICs due to financial constraints. Against this backdrop, BMT is the primary strategy to provide clinical preventive dentistry and an array of pediatric dental treatment for dentally anxious children aimed at preventing premature loss of deciduous teeth and improved oral health related quality of life (11). Compared to pharmacological BMT, such as general anesthesia, inhalation sedation… etc., non pharmacological behavior management techniques (NPBMTs) are safe, cost effective and less resource intensive for health care systems and countries gripped by resource constraints. Furthermore, the training of dental students and dentists in NPBMT is far easier and inexpensive for the state.

Studies have explored the effect of dental education on perceptions of dental undergraduates on BMT in pediatric dentistry. Sotto et al. (2008) evaluated the effect of a dental education component on dental students' perceptions toward BMT in pediatric dentistry among a sample of 73 first-year dental students (14). As emerged from the findings, acceptability for aversive behavior guidance (voice control, hand over mouth, and immobilization), sedation, general anesthesia, and modelling were significantly increased after the course. In contrast, acceptability for mentioning the possibility of pain during treatment and with a parent being in the clinic or talking with the child during treatment significantly reduced (14). The same study also found female students, those who were married, those who had previous dental treatment and having a dentist in the family indicated significant changes in empathy for children (14). Another longitudinal study was conducted among 78 fourth year Saudi Arabian dental undergraduates (6). This study reported significantly higher acceptance for reinforcement and desensitizing techniques and the lowest acceptance for aversive and communicative techniques prior to the course (6). This

finding was reversed after the course as statistically significant increases were found in the acceptability of aversive techniques (voice control and hand-over-mouth), all pharmacological techniques, and modelling. Gender based preferences in BMT was evident in the same study. Accordingly, immobilization using a papoose board, modelling, the presence of parents during the child's treatment, and most communicative techniques were rated as significantly more acceptable by male students than female students (6). A similar study conducted among year 1-5, 336 Malaysian dental undergraduates revealed significantly higher acceptance of reinforcement techniques (eg., positive reinforcement, encouraging child "not to be a "coward", promising a toy) and desensitization methods (tell-show-do, music/video distraction, stimulating the child's imagination, using euphemism), compared to aversive interventions (hand over mouth, using Papoose Board, active immobilization) and showing needles (7).

Despite the increased interest in pediatric dentistry research concentrated to high-income countries, such as the USA, UK and Australia, there are comparative limited research on NPBMT from middle-income and low-income countries (15). Not surprisingly, aligning with this trend, there is limited research on NPBMT practiced in Sri Lankan context (11), and no previous assessments on perceptions and preferable practices of dental undergraduates. These information gaps provided the rationale for the present pilot study. This study was aimed to explore preferable practices of pediatric NPBMT among a cohort of Sri Lankan seventh semester dental undergraduates in pediatric dentistry clinical rotation and to assess whether the practices were associated with gender of the dental undergraduate, pediatric patient and type of treatment.

2. Materials and Methods

2.1 Study Design, Setting and Eligibility Criteria

The study design was cross-sectional descriptive and the study setting was the Division of Pedodontics, Faculty of Dental Ssciences, University of Peradeniya, Sri Lanka which is the oldest and premier dental school among two dental schools in the country (16). Seventh semester dental undergraduates were selected as their curriculum required them to perform a variety of pediatric dental treatments during their clinical rotation. Therefore, the inclusion criteria for the dental undergraduates comprised seventh semester of the training, in final 2-4 days of pediatric dentistry rotation. This choice was made deliberately due to the active involvement of seventh semester dental undergraduates in providing diverse pediatric dental treatment with relatively higher clinical exposure compared to dental undergraduates in other semesters. The inclusion criteria for the pediatric patients specified pediatric patients aged 5 to 8 years who visited the above dental clinic for the first time. Selection of the given age group of children was governed by the unique developmental stage of secondary socialization that they were underpinned by interactions with school teachers and peers which deemed more formal than family-centered personal interactions. Therefore, it seemed interesting to explore how those children respond to NPBMT. First-visit pediatric patients were selected, as the levels of dental anxiety is higher among them compared to their counterparts who came for subsequent visits. Similarly, children with special health care needs were excluded, as they are often managed by qualified dental surgeons under general anesthesia (17).

Ethical approval for the study was obtained from the Ethics Review Committee of the Faculty of Dental Ssciences, University of Peradeniya. Administrative approval was obtained from the Dean of the Faculty and the Head of the Division. Written informed consent was obtained from participating dental undergraduates and parents of children. Parental information sheet and consent form were translated into Sinhala and Tamil versions from the original English version by bilingual experts with backward translation. Initially, two bilingual experts and translators, who were experts in pediatric dentistry, translated the original English version to Sinhala language. A third bilingual expert compared the two versions, and a consensus version was reached. The participant information sheets provided contained descriptions of commonly used non-pharmacological BMT with relevant photographs. The study participants were informed that they had the right to withdraw from the study without any negative consequences. Given the small identifiable cohort of study participants, the anonymity of self-administered questionnaire was maintained by not collecting personal data on name and student identification numbers. Questionnaires were kept under lock and key and were accessible only for the investigators.

2.2 Study Sample

Despite being a cross-sectional descriptive study, *a*

priori-sample size calculation was not performed, as this was a pilot study conducted among 69 seventh semester dental undergraduates, engaged in last 2-3 days of pediatric dentistry clinical rotation. As this was conducted as a pilot study targeted to seventh semester dental undergraduates in near completion of the pediatric dentistry clinical appointment, *a priori* sample size calculation was not possible.

2.3 Data Collection and Analysis

The data collection instruments comprised a structured, self-administered, pre-tested questionnaire to the dental undergraduates. The dental undergraduate questionnaire was in English. It contained information on basic socio-demographic information (age, gender, semester) of the dental undergraduate, age and gender of the child treated, the type of pediatric dental treatment provided (preventive, curative, invasive), use of non-pharmacological BMT and if used the preferable type of BMT among a list (tell-show-do, positive reinforcement, modelling using a cooperative child, stop signaling, distraction methods: video clip and storytelling/asking questions and its effectiveness in managing the child. An open-ended question was left as any other method used. The perceived barriers for application of non-pharmacological BMT were assessed on a list as language barrier, cultural barriers, lack of parental cooperation, time constraints, confusion with most appropriate BMT, past dental experience of the child, unwillingness of parents to get treatment for their child from dental undergraduates and structural constraints, such as lack of dental material, equipment and assistance. Further, age and gender of the pediatric patient were obtained from the clinical history record.

The dental undergraduate questionnaire was pre-tested among 10 eighth-semester students of 2016/2017 academic batch who were not in the study population. Necessary modifications were made thereafter to the questionnaire to improve its clarity and coherence.

The participating dental undergraduates were informed about the purpose of the study. The participant information sheet and consent form were distributed before commencing pediatric dental treatment. The self-administered questionnaire with detailed description of BMT explored in this study was also distributed simultaneously. The dental undergraduate questionnaire was completed after provision of pediatric dental treatment which was handed over to data collectors.

Data entry and analysis were carried out using IBM SPSS-26, (IBM Corp., Armonk, NY, USA) statistical software package. Frequency distributions are presented. Descriptive analysis was carried out with mean and standard deviation (SD). Bivariate analysis was conducted to test the association between the most used BMT with gender of the operator, gender of the patient and the treatment procedures. $p<0.05$ was considered as statistically significant.

3. Results

The response rate for this study was 69.5%, as duly filled questionnaires were returned by only 48 seventh-semester dental undergraduates. The rest of the 21 questionnaires needed exclusion, as the respondents were unable to fill them due to other commitments and grossly incomplete data.

Table 1. Socio-demographic profile of seventh-semester dental undergraduates and pediatric patients

Dental Undergraduates		
Age mean ± SD in years	25.48 ± 0.85 years	
Age range	24-27 years	
Gender	**N**	**%**
Male	16	33.3
Female	32	66.7
Pediatric Patients		
Age mean ± SD in years	6.77± 1.31years	
Age range	5-8 years	
Gender	N	%
Male	25	52.1
Female	23	47.9

As shown in Table 1, the majority of dental undergraduates and over a half of pediatric patients were females.

Table 2. Distribution of dental undergraduates by preferable practice of pediatric NPBMT

Type of pediatric NPBMT	Number	%
Not practiced	12	25.0
Tell-show-do	20	41.7
Storytelling and asking questions	8	16.7
Positive reinforcement	5	10.4
Modelling	1	2.1
Video-clip	1	2.1
Other	1	2.1

The majority of dental undergraduates practiced NPBMT for pediatric patients, the majority preferred tell-show-do technique followed by storytelling and asking questions. The uptake of video-clip was low (Table 2).

Table 3A. Comparison of use of NPBMT by gender of seven-semester dental undergraduates

NPBMT	Gender of dental undergraduates				p-value
	Male		Female		0.92
	N	%	N	%	
No BMT	4	25.0	8	25.0	
Tell-show-do	6	37.5	14	43.8	
Storytelling/asking questions	3	18.8	5	15.6	
Positive reinforcement	2	12.5	3	9.4	
Modelling	1	6.2	0	0.0	
Showing a video-clip	0	0.0	1	3.1	
Other	0	0.0	1	3.1	

Table 3B. Comparison of NPBMT use by gender of pediatric patients

NPBMT	Gender of pediatric patient				p-value
	Male		Female		0.28
	N	%	N	%	
Tell-show-do	14	70.0	7	43.7	
Storytelling/asking questions	4	20.0	4	25.0	
Positive reinforcement	2	10.0	2	12.5	
Modelling	0	0.0	1	6.3	
Showing a video-clip	0	0.0	2	12.5	

Of 25 male children and 23 female children, data on BMT was available only for 20 male children and 16 female children.

Despite differences in NPBMT use among male and female dental undergraduates as well as differences in NPBMT use by gender of the pediatric patient, those differences could not reach statistical significance(p>0.05) (Table,3A & 3B). Similarly, the differences in use of NPBMT by type of dental treatment could not reach statistical significance (p>0.05) (Table 4).

Table 4. Comparison of NPBMT use by type pediatric dental treatment

NPBMT	**Type of pediatric dental treatment**						**p-value**
	Preventive*		**Curative****		**Invasive*****		0.72
	N	**%**	**N**	**%**	**N**	**%**	
Tell-show-do	11	78.6	10	55.5	6	(66.7)	
Story telling/questioning	3	21.4	4	22.2	2	(22.2)	
Positive reinforcement	0	0.0	3	16.7	1	(11.1)	
Modelling	0	0.0	1	5.6	0	(0.0)	

***** Preventive resin restoration, fissure sealant application, fluoride varnish/gel application, oral hygiene instructions.
** Temporary filling, scaling, dental trauma management.
*** Pulp therapy, extraction, abscess drainage.

Table 5. Perceived barriers for using pediatric NPBMT

Perceived barrier	**Number**	**%**
Past dental experience of the child	29	24.0
Language incompetency	25	20.7
Resource constraints: instruments, materials, assistance	15	12.4
Cultural issues	12	9.9
Difficulty to select the most suitable BMT	12	9.9
Time constraints	11	9.1
Parental cooperation	11	9.1
Parental reluctance to obtain pediatric dental treatment provided by dental undergraduates	4	3.3
Other	2	1.6
Total	121*****	100.0

***** Multiple responses were provided**.**

As shown in Table 5, past dental experience of the pediatric patient and language incompetence were perceived as key barriers for using pediatric NPBMT by the majority of dental undergraduates.

4. Discussion

The present study explored the use of NPBMT by seventh semester dental undergraduates to manage dentally anxious pediatric dental patients as applied to a middle income country context with resource constraints. It was also attempted to assess whether the use of NPBMT differed by gender of the operator, pediatric patient and type of pediatric dental treatment. However, the small sample size was underpowered to

detect gender and treatment type differences. Given this serious limitation, further research is much warranted with larger sample sizes and stratified sampling to generate conclusive evidence in this regard. Given the limitations, the present pilot study provides the baseline to conduct further research with methodological rigor on factors associated with NPBMT among dental undergraduates in Sri Lanka and similar LMIC and LIC country contexts with resource constraints.

As emerged from the findings, the majority of seventh-semester dental undergraduates practiced NPBMT and communication based simple NPBMT, such as tell-show-do (TSD) and distraction by storytelling and questioning, were practiced over and above distraction by using a video-clip and positive reinforcement and modelling. Taken together, these findings aligned with similar studies conducted in other countries. A systematic review that aimed to assess the acceptability of dental students and professionals on NPBMTs applied for pediatric dental patients concluded that more accepted techniques were based on communication with desensitization (18). Similarly, TSD was the most common NPBMT used by final-year Nigerian dental therapy students (19). In reality, NPBMTs are used both in isolation and in combination. For example, tell-show-do, a popular communication based desensitization technique is in general followed by praise (positive-reinforcement) (20). Therefore, it is rational to argue that dental undergraduates may need theoretical and practical training in combining NPBMTs, for optimal outcomes. Aligning with our findings, Malaysian dental students accepted reinforcement techniques, such as promising a toy, and desensitization methods, such as stimulating the child's imagination using euphemisms, and did not accept aversive interventions, including hand over mouth, using Papoose Board, active immobilization and showing needles (7). In contrast, with time, Saudi Arabian dental undergraduates' initial preference towards communication based NPBMT and rewarding shifted towards aversive techniques and pharmacological methods (6). Given the differences in socio-cultural background, education, training and resources, it is reasonable to observe differences in use of NPBMT by dental undergraduates in different countries (6).

Gender differences in NPBMT use among dental undergraduates have been reported by previous studies. Accordingly, a study conducted in the USA found that female dental undergraduates had significantly higher empathy towards pediatric patients compared to their male counterparts (21). Another longitudinal study conducted among Saudi dental students reported that prior to the course on pediatric dentistry comprising NPBMT, female dental undergraduates significantly preferred certain communication based NPBMT compared to male undergraduates (6). Those included modelling, mentioning possibility of pain, treatment without local anesthetics, allowing the child to stop treatment, having the parent present during the treatment and showing the needle to the child. Evidence also suggests child's age dependent preference in use of NPBMT. In contrast, our findings could not demonstrate significant gender differences in use of NPBMT by operator's or child's gender, attributed to underpowered sample size. Therefore, it is not possible to generate conclusive evidence on gender differences of NPBMT among Sri Lanka dental undergraduates necessitating further research with methodological rigour. As reported by a cross-sectional study conducted among Indian pediatric dentists, for the 6-10-year age group of children, communication and communicative guidance were the most preferred NPBMT followed by tell-show-do and ask-tell- ask (22). This finding was comparable with despite the age group was different in our study (5-8 years). Due to very small sample size of children in out study, it was not possible to conduct a delayed analysis.

Our findings demonstrated use of NPBMT across a wide range of pediatric dental treatment. Aligning with those findings, a previous Sri Lankan study conducted among high caries 2-to 5-year-old children receiving preventive oral health care reported the use of combination of NPBMT for dentally anxious children (11). Dental anxiety is common among pediatric patients (23). Children without previous dental experience, a negative dental experience in the past, high caries experience and anticipation of pain demonstrated higher levels of dental anxiety (24,25). Therefore, a child friendly environment in the dental office, simple NPBMT and non-invasive preventive dental treatment are suggested to be effective in managing young pediatric patients with a high burden of dental caries (11).

Digital behavior management research has increased substantially in pediatric dentistry embracing immersive technologies, such as virtual reality becoming increasingly prominent (26). Hence, it was surprising to

detect the very low uptake of video-clip distraction (2.1%) by dental undergraduates of the present study, as the emerging evidence suggests the effectiveness of digital tools in managing anxious pediatric dental patients (27-29). Further, some respondents indicated resource constraints as a perceived barrier in effective use of NPBMT. However, availability of video-clip as a digital tool could be considered as a resource. Given the implications of our findings, further explorations on underlying reasons for the gross underutilization of this tool which could have strategically combined with preferable communication based NPBMT. Additionally, our findings indicate the need for inculcating positive attitudes and building the capacity of dental undergraduates using available digital tools to manage dentally anxious pediatric patients.

The perceived barriers of use of NPBMT in this study gives insights into addressing them in undergraduate training. As seven semester dental undergraduates heavily relied upon conventional, communication based desensitizing techniques, such as TSD and distraction by questioning and storytelling, language incompetency becomes a considerable barrier. The native languages of Sri Lanka comprise Sinhalese and Tamil. Thus, multi-lingual communication ability of dental undergraduates deemed important. Further, perceived barriers of resource constraints and cultural barriers need due consideration in Sri Lankan context. Such barriers could be common to other middle and low income country contexts as well. Difficulty to select the most suitable NPBMT perceived by some of the respondents of our study needs attention. Selecting the most appropriate technique deserve understanding and appreciation of continuum of the pediatric dentistry triangle thus ensuring optimal communication and collaboration with the dentist, parent and the child in providing pediatric dental care (30). Thus, capacity building in customizing NPBMT for the given continuum and socio-cultural context need, meticulous consideration in dental undergraduate training as applied to Sri Lanka.

One of the notable limitations of the present study was the small number of respondents due to time constraints and poor response rate on the part of the students. Despite the distribution of 69 questionnaires, some were not returned at all, while others had incomplete responses. This reduced the representativeness of seventh semester dental undergraduates as well as the number of pediatric patients thus impacting statistical power to detect gender differences and treatment type differences in use of NPBMT. The dental undergraduates were in general dominated by females (16), however, a comparative analysis including equal proportions of male and female dental undergraduates, would have generated more useful information on gender- based differences in BMT use. As the responses were based on self-reports there was a possibility of social-desirability response bias in responding which could have overcome by observations. Inclusion of a selected age cohort of children and very limited sample size limited the generalizability of the findings.

5. Conclusions

The present pilot study clearly demonstrated that seventh semester Sri Lankan dental undergraduates preferably practiced simple, foundational, communication based desensitizing NPBMT, such as TSD and 'distraction with questions and storytelling' compared to other techniques, such as distraction via video clip. Those techniques were used over a wide range of preventive, curative and invasive pediatric dental treatment procedures. Therefore, inculcating soft skills, such as empathetic communication with pediatric dental patients and their parents, would be a viable option in dental undergraduate training on NPBMT in middle-and low-income countries with resource constraints. Making the first dental experience pleasurable for a child with communication based NPBMT by overcoming language barriers would make pediatric patients more cooperative. Given the small sample size, it was not possible to detect significant differences in NPBMT use by gender of the dental undergraduates, gender of the pediatric patient and type of dental treatment ($p>0.05$). Future studies therefore, are warranted with larger sample sizes, methodological rigor with longitudinal designs and stratified sampling to explore NPBMT use by dental undergraduates aimed at generating more conclusive evidence on how they translate knowledge into practices and the barriers encountered.

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Conflict of Interests

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