INCREASING PERCENTAGE OF PRESCHOOL CHILDREN RECEIVING DENTAL TREATMENT AT KINDERGARTENS IN MACHANG DISTRICT

Nor Azee Azwa Kamarudin, Afifah Adilah Asshaari

Machang District Dental Health Clinic, Kelantan Malaysia,
Ministry of Health Malaysia

Corresponding Author: Nor Azee Azwa Kamarudin
Email: drazeeazwa@moh.gov.my

Abstract

Preschool children are one of the major target groups of the Oral Health Program, Ministry of Health Malaysia. However, caries prevalence of preschool children due to unmet treatment needs remains high. Thus, it is imperative for preschool children to receive dental treatment to maintain or restore function and aesthetics, prevent premature tooth loss and improve their quality of life. We aimed to increase the percentage of preschool children receiving dental treatment at kindergartens from 9.8% to 30% in a year. A cross-sectional study was conducted in January 2015 to March 2015 to identify factors contributing to low percentage of preschool children receiving dental treatment using a structured questionnaire modified and adapted from literatures. Ten kindergartens in Machang District were randomly selected, and a total of 200 preschool children, 180 parents and 13 dental therapists in Machang District were recruited for this study. Remedial measures were implemented in April 2015 until September 2015, followed by a post-remedial evaluation in October 2015 to December 2019. The factors contributing to low percentage included inconvenient visit schedule, lack of monitoring system, preschool children at kindergartens refusing dental treatment, and lack of oral health knowledge and awareness among parents. A series of interventions were introduced including improvement of care process, systematic planned visits, and formation of a dedicated team for kindergartens. Oral Health Education and seminars were given to parents. Supportive environment and innovations were created, including colorful attire, cartoon accessories and Benzo Kids' eye-wear tools. The Benzo Kids functioned as a smart phone holder for a child to watch their favourite video during treatment to divert the child's attention and reduce anxiety. The percentage of preschool children receiving dental treatment at kindergartens increased from 9.8% (2014) to 55.9% (2019), which exceeded the initial target of 30%. This study has had a significant impact on the number of deciduous teeth with dental caries of these preschool children when they progress to primary one. The HMIS data showed a decreasing trend of dental caries per 100 children from 80(2013) to 58(2019).

KEYWORDS: Preschool children, dental treatment, kindergarten, quality improvement study

Problem

In Malaysia, 86% of rural and 69% of urban preschool children have experienced dental caries, most of which remained untreated (1). With only 12.9 % of 5 years-old being caries-free (1995), Malaysia lags behind the Oral Health Goal for the year 2020 set by the World Health Organization (WHO) to have 50% caries-free children (5-6 years-old). According to WHO, 60% to 90% of school children worldwide have experienced dental caries (2). Local data based on Health Management Information System (HMIS) report in 2014 of Machang dental clinic showed that only 9.8% of preschool children received dental treatment at kindergarten, not achieving the *District Specific Approach* (DSA) standard of 30%. Therefore, it is imperative that this problem is addressed to ensure pre-school children receive dental treatment to preserve or restore function and aesthetics, prevent early loss of teeth, and improve their quality of life.

Machang District Dental Health Clinic is located at Machang's city centre close to the Machang District Hospital. Machang District consists of 79 kindergartens with 2289 preschool children. Machang District Dental Health Clinic provides dental services to several target groups including toddlers, preschool children, primary school students, secondary school students, antenatal mothers, adults, special needs children and senior citizens.

Patients are seen at dental outpatient clinics, schools, hospitals and during domiciliary visits. The dental mobile team consists of dentists and dental therapists who visit elderly patients in elderly centers, and patient's home at least once a year. Secondary school children (13 to 17-year-olds) are seen and treated by dentists. Preschool children (5 to 6-year-olds) and primary schoolchildren (6 to 12-year-olds) are treated by trained dental auxiliary, dental therapists. The dental therapist will conduct dental visits and provide dental treatment to preschool children at least once a year. The services include promotive, preventive and curative activities towards the control of oral diseases. Priority is given to government-aided kindergartens and are extended to private kindergartens.

Children under the age of six generally spend most of their time with parents and teachers who play a central role in educating and encouraging children to have a healthy oral condition. Preschool children's oral healthcare is influenced by their parent's knowledge, attitude and practices. Dental anxiety and fear of dental treatment among preschool children may contribute to the problem. Inconvenient schedule arrangement among dental team was among the factors that contributed to the problem of giving dental treatment to preschool children at kindergarten. The processes and schedule could be improved for the benefit of preschool children. To understand the current problem, possible contributing factors and designate institute appropriate strategies for improvement, we conducted a quality improvement study aimed to increase the percentage of preschool children receiving dental treatment at kindergartens in Machang District from 9.8% to 30% within a year.

Background

A study in Beijing, China reported that 648 (45.5%) preschool children in kindergarten had utilised oral health services in the past 12 months, while 24.3% had received preventive oral health services or dental treatment. Routine check-ups and receiving preventive measures accounted for 63.2% of the children who utilised oral health services in the past 12 months (3). This regional study showed that 12.3% to 42.3% preschool children had accessed oral health services within the past 12 months (3). However, several barriers impeded children from receiving timely dental treatment; the most frequently cited being insurance related problems for children and adults. Other

barriers included limited dental services for children aged 2 years, perceived poor quality of some dental practices, lack of emphasis on prevention-based dental care, poor care-coordination, and insufficient culturally-appropriate care. Important family-level barriers included parental oral health literacy, cultural factors, limited English proficiency and competing priorities. Several solutions were proposed to address these modifiable factors through strategic oral health policies, community outreach and improved care coordination between physicians, dentists and early childhood care providers (4).

Many studies reported that health-related behaviors are established in preschool children during the period of primary socialisation (1). Good management of preschool children is essential. This leads to a motivated patient, happy to undergo any necessary treatment, instills confidence and improves attitude to oral health of other family members. Rayner (5) showed that the combination of tooth brushing in school and dental education among parents improved the oral hygiene of their children. Cohen (6) suggested that it is important to advice the parents and children in the same environment. More emphasis should be placed on teaching proper tooth brushing skills and on positive parental engagement. Good teamwork between dentists, teachers and parents, and using good pedagogical approach for effective preventive and oral healthcare treatment for preschool children are important (6).

Measurement

The initial data was gathered using the Health Management Information System (HMIS), questionnaire and checklist survey. Data from HMIS was used to calculate the percentage of preschool children receiving dental treatment in kindergarten. Preschool children are categorised as children aged 5 to 6 years old, and kindergarten is a school or class for these children. Dental treatment is any variety of treatment of the teeth and adjacent tissue to restore or maintain oral health and function. The indicator of this study was the percentage of preschool children receiving dental treatment at kindergarten using the formula below:

$$= \frac{Number\ of\ preschool\ children\ receiving\ dental\ treatment\ at\ kindergartden}{Total\ enrolment\ of\ preschool\ childeren\ at\ kindergartden\ in\ Machang\ district} x\ 100\%$$

The target of this indicator was discussed at the state level and determined to be more than 30%. Data was collected on a monthly basis and the achievement was calculated every six months. The HMIS data in 2014 showed our achievement was only 9.8%. Our baseline findings from January to March 2015 revealed that only 2.2% preschool children received dental treatment in their kindergarten in Machang District. The implementation of strategies for change started from April until September 2015, and re-evaluation of the effectiveness was conducted by our team members every three months for five cycles until December 2019.

Initial Assessment of the Problem

The existing process of care was reviewed, and a few critical steps were identified and added to emphasise on the implementation of a second visit for dental treatment if needed, and referred to the nearest dental clinic if further treatment was required (Table 1). The process of care started with the preparation of scheduled visits to all identified kindergartens by dental therapists. During the first visit, Dental Health Education (DHE) was given to 90% of parents and caregivers in attendance, and all teachers. Tooth Brushing Drill (TBD) was conducted among all kindergarten students. Then, the dental checkup or screening was performed by a dental therapist. The oral health status of the kindergarten students was informed to the parents. For students who needed treatment, consent was obtained from the parents. The kindergarten's students with dental

problems were treated during the second visit.

A cross-sectional study was conducted to identify factors contributing to the low percentage of preschool children receiving dental treatment. Ten kindergartens were randomly selected from 79 kindergartens with a total enrolment of 2224 children at Machang district. The calculated sample size was 213 with the following parameters: proportion 0.7, significant level (α) of 0.05, precision (Δ) of 0.065 and dropout rate of 20% (7). The consent form was distributed to all parents prior to the study. All kindergarten students (n=200), aged 5 to 6 years old from the 10 kindergartens were recruited for this study. Inclusion criteria were children aged between 5 to 6 years old with parent's or caregiver's consent. Data was obtained using a structured questionnaire modified and adapted from Alsarheed (7) to assess attitude of children towards dental therapists and towards dental treatment. This was an assisted questionnaire with photos delivered by an officer to a small group of three children (7). For evaluation of anxiety, Norman Corah's Dental Anxiety Scale 1978 was adapted, using images of dental treatment which were presented to each child. The child then chose a face emoticon (happy face, natural face and sad face) to represent their response (8). To determine oral health knowledge, attitude and practice (KAP), a self-administered questionnaire by Singhal *et al*., (9) was adapted and translated into simple Malay language and administered to 180 parents or caregivers at the same 10 kindergartens. The questionnaire consisted of three sections with each section covering a specific domain. Each section has five questions and covered oral health knowledge, attitude and practices. A score of one reflected a correct answer and a score of zero indicated an incorrect response. An overall oral health knowledge and attitude score was calculated by adding each correct answer for all questions for each participant and converted into percentage.

The level of oral health KAP was determined using Bloom's cut-off points - good (80-100%), moderate (60-79%) and poor (0-59%) (9). In addition to that, a checklist survey was performed among all dental therapists in Machang District consisting of questions related to the scheduled visit to kindergartens and annual leave to determine problems encountered in delivering dental treatment to preschool children. The data of preschool children's oral health status was extracted from the HMIS report.

Three quarters of kindergartens students (n=150, 75%) were uncooperative towards dental treatment. Their cited reasons were anxiety (74%) and fear (26%). Most of them were anxious about dental treatment due to dental instruments (85%) and dental therapists (15%), (Figure 1). Nearly two-thirds of parents or caregivers (60%) lacked knowledge on their children's oral health. Only 22% of them had good attitude towards their children's oral health. The oral health practices of parents or caregivers towards their children is demonstrated in Table 2. Most parents or caregivers reported moderate oral health practices for Questions 1 and 2. However, most parents or caregivers showed poor oral health practices for Question 4; 91.6% parents took their child to visit the dentist only when needed and Question 5; 81.7% parents visited the dentist only when their child experienced pain. Out of 13 dental therapists in Machang District, more than half of them reported having problems with arranging scheduled visits, some cited lack of monitoring system, while others reported annual or emergency leave.

Therefore, inappropriate visit schedule to kindergartens, lack of monitoring system, preschool children refusing dental treatment due to anxiety, and lack of knowledge and awareness among parents were the major factors contributing towards the low percentage of preschool children receiving dental treatment in Machang District.

Table 1: Model of Good Care on dental treatment among preschool children at kindergarten.

Critical Step	Criteria	Standard	Pre-remedial	PDSA Cycle 1	PDSA Cycle 2
Oral health screening by dental therapist (First visit)	- Do dental check up to all kindergarten's children - Identify the children with dental problems and treatment needed - Dental health education (DHE) - Tooth brushing drill (TBD)	100%	100%	100%	100%
Inform parent of oral health status and to obtain treatment	Obtain consent from parents for dental treatment	100%	85%	100%	100%
Implement second visit	- Dental health education (DHE) - Tooth brushing drill (TBD) - Role play/ control oral disease - Do the dental treatment if needed and refer to the nearest dental clinic if further treatment required	100%	75%	85%	100%
Patient referral	Refer patient to the nearest dental clinic if treatment needed	100%	100%	100%	100%
Data collection	- HMIS: Reten PG307, PG201, PG203 - Update checklist for coverage of kindergartens - Record HMIS Reten form	100%	100%	100%	100%

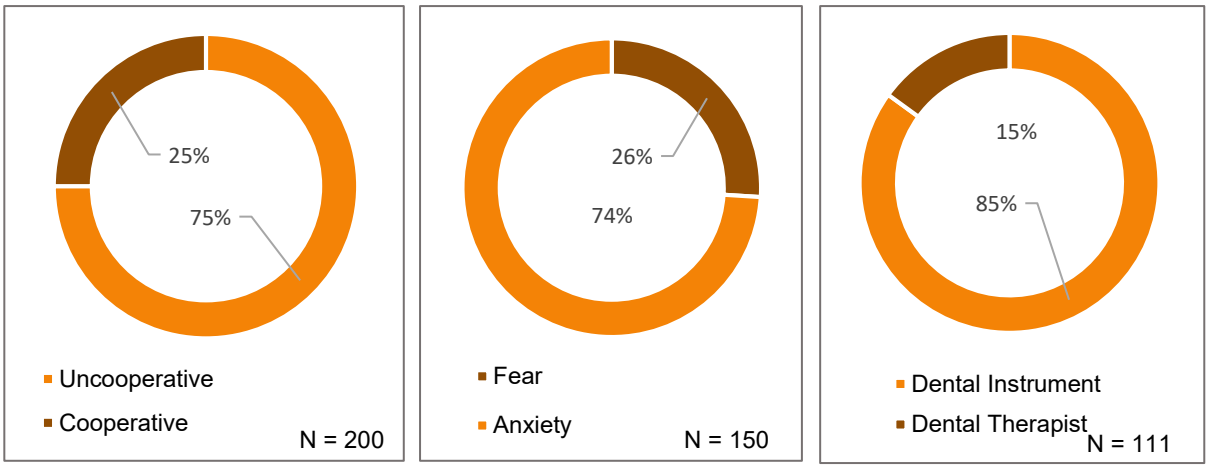


Figure 1: Attitude and anxiety among preschool children towards dental treatment.

Table 2: KAP among parents and caregivers towards oral healthcare (N=180)

Scoring	Frequency of Responses (Percentage)		
KNOWLEDGE:			
Good (80-100%)	45 (25%)		
Moderate (60-79%)	27 (15%)		
Poor (0-59%)	108 (60%)		
ATTITUDE:			
Good (80-100%)	40 (22%)		
Moderate (60-79%)	36 (20%)		
Poor (0-59%)	104 (58%)		
PRACTICE: (Question)			
1. How often do you clean your child's teeth?	Once a day 9.4%	Twice a day 85%	Never 5.6%
2. How frequently do you change your child's toothbrush?	3 monthly 5.6%	6 monthly 72%	Once a year 22%
3. How long do you take to brush your child's teeth?	1 minute 88.9%	2 minutes 11.1%	3 minutes 0%
4. How frequently do you take your child to the dentist?	Once a year 5.6%	Twice a year 2.8%	When needed 91.6%
5. At what age should you take your child for his/her first dental visit?	7 years old 11.1%	1 year old 7.2%	When felt pain 81.7%

Strategy

Our SMART (specific, measurable, achievable, realistic, and timely) aim was to increase the percentage of preschool children receiving dental treatment by dental therapist in kindergartens so that 30% of children can be treated during the visit. We performed four PDSA (plan, do, study, act) test cycles.

PDSA cycle 1: Our initial intervention was to establish a supportive and friendly environment during treatment such as donning colorful attire and mask, and modifying dental instruments by placing cartoon accessories at the end of hand instruments to help children overcome anxiety. The lack of oral health knowledge, attitude and practices among parents improved through oral health education and motivation by dental officer that was offered once a year. Seminar and talks on oral health care and demonstration of dental treatment such as fluoride varnish, dental material exhibition and question and answer sessions were conducted by dental officers and dental specialists. Based on feedback received, this strategy might be sustainable as it took place only once a year and involved only a minimal cost because the budget was supported by the kindergartens' administrators.

Improving the care process by introducing a third time dental visit to certain kindergartens was implemented to increase the coverage of dental treatment. Two visits were usually scheduled at intervals of one week with the first visit for dental checkup and tooth brushing drill, and the second visit for simple treatments like fluoride varnish. The team took the initiative of arranging a third visit for a particular kindergarten when they were scheduled to visit a primary school in close proximity to the kindergarten. The third visit was for the team to provide fluoride varnish to children who could not be treated during the second visit. The third visit successfully increased the number of children receiving dental treatment to 16.5%. However, children who needed treatment like filling and scaling could not be treated at their kindergartens due to logistics and facility reasons.

PDSA cycle 2: To overcome the issue of children who required scaling and filling, the third visit was strengthened. Planned visits to kindergartens were rescheduled according to topography and distance of kindergartens to the nearest primary school, and kindergartens remained open throughout the year. Children who needed such treatment would be brought to the nearest primary school with their parents' consent. Children would be accompanied by their teachers during the treatment at the primary school. The dental treatments increased to 19%. However, based on feedback from the dental therapists, the strategy was quite risky as teachers needed to accompany children from kindergarten to the primary school.

PDSA cycle 3: We hypothesised that our intervention may be more effective if it were more organised, systematic and could be monitored better. To achieve this, a Dental Officer in Charge (DOIC) was assigned and a dedicated team for pre-school care was formed, consisting of a dental therapist and a dental officer for each team. Monitoring was done every three months. This led to dental treatments increasing to 36%. This strategy received positive feedback; indicating that it might be sustainable due to good communication and team work between the dental therapists and dental officers.

PDSA cycle 4: For our final test cycle, an innovation called 'Benzo Kids' was developed to divert children's attention and reduce anxiety during treatment. By implementing Benzo Kids, the percentage of preschool children receiving dental treatment increased to 43%.

Results

The number of uncooperative children towards dental treatment decreased from 150 in 2014 to 60 in 2019.

Children's attitude towards dental treatment showed an improvement as the number of children with anxiety decreased from 95 to 30 children. Levels of knowledge, attitude and practices among parents and caregivers towards children oral health care improved. All parents consented to their children's dental treatment and was aware of the dental treatment being delivered at kindergartens. All dental therapists followed new scheduled visits to kindergartens with the dedicated team.

The percentage of pre-school children receiving dental treatment at kindergartens increased from 9.8% (2014) to 70.3% (2019) (Figure 2). The initial target set was 30% in 2014. Even though we cannot achieve our objective in the stipulated time frame, improvement was seen following each PDSA cycle (Figure 2). The District Dental Officer (DDA) increased the standard to more than 50% in 2018. The ABNA was reduced from 20.2% to 0% following continuous remedial actions and strategies taken from PDSA cycle 1 to PDSA cycle 4. This study led to a significant impact on the number of deciduous teeth with dental caries of these pre-school children when they progress to primary one. The HMIS data showed that the number of dental caries per 100 children decreased from 80 (2013) to 58 (2019).

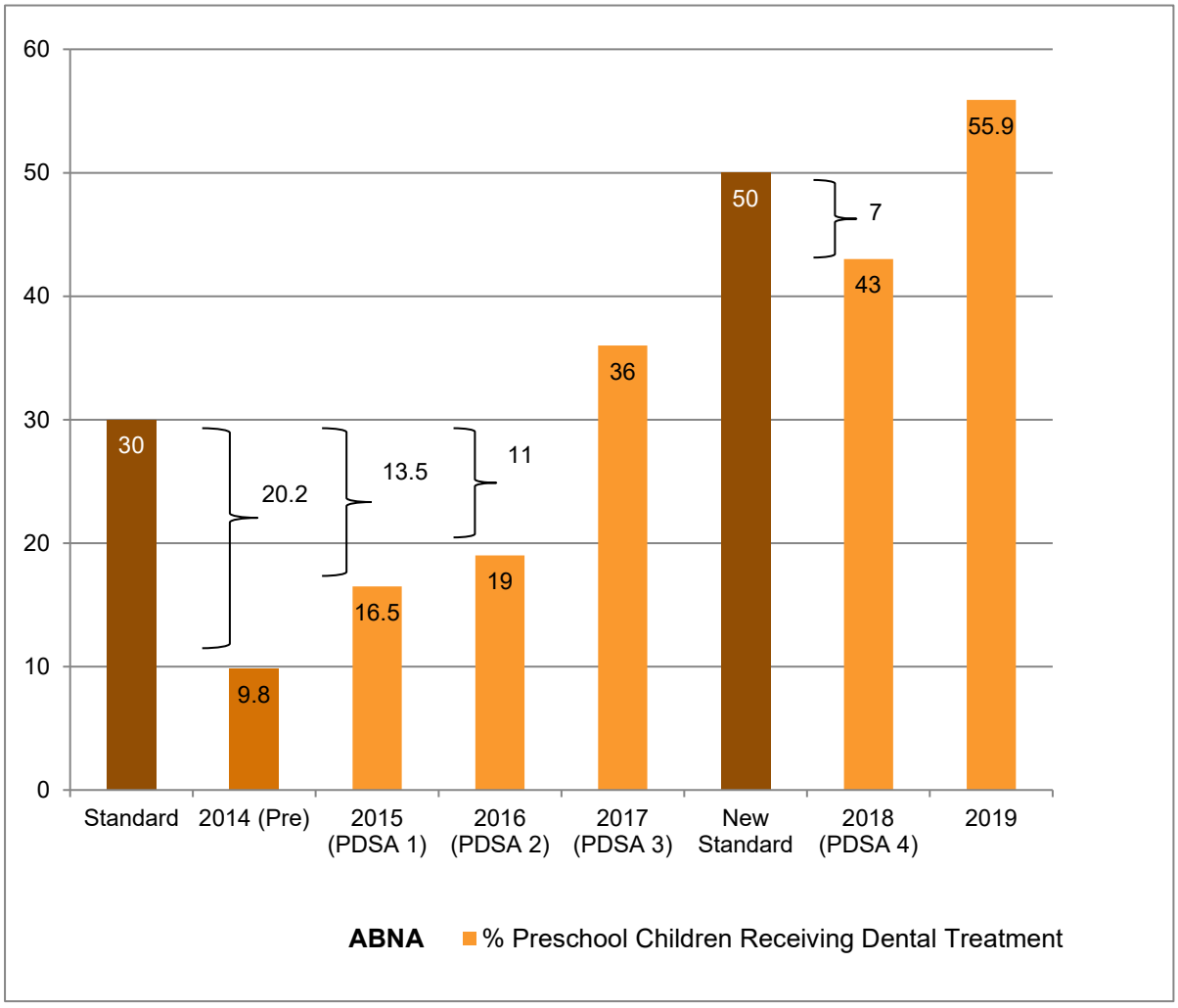


Figure 2: Pre and post-remedial achievements: percentage of preschool children receiving dental treatment at kindergartens in Machang District.

Lessons and Limitations

This project aimed to increase the percentage of dental treatment among pre-school children in kindergartens by dental therapists and dental officers. This study also focused on implementing a sustainable solution rather than a short-term intervention.

A key lesson learnt during this process was the importance of PDSA cycles, which helped ensure that at each stage, the intervention method was optimised before being fully implemented across the district. Our findings suggest that each intervention was effective. The formation of a dedicated team had a positive impact, proved to be the most effective intervention, and had a greater chance of being sustainable. In comparison, the intervention that was least effective was introducing a third dental visit to the kindergarten, which added workload to the dental therapists. We were able to achieve our target of more than 50% preschool children receiving dental treatment at kindergartens in 2019. Good teamwork and communication between kindergarten's teacher and dental staff was one of the main factors lead to the project successful.

There were also minor issues regarding the cost of supplying and distributing colorful masks, gowns, cartoon accessories and 'Benzo Kids'. For our intervention to succeed, we had to ensure that these modified gowns, masks and cartoon accessories were distributed to all dental therapists, which was not feasible due to a lack of budget. However, this strategy may be possible in the future if there is an increase in financial resources.

Conclusion and the Next Steps

The project team was able to identify the factors that contributed to the low percentage of pre-school children receiving dental treatment at kindergartens. The team also developed interventions that addressed these problems to increase the percentage of dental treatment performed. Continuous monitoring of remedial measures is necessary to ensure achievement of the DSA standard. To ensure continuous improvement, the team implemented 'Little Precious Child Oral Care' programme in all kindergartens. By making all kindergartens at Machang district as a *'Tadika Angkat'* (adopted kindergarten), we would be able to improve the oral health status of all kindergarten children.

Due to the significant results of this project, it is necessary to ensure these improvement methods and interventions are shared throughout the state.

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Conflict of Interest

None.

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