ORIGINAL ARTICLE

Preschool Children Feeding Patterns And Early Childhood Oral Health Impact In Tanah Merah, Kelantan, Malaysia

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ABSTRACT

Introduction: Poor feeding patterns increase risk of Early Childhood Caries (ECC), which can cause negative impacts on oral health-related quality of life (OHQoL) of preschool children and parents. This study aims to assess feeding patterns of preschool children and OHQoL of the children and their parents in Tanah Merah. **Methods:** A cross-sectional study was conducted involving 134 preschool children aged 5-6 years old from eight private preschools, chosen by multi-staged stratified cluster sampling. Parents answered adopted self-administered questionnaire on feeding patterns and oral health-related impacts. Mann-Whitney U test and Kruskal-Wallis test were used to compare the median between groups of feeding patterns. **Results:** A total of 122 parents responded. Majority of the children had history of bottle-feeding (97.5%) and being given solid food during infancy (61.2%). Many children were still using bottle to drink (38.5%). Majority were still given formula milk at least three times daily (51.1%) and were feed with bottle to put to sleep (97.9%). The Child Impact Section (CIS), Family Impact Section (FIS) and Overall ECOHIS mean scores were 2.39 (SD=3.41), 0.71 (SD=1.45) and 3.10 (SD=4.41), respectively. Most common impact reported in CIS was 'oral pain' (26.2%) whereas in FIS, 'parents felt guilty' (7.4%). None of feeding patterns were found significantly different in terms of ECOHIS score median (p-value>0.05). Children OHQoL reporting by proxy should be treated as complementary. **Conclusion:** Many preschool children were involved in prolonged, frequent and nocturnal bottle-feeding. No significant difference in median ECOHIS scores found according to feeding patterns.*Malaysian Journal of Medicine and Health Sciences* (2023) 19(4):178-185. doi:10.47836/mjmhs19.4.27

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INTRODUCTION

Feeding patterns are important factors in oral health of the children; poor children feeding habits and insufficient oral health care practices lead to increased prevalence of oral diseases, particularly Early Childhood Caries (ECC) (1). This dynamic multifactorial oral disease is very common both nationally and worldwide, mediated by dysbiotic microbiome driven by sugar that results in demineralisation of primary teeth (2, 3). The disease compromises primary teeth structures, leading to chronic pain and infections (3). The signs and symptoms of ECC can be disturbing to child and family members (4, 5).

Inappropriate feeding patterns such as early introduction of sugar-contained complementary food to infant, frequent sweet food and drink have been shown to be associated with ECC (6, 7). Poor bottle-feeding habits such as frequent, nocturnal and beyond-infancy bottle-feeding also increased risk of ECC (7, 8) as these prolong the exposure of oral environment to fermentable carbohydrates which favours dental caries (9). Nationally, there was high prevalence of bottle feeding and bottle feeding just before or during sleep practices among children aged 0-23 months (10). Moreover, in a study, over half of preschool children aged 3 to 5 years old were current bottle-fed (11).

Good feeding practice can modify the risk of ECC and its subsequent negative impacts (12). Previous studies assessed relationship between feeding behaviour and dental caries, however, few explored relationships between maternal health behaviours (including feeding habits) and childhood oral health-related quality of life (4). Feeding patterns - oral health impacts studies are needed for the purpose of planning oral health and healthy feeding programmes and encourage common risk approach (13). This study aimed to assess feeding patterns of private preschool children in Tanah Merah, Kelantan, and the early childhood oral health-related

quality of life (OHQoL) of children and their parents.

MATERIALS AND METHODS

Study design and participants

This was a cross-sectional study on parents and their children aged 5-6 years old in private preschools in Tanah Merah, Kelantan. Private preschools were selected as study area justified by high prevalence of ECC (74.2%) among private preschool children according to local dental service data. The sample size determination was calculated using single mean formula based on ECOHIS score mean of 18.4 (sd=5.4) in previous study by Hashim et al. (2015), which resulted in a minimum sample size of 112 participants. Taking into account of 80% response rate, the estimated sample size of 134 preschool children were selected through multi-stage stratified cluster sampling. The inclusion criteria were children with absence of medical and physical problems; and Malaysian nationality parents who were able to read and write in Malay language. No physical observation of the children was involved; the study included children regardless of oral health status.

Sample selection was conducted in three stages. Stage 1 was the cluster identification and selection, which eight preschools the providers agreed to cooperate and with enough number of 5-6 years old children included as clusters. Stage 2 involves grouping of children into 5 years old and 6 years old strata according to name lists provided by the preschool providers; and proportionate number of the children needed in each stratum was calculated using Microsoft Excel. Stage 3 involved selection of children within the clusters using systematic random sampling until the sample size was satisfied. Sampling interval, k^{th} was obtained by dividing the sampling frame, N with the sample size. A starting point between 1 and k^{th} (2) was selected at random, using random draw in SPSS. The number randomly selected was number 1. Children were selected in every 2nd name on the name list after the starting point, until enough sample size was achieved.

Research tool

A 36-questions self-administered Malay language questionnaires adopted from previous studies to assess the sociodemographic status and feeding patterns (11), and a Malay version of Early Childhood Oral Health Impact Scale (Malay-ECOHIS) to assess oral health-related impacts to child and family members (14) was used. Permission to utilize the tools obtained from both corresponding authors. The proxy (parents) needs to consider their current sociodemographic status, theirs, and their children's current experience of feeding patterns and both children and family members' lifetime experience on early childhood oral health problems impacts.

The questionnaires consist of three parts: (i) Sociodemographic status (ii) Feeding patterns and (iii) ECOHIS. The first part assessed the child age, sex and position in the family; and parent's characteristics: relationship with child, age and number of children in the family. The second part assessed the child feeding status and existing bottle-feeding patterns (variables as in Table II and Table III).

The third part consists of 13 items divided into two sections: the Child Impacts Section (CIS) and Family Impacts Section (FIS). CIS contains nine ordinal items in four domains which were child symptom, function, psychology; and self-image and social interaction. FIS contains four ordinal items in two domains which were parental distress and family function. Based on original version of ECOHIS, the answer options were in Likert scales: 0= Never, 1=Hardly ever, 2=Occasionally, 3=Often, 4=Very often, 5=Don't know (DK). Presence of impact was considered if at least 'occasionally' response recorded.

The ECOHIS domains score ranged as follows: child symptom (0-4), child function (0-16), child psychology (0-8), child self-image and social interaction (0-8), parental distress (0-8) and family function (0-8). The overall ECOHIS scores ranged between 0 to 52 (0-36 from CIS and 0-16 from FIS). This was obtained through summing up all the 13 items response codes but only response codes 0 to 4. The score 5 (the Don't know; DK) was considered as missing data, as proposed by the original version of ECOHIS (15).

Response with less than 2 missing answers in child impact section and 1 missing answer in family impact section were considered missing data and were replaced by the mean score of that part. If there are more missing answers, the respondent will be omitted. Subsequently, the Overall ECOHIS mean scores was counted. Higher overall ECOHIS scores and overall ECOHIS mean score indicate higher early childhood oral health impacts to the children and their family.

Data collection

Ethical approval was obtained from The Human Research Ethics Committee of USM (JEPeM Code: USM/JEPeM/22010072). This research also registered to National Medical Research Registration (NMRR research ID: RSCH ID-22-00517-QAM). Informed consent was obtained from the parents before the feeding patterns of preschool children and OHQoL of the children and their parents were assessed.

The preschool providers' permission was sought before conduction of study. The preschools children registration name lists were obtained for sampling purposes. Subsequently, the preschool providers or teachers informed the selected children's parents about the study. Then, the participants were approach face-to-face by the researcher at the selected private preschools to obtain

their consent and responses on sociodemographic status of children and parents, child feeding patterns and oral health-related impacts. The parents were asked to self-answer the printed questionnaire which took about 15 minutes to be completed. The completed questionnaires were collected in the same day. Another day was given to parents who were not able to submit the questionnaires on time. The involved parents received feedback on the findings of this study and some education on children feeding practice to prevent ECC through virtual dental talk. Each of the children received child's toothbrushes and fluoridated toothpaste as a token of appreciation from the researchers.

Data analysis

Data entering and analysis were conducted using IBM SPSS Statistics version 26.0. Percentages were used to describe the feeding patterns categories whereas percentages, mean and standard deviation were used to analyse the numerical ECOHIS scores. The overall ECOHIS score for each of the groups of feeding status and patterns were not normally distributed, in addition to insufficient sample size within each of the groups. Therefore, Mann-Whitney U test and Kruskal-Wallis test were used to compare the median between groups.

RESULTS

Twelve out of 134 children were excluded during data collection day due to absence during data collection (n = 3), child moved to other school (n = 2), and parents' refusal (n = 7). Table I shows sociodemographic profile of respondents. One hundred and twenty-two parents of 74 boys (60.7%) and 48 girls (39.3%) responded, thus, included in this study. There were 57 (46.7%) five years old, and 65 (53.3%) six years old children involved. Children mean age was 5.53 (sd=0.50). Regarding child position in the family, most of them are the eldest (38%). Most of the proxy were the mothers (84.4%). Majority of the parents were from 31 – 40 years old age group (68.6%). Number of children in the family ranged between one to seven, with the majority of family having two children (35.8%).

Table II shows feeding patterns of the preschool children. A 5-year-old child (0.8%) was still breast-and-bottle feeding. More than one-third of the children (38.5%) were still currently bottle fed at the age of 5 or 6, the majority were the 5 years old children (61.7%). Many children with history of bottle feeding were introduced to bottle feeding during age less than 6 months (58.8%). Majority of parents whose children currently bottle feeding were not sure on expected child age to wean off bottle (53.2%). On the other hand, among those children who already wean off bottle, majority had stop bottle feeding at the age of 4 years old (39.7%). More than half of the respondents (61.2%) reported introduced child with solid food before 1 year old.

Table I: Sociodemographic profile of respondents

Sociodemographic characteristics	Frequency	
	n	%
Children		
Age (years) (*N*=122)		
5	57	46.7
6	65	53.3
Sex (*N*=122)		
Boys	74	60.7
Girls	48	39.3
Birth order (*N*=122)		
1	51	41.8
2	35	28.7
3	18	14.8
4	12	9.8
≥5	6	4.9
Position in the family (*N*=121)		
Eldest	46	38.0
Middle	32	26.4
Youngest	38	31.4
Only	5	4.1
Parents		
Relation (*N*=122)		
Father	19	15.6
Mother	103	84.4
Age group/year (*N*=121)		
20-30	16	13.2
31-40	83	68.6
>40	22	18.2
Number of children (*N*=120)		
1	11	9.2
2	43	35.8
3	33	27.5
>3	33	27.4

Table III shows current bottle-feeding patterns among 47 children who were using bottle to feed. Majority of them (51.1%) were given formula milk either three times (27.7%) or more than three times (23.4%) daily. Almost half of them were never being given water drink with bottle (46.8%). More than half of the children were never being given bottle with juice /sugary drink (59.6%).

Almost all the currently bottle-feeding children were feed with bottle to put them to sleep (97.9%), either sometimes (36.2%) or every night (61.7%). However, not more than half of the children were given bottle feeding in the middle of the night (42.5%), either sometimes (31.9%) or every night (10.6%). No child took more than 30 minutes to complete one bottle feeding; majority (80.9%) only took less than 10 minutes.

Table IV shows the Malay-ECOHIS responses of parents, who considered their and their children's lifetime

Table II: Feeding patterns of the preschool children

Feeding patterns	Frequency	
	n	%
Breastfeeding (*N*=122)	1	0.8
Bottle feeding (*N*=122)		
Yes	47	38.5
5 years old	29	61.7
6 years old	18	38.3
No	75	61.5
Wean off bottle feeding	72	59.1
Never bottle feeding	3	2.5
Age of introduction to bottle feeding (*N*=116)		
<6 months	70	58.8
6 months - 1 year	20	16.8
1 year old – 2 years	26	21.8
Expected age to wean off bottle (*N*=45)		
5	4	8.5
6	16	34.0
Not sure	25	53.2
Age weaned off bottle feeding (*N*=68)		
1	2	2.9
2	18	26.5
3	14	20.6
4	27	39.7
5	7	10.3
Breast and bottle feeding (*N*=122)	1	0.8
Trained using cup (*N*=122)	115	94.3
Solid food (*N*=122)	122	100.0
Age of introduction to solid food (*N*=121)		
<1	74	61.2
1 - 2	32	26.4
2 - 3	10	8.3
3 - 4	3	2.5
4 - 5	2	1.7

Table III: Bottle feeding patterns among currently bottle-fed children; *n*=47

Current bottle-feeding patterns	Frequency	
	n	%
Daily frequency of formula milk bottle feeding (*N*=47)		
Never	1	2.1
Occasionally	4	8.5
Once	3	6.4
Twice	15	31.9
3 times	13	27.7
>3 times	11	23.4
Daily frequency of water drink bottle feeding (*N*=47)		
Never	22	46.8
Occasionally	9	19.1
Once	2	4.3
Twice	2	4.3
3 times	-	-
>3 times	12	25.5
Daily frequency of juice/sugary drink bottle feeding (N=47)		
Never	28	59.6
Occasionally	14	29.8
Once	-	-
Twice	3	6.4
3 times	-	-
>3 times	2	4.3
Daily frequency of bottle feeding to put child to sleep (*N*=47)		
Never	1	2.1
Sometimes	17	36.2
Every night	29	61.7
Daily frequency of bottle feeding in the middle of the night (N=47)		
Never	27	57.4
Sometimes	15	31.9
Every night	5	10.6
Duration to complete one feed (*N*=46)		
<10 minutes	38	80.9
10-30 minutes	8	17.0
>30 minutes	-	-

experiences pertaining to the children's oral health-related quality of life. No 'very often' and 'Don't Know' responses recorded. The mean CIS score was 2.39 (3.41) whereas the mean FIS score was 0.71 (1.45). Overall ECOHIS mean score was 3.10 (4.41). Maximum overall ECOHIS score recorded was 22. Fifty-three respondents (43.4%) reported floor response (overall ECOHIS score = 0), i.e., no early childhood oral health impacts to the children and their family.

In the CIS, the most common impact reported was oral pain at 26.2% whereas the least common impact was missed preschool at 2.5%. More than one-tenth of parents reported their child had difficulty eating (13.9%). In the FIS, the most common impact reported was parents felt guilty (7.4%). Parents felt upset was also more reported compared to other items in the section (5.7%). The least common impact was financial impact (1.6%).

Table V shows comparison of overall ECOHIS score according to feeding patterns. No significant difference in median ECOHIS scores found according to feeding patterns.

DISCUSSION

High prevalence of current bottle feeding was found among the children, although the percentage was lower from a local study (11). Convenient, easy, and busy for work were the reason of maternal practice of bottle feeding (16). This study revealed the 'norm' of prolonged bottle feeding among the population; only a minority had stop bottle feeding at the age of 1 year old. Majority of parents whose children currently bottle feeding were not sure on expected child age to wean off bottle; this was of concern because they were probably not aware of current recommendation to wean off baby bottle use

Table IV: Malay-ECOHIS responses of parents (*N*=122)

Impacts	Mean (SD)	Never or hardly ever		Occasionally or often	
		n	%	*n*	%
Child Impact Section (CIS)					
Oral/dental pain	0.70 (0.86)	90	73.7	32	26.2
Difficulty drinking	0.18 (0.50)	116	95.1	6	4.9
Difficulty eating	0.45 (0.77)	105	86.1	17	13.9
Difficulty pronouncing words	0.19 (0.55)	115	94.3	7	5.7
Missed preschool	0.11 (0.38)	119	97.5	3	2.5
Trouble sleeping	0.23 (0.56)	114	93.4	8	6.6
Irritable or frustrated	0.16 (0.53)	115	94.3	7	5.7
Avoided smiling or laughing	0.22 (0.60)	115	94.2	7	5.7
Avoided talking	0.15 (0.46)	117	95.9	5	4.1
Mean CIS score	2.39 (3.41)				
Family Impact Section (FIS)					
Been upset	0.24 (0.60)	115	94.3	7	5.7
Felt guilty	0.30 (0.68)	113	92.6	9	7.4
Time off from work	0.13 (0.50)	116	95.1	6	4.9
Financial impact	0.04 (0.27)	120	98.3	2	1.6
Mean FIS score	0.71 (1.45)				
Overall ECOHIS mean score	3.10 (4.41)				

Frequency test was applied
Mean (SD): Mean and standard deviation

Table V: Comparison of Overall ECOHIS score according to feeding patterns

Variables	Median (IQR)	Statistic	*p*-value*
Breastfeeding			
Yes	-	26.000	0.305†
No	2.00 (4)		
Bottle feeding			
Yes	0.00 (3)	1436.500	0.073†
No	2.00 (6)		
Breast and bottle feeding			
Yes	-	26.000	0.305†
No	2.00 (4)		
Trained using cup			
Yes	2.00 (4)	229.500	0.149†
No	0.00 (3)		
Solid food			
Yes	-	-	-
No	2.00 (4)		
Age of introduction to solid food			
<1	2 (4)	3.744 (4)	0.442
1 - 2	1 (4)		
2 - 3	3 (9)		
3 - 4	0 (0)		
4 - 5	1.5 (.)		
Age of introduction to bottle feeding			
<6 months	1.50 (4)	1.735 (2)	0.420
6 months - 1 year	2.50 (5)		
1 year old – 2 years	1.00 (4)		
Daily frequency of formula milk bottle feeding			
Never	-	5.852 (5)	0.321
Occasionally	0.00 (8)		
Once	5.00 (.)		
Twice	0.00 (2)		
3 times	1.00 (2)		
>3 times	3.00 (5)		

Table V: Comparison of Overall ECOHIS score according to feeding patterns (continued)

Variables	Median (IQR)	Statistic	*p*-value*
Daily frequency of water drink bottle feeding			
Never	0.00 (2)	3.592 (4)	0.464
Occasionally	1.00 (5)		
Once	3.00 (.)		
Twice	0.00 (0)		
3 times	-		
>3 times	0.50 (3)		
Daily frequency of juice (with added sugar)/sugary drink bottle feeding			
Never	0.00 (2)	1.643 (3)	0.650
Occasionally	0.50 (3)		
Once	-		
Twice	4.00 (.)		
3 times	-		
>3 times	3.00 (.)		
Daily frequency of bottle feeding to put child to sleep			
Never	-	1.508 (2)	0.471
Sometimes	1.00 (5)		
Every night	0.00 (3)		
Daily frequency of bottle feeding the child in the middle of the night			
Never	0.00 (2)	2.483 (2)	0.289
Sometimes	2.00 (4)		
Every night	0.00 (2)		
Duration to complete one feed			
<10 minutes	-	1.774 (1)	0.183
10-30 minutes	0.00 (2)		
>30 minutes	3.00 (6)		
Age of weaned of bottle feeding			
1	3.00 (.)	0.326 (4)	0.988
2	2.00 (7)		
3	1.00 (6)		
4	2.00 (5)		
5	2.00 (4)		
Expected age to wean off bottle			
5	2.00 (6)	5.042 (2)	0.080
6	2.00 (5)		
Not sure	0.00 (2)		

†The Normality assumption is not fulfilled: Mann Whitney test was applied
The Normality assumption is not fulfilled: Kruskal Wallis test was applied
*Significant at the level of <0.05
Median (IQR): Median and interquartile range

after 12-18 months (17).

The percentage of children introduced to bottle feeding before age 6 months and the percentage of children introduced to solid food before 1 year old were higher than that in previous study (11). Introduction of bottle feeding to infants aged less than 6 months with liquid other than breast milk was in contrast with recommendation for the mothers to exclusively breastfeed children up to 6 months, when nutritionally adequate and safe solid foods are recommended together with continued breastfeeding up to 2 years of age or beyond (18). The non-compliance with the recommendation is pandemic; globally, almost one third of infants aged less than 6 months were fed solid food (19). Early initiation of food and drink other than breastmilk predisposed the children to ECC (6), in addition to growth and development

problems such as rapid infant weight gain and increased risk of childhood obesity (20).

More than half (51.1%) were given formula milk 3 times or more daily, though many (59.6%) reported never give their children nursing bottle with juice with added sugar/ sugary drink. Parents may not be aware that formulated milk products generally contain carbohydrate (21) in the form of added sugar, hence, as detrimental as sugary drink to the teeth. Formula milks are higher in carbohydrates than breastmilk, and are not labelled with sugar content labels properly, thus, it may not be feasible for consumers to choose low sugar products based on the labels (22-23). Frequent use of nursing bottle containing formula milk, drinks with added sugar, or even 100% juice (24) are risk factors for ECC and its severity, further increase the risk of both children and parents having impacts of ECC.

This report also found higher frequency of putting child to sleep using bottle (97.9%) than previous local study (25). Study by Rusali et al. (2019) proved bottle-feeding practice in bed significantly linked to ECC status (25). As the child sleep, decrease flow of saliva and swallowing reflex lead to decrease carbohydrate clearance, causing the drink to pool intraorally favouring multiplication of existing Mutans Streptococci; an acidogenic bacteria which was transmitted from mother to child at the period of infectivity within the first 2 years of age (26).

Overall ECOHIS mean score of 3.10 (4.41) was found lower from study in a university paediatric dental clinic in New Delhi (7.02, SD=5.47) (27). Compared to healthy children in present study who attend preschools, the patients who attended clinic may already have symptoms and impacts of ECC. In present study, parents reported low mean CIS score of 2.39 (3.41) and mean FIS score of 0.71 (1.45) indicating low impact of oral health on quality of life of both children and parents.

However, in this study, oral pain was the most commonly reported impact at 26.2%. This reflected the situation in which the state of Kelantan had the highest prevalence of ECC at 88.7% (2), although the occurrence of dental caries in young children do not necessarily involve pain, in particular, the incipient stage. The present study did not assess caries status of the children considering the situation of COVID-19 pandemic in the state and subsequent poor acceptance of both preschool providers and parents to oral examination of children, but it is worth noting that oral pain was reported more often in children with severe ECC (27).

In contrast to the expectation of significantly higher oral health-related impact among children with poor feeding status and patterns, the present study found no significant difference between feeding status/patterns and overall ECOHIS median score. Children OHQoL reporting by proxy should be treated as complementary as parents may under-report their and the children's experiences. Children who are still bottle feeding at the age of 5-6 are considered prolonged bottle feeding, therefore, expectation of increased OHQoL impacts to both children and parents are plausible because prolonged bottle feeding means prolonged exposures of tooth surfaces to drinks contained carbohydrates, favouring demineralization of dental enamel which may cause symptoms. Moreover, previous study found those who usually bottle feeding at night had higher ECOHIS mean score (28). Divaris (2012) also found higher ECOHIS mean score found among children who drink juice more than once daily (28) but it was not clear whether the consumption of juice was by bottle or other means such as sipping cup. After all, evident unhealthy feeding patterns in the study warranted strengthening of child feeding education.

CONCLUSION

Many preschool children were involved in prolonged, frequent and early introduction of bottle-feeding. The OHQoL impacts to preschools children and their parents were low. No significant difference in median ECOHIS scores found according to feeding patterns.

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