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Evaluation of the Oral Healthcare Programme during Pregnancy in reducing Dental Caries in young children in the district of Gampaha, in Sri Lanka

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ABSTRACT

Objectives: To evaluate the effectiveness of the National Oral Healthcare Programme for Pregnant Mothers in reducing Early Childhood Caries (ECC) in the district of Gampaha. **Methodology:** A descriptive cross sectional study was carried out in 2013 - 2014, among 558 mothers, having one year or 1 ½ year old child, attending Maternal & Child Health MCH clinics in Gampaha district. A structured interview was conducted with every mother and clinically examined the child for ECC. The effectiveness of the programme was determined by comparing the level of knowledge, attitude and practices on preventive measures of ECC between exposed and unexposed mothers to the oral healthcare package in pregnancy and ECC status of their children. Multivariate analysis was performed to treat the potential confounders. **Results:** Among interviewed, 41.8% (n=233) were exposed to the 'oral healthcare package' consisted of health education, timely referral, oral screening and completion of recommended treatments by a Dental Surgeon. The prevalence of early childhood caries among one year old children was 17.2% (n=46) while it was 32.4% (n=94) among 1 ½ year old children. The level of knowledge, attitude and practices on oral healthcare during early childhood was significantly higher in the exposed mothers than the unexposed (Adj. OR=6.2; 95%C.I.=4.16-9.34; P<0.01). The occurrence of ECC was also significantly less likely in the children of exposed mothers than the unexposed (Adj. OR=0.41; 95%C.I.=0.22-0.75; P<0.01). **Conclusion:** The antenatal oral healthcare programme is effective in prevention of ECC.

Key words: ECC, Effectiveness, Evaluation, Pregnancy

Introduction

Preserving a woman's oral health throughout pregnancy can promote the oral health of her children by decreasing the potential for early childhood caries (ECC). Early childhood caries is the term used for dental caries of the primary dentition of infants to young children between 0 to 72 months of age [1].ECC is an infectious and transmissible disease initiated by oral colonization of cariogenic bacteria mainly Streptococcus mutans [2].Children acquire these oral microorganisms during the first two to three years of their life by the persons in closest contact with it - typically the mother, and significant colonization happens only after the eruption of the primary teeth since they provide non-shedding surfaces for adherence. Early colonization of the oral cavity with streptococcus mutans bacteria has been associated with high rates of dental caries in young children [3, 4]. Research evidences show that maternal untreated caries increases the likelihood of developing dental caries in young children [5-7]. According to the dental caries pattern which was evident from the last National Oral Health Survey, 2003 in Sri Lanka, there was high caries experience in deciduous dentition of the children. The reported prevalence of early childhood caries (ECC) was 65% in five year olds. On an average each child in this age group experience more than three decayed teeth [8]. A study conducted by Shahim (2003) had further shown that the prevalence of ECC including non cavitated decayed teeth increased from

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23% to 65% between the ages one and two years in children in Sri Lanka and this sharp increase was attributed to the beginning of weaning practices of infants [9]. Those children with early childhood caries are subjected to recurrent oral pain, poor eating habits, speech problems and low self-esteem as well as being distracted in playing and learning activities. Furthermore, as a result of enforced extraction of poor quality primary teeth they can develop malocclusion in the primary dentition. The risk of future dental caries is also high among children with ECC. Dental caries marked the highest reported, identified health problem among school children in every year in the recent past in Sri Lanka according to the School Medical Inspections (SMI) conducted under the school health programme of Family Health Bureau. Moreover, maternal beliefs, self-efficacy and knowledge about appropriate oral health behaviour influence children's oral health behaviours [10]. The National Oral Health Survey of 2002-2003 in Sri Lanka providing information about the maternal oral health status has reported that 78.4% of the 34-44 year old age group have active dental caries [8].Therefore, ensuring direct access to preventive oral healthcare and treatment services by all antenatal mothers and their off springs are important for improving both the mother's and the child's oral health.Antenatal oral healthcare was known since the early 1970s. In 1972, an oral health promotion programme was started in Finland through Public Health Act and it comprised of oral health education at MCH clinics [11]. Today antenatal oral healthcare programmes are in place in many countries. Most of the states in United States (US) implemented successful oral screening and oral healthcare programmes for pregnant patients through integrated efforts with MCH care. The American College of Obstetricians and Gynaeocologists (ACOG) advises all the women to continue their 'usual dental care' even during the pregnancy as par with their perinatal guidelines issued in 2007. The American Academy of Periodontology also recommends all women to receive 'preventive dental care' as well as 'indicated therapeutic interventions' during pregnancy to maintain good oral health [12]. The Federation Dentaire Internationale (FDI) in its policy document in 2014 also stated that perinatal and infant oral healthcare are essential aspects of early intervention for good oral health and integration of oral health into primary healthcare using inter-professional and multidisciplinary approach will forecast the future of dental profession [13]. In Sri Lanka, Maternal and Child Healthcare is a major component under the National Family Health Programme (NFHP). It's a community based health care service targeted to mothers and children. Family Health Bureau is the national focal point for delivery of MCH care service. It is a free service that achieves high coverage particularly among low income groups, through antenatal, postnatal, family planning, well-baby and well-women clinic services. Only a minority of these women can afford to pay the high cost involved in oral care in private dental facilities. Earlier, antenatal oral healthcare in Sri Lanka was an "on-demand" service and intervened by therapeutic care, if the matter is very urgent. With the growing literature on evidence-based oral healthcare during pregnancy, a need aroused for an implementation of government funded, well organized comprehensive oral healthcare programme for antenatal mothers. As such, antenatal oral healthcare programme was introduced in Sri Lanka with the collaboration of existing Maternal and Child Health Programme (MCH) in 2009 with following specific objectives [14].

- Reduce complications of dental diseases during pregnancy.
- Prevent worsening of the existing oral diseases.
- Reduce the possibility of adverse pregnancy outcomes.
- Educate pregnant mothers about preventing dental caries in young children.
- Decrease early childhood caries by reducing the risk of transmission of caries causing bacteria to the newborn.

The present guidelines in Sri Lankan 'Pregnancy - oral healthcare package' recommends referral for dental clinic in the first antenatal clinic visit, receiving oral health education at the antenatal clinic, compulsory oral screening and completion of necessary clinical management for existing oral diseases before the delivery [14]. However, it is known that many women do not access dental care during pregnancy even though the importance and safety of dental care during pregnancy has been confirmed at national level as well as the global level [15]. Currently the information on 'Coverage' of dental services to pregnant mothers in Sri Lanka can be obtained from annual reviews conducted by the Family Health Bureau. According to the latest published data provided by the FHB in their Annual Health Report on Family Health, only 41% of registered pregnant mothers were screened by Dental Surgeons during the year 2013. Out of the screened 18% were found to have healthy dental hygiene, 58% had dental caries and 38% had gum diseases [16]. Evaluation of this oral health promotion programme for its effectiveness in prevention of dental caries in young children is needed to strengthen the current oral health promotion efforts and expand the services to reach all antenatal mothers and their off springs.

Materials and Methods

A descriptive cross sectional study design was adopted. The study was conducted among mothers attending MCH clinics with their one year or 1 ½ year old child in the district of Gampaha, Western Province, in Sri Lanka. All mothers those who were registered in the same MCH clinic centre by Public Health Midwives during their last pregnancy and their children in whom at least one deciduous tooth had erupted were eligible to be included in the study. Mothers whose last pregnancy was a multiple pregnancy were excluded. The sample size was calculated based on the prevalence of ECC in one year aged children (23%) available for Sri Lanka according to the study done by Shahim in 2003 [9]. Twenty MCH clinics were selected from the district using the systematic sampling method and 28 mother and child pairs were decided to select randomly from each clinic to obtain the total sample size of 560. A structured interview was conducted with every mother to gather required information on exposure status to the total oral healthcare package of the programme including oral health education, timely referral to the closest dental clinic and receiving obligatory oral screening and recommended treatment by a qualified Dental Surgeon. The exposure status was cross checked with the Pregnancy Record (512-A) and Child's age was validated using the Child Health Development Record. It was further assessed the mother's knowledge, attitudes and practices (KAP) on oral healthcare during early childhood and related information on several risk factors for early childhood caries. This component was developed referring to the oral health messages to be given to mothers regarding oral health of children, recommended by the published practice guidelines [14]. A scoring system was also developed to measure the level of KAP on oral health care during early childhood. The modified Delphi process was used to gain consensus from eight experts in dental public health in deciding the cut off points for satisfactory level of KAP. Clinical examination of (ECC) was scored using the diagnostic criteria developed by the National Institute of Dental and Craniofacial Research (NIDCR) - USA in 1999. They specifically recommended that 'at a minimum, the mean number of non-cavitated decayed (d_1), cavitated decayed (d_2), missing due to caries (m), filled (f) teeth and total dmfs (t) be reported' [17]. However, considering the ease of its use on young children in a non-clinical setting due to various practical problems, it was decided to use the dmft score in the present study instead of dmfs. Children with dmft score 'zero' were grouped as 'Without ECC' and those with dmft score 'more than zero' as 'with ECC'. All clinical oral examinations of the children aged one year and 1 ½ year were conducted by a calibrated Dental Surgeon (PI). The questionnaire was administered by two Dental Surgeons having previous work experience in Community Dental Units.The methods for clinical oral examination were based on the WHO's Guidelines for Basic Oral Health Surveys [18]. Oral examination of the child was done in the knee to knee position while he/she was comfortably seated on mother's lap.Caries assessment of each child was done under the natural light using a plain mouth mirror. A tooth was regarded as erupted, if any surface of it was present in the mouth. The dental caries status was assessed after the teeth were dried with cotton pellets. Examination was done using a minimum of equipments to obtain the maximum cooperation of the child. Therefore, the CPI (Community Periodontal Index) probe was used for examination only in cases where it was absolutely necessary for the caries diagnosis. These instruments were sterilized and packed before visiting the study area. The examination findings were recorded in an oral health assessment form by a trained recorder. All the analyses were done using the SPSS (16.0) statistical software package. Cross tabulations were done for the categorical variables and Chi-square test (Pearson) was performed to compare frequencies. A probability value (P) ≤ 0.05 was used to indicate statistically significant differences between two groups of exposed and un-exposed. Further, multivariate logistic regression analysis was used to treat the potential confounders. Ethical approval for the study was granted by the ethics review committee of the Faculty of Medicine, Colombo.

Results

The response rate was 99%.Two children were not cooperative for the clinical examination and their mothers were also reluctant to face the interview. Table 1 describes the socio-demographic profile of the mother and the index child. The median age of the group of mothers was 29 yrs with inter quartile range (IQR) of 25 to 32 yrs. Sixteen percent of mothers were in the risk category of pregnancy (<19yrs and >36yrs). The Sinhalese ethnic category comprised the largest proportion of the study sample (92.5%) and 3.8% and 2.7% was represented by Muslims and Tamils respectively. Both age groups of children were represented in almost equal proportions, approximately 50%.

Table 1: Distribution of mothers and children by socio-demographic characteristics

Variable	Frequency	
	No. (N=558)	%
Age at last pregnancy*		
<19	23	4.1
20-35	469	84.0
>36	66	11.9
Ethnicity		
Sinhala	516	92.5
Muslim	21	3.8
Tamil	15	2.7
Burghers & Other	6	1.1
Level of education		
Below G.C.E.O/L	55	9.9
G.C.E.O/L	286	51.3
Above G.C.E.O/L	217	38.8
Monthly family income		
Less than Rs.20,000	227	40.7
More than Rs. 20,000	331	59.3
Age of the child		
1 yr	268	48.0
1 ½ yrs	290	52.0
Sex of the child		
Male	278	49.8
Female	280	50.2

*Mean Age =28.84yrs (SD=5.34)/ Median Age= 29 yrs (IQR=25-32yrs)

Assessment of 'Exposure status' of the mothers to the 'Oral Healthcare Package'

Table 2 indicates the 'exposure status' of the mothers to the 'Oral Healthcare Package' of the programme. Among the mothers 41.8% (n=233) were exposed to the 'Oral Healthcare Package' consisted of oral health education, timely referral, oral screening and recommended treatment during last pregnancy.

Table 2: Distribution of the study sample by 'exposure status' to the oral healthcare package

Exposure Status	Frequency	
	No. N=558	%
Exposed		
- **Oral Health Education + Referral + Oral screening (found as healthy)**	65	**11.7**
- **Oral Health Education + Referral + Oral screening and treatment completed**		
- **Oral Health Education + Referral + Oral screening + treatment obtained and need further care**	81	**14.5**
	87	**15.6**
Partially exposed		
- **Only to Health Education&Referral**	11	2.0
- **Only to Oral Examination**	8	1.4
- **Only to Health Education**	8	1.4
- **Only to Referral**	1	0.2
Not exposed to any activity	297	53.2
Total	**558**	**100.0**

Table 3 compares the level of Knowledge, Attitudes, Practices (% KAP) between exposed and unexposed group of mothers to the oral healthcare programme. There was a statistically significant difference (P<0.001) in % KAP on oral health care during early childhood among mothers those who were exposed to the oral healthcare programme (51.5%) compared to those who were not exposed or incompletely exposed to the programme (15.1%).

Table 3: Comparison of level of Knowledge, Attitudes, Practices (%KAP) on oral health care during early childhood between exposed and unexposed groups

Exposure		(KAP of oral health care during early childhood) Not Satisfactory (0-69) No.	%	Satisfactory (>70) No.	%	*Significance
%KAP	Exposed	112	(48.5)	120	(51.5)	X^2=83.56
	Un exposed	276	(84.9)	49	(15.1)	Df=1 P<0.001

*Chi square test has been performed

Table 4 shows the regression results for the comparison of 'Level of oral health knowledge, attitude and practices on oral healthcare during early childhood' between exposed and unexposed groups of mothers.

Table 4: Regression results for the Comparison of 'level of Knowledge, Attitude and Practices on Oral healthcare during Early Childhood'between Exposed and Unexposed group of mothers

Dependent variable	Independent variables	Adjusted Odds ratio	P value	95% CI for Odd ratio	
				Lower	Upper
KAP status	Education level	0.71	0.11	0.45	1.09
	Income level	0.98	0.94	0.64	1.50
	Exposure to Oral care	6.24	<0.001	4.17	9.35

Logistic regression results indicated that the full model containing all control variables was statistically significant, X^2 (3, N=558) = 88.87, P< 0.001. It is indicated that the model was able to distinguish the level of knowledge, attitude and practices on oral healthcare during early childhood between exposed and un-exposed groups of mothers. It is important to note that in the final model, exposure to oral healthcare during pregnancy was significantly (P<0.001) associated with the level of Knowledge, Attitude and Practices on oral healthcare during early childhood after adjusting for the confounders such as education level and monthly family income (OR 6.2, 95% C.I:4.16-9.34).

Early Childhood Caries Status: Figure 1 shows the overall prevalence of early childhood dental caries among the one year and 1 ½ years old children examined.

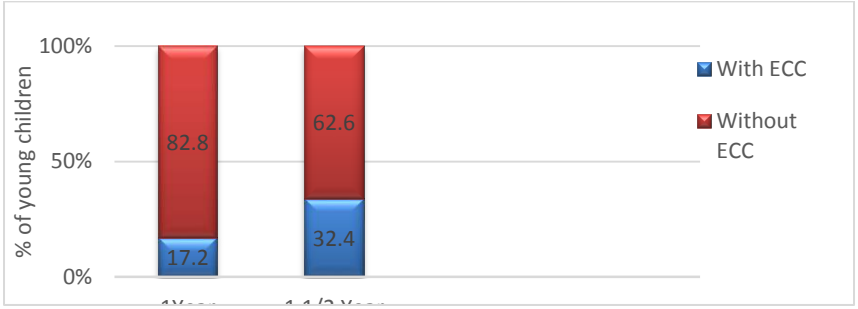

Fig 1: Distribution of the Study sample by ECC status of the children

The prevalence of early childhood caries among one year old children was 17.2% (n=46) while it was 32.4% (n=94) among 1 ½ year old children.

Mean dmft by Age

Table 5 shows the dental caries experience of the one year and 1 ½ year old children examined.

Table 5: Mean dmft by Age

Age in yrs	Mean'd_1'± SD	Mean'd_2'± SD	Mean 'm'	Mean 'f'	Mean 'dmft'± SD
1 Yr	0.36± 0.91	0.0	0.0	0.0	0.36± 0.91
1 ½ Yrs	0.98±1.54	0.04± 0.33	0.0	0.0	1.03±1.64

There were not any missing or filled teeth among the children examined. Therefore, the Mean 'm' and Mean 'f' components remained as zero. The Mean 'dmft'± SD was 0.36± 0.91among one year old children while it was1.03±1.64among 1 ½ year old children. The d_1 component (non cavitated decay) is the main contributor for the dmft value.

Comparison of ECC status of children in exposed and unexposed groups

Table 6 compares the occurrence of early childhood caries between the groups of children whose mothers 'exposed' and 'unexposed' to the oral healthcare package of the programme. It was significantly less likely to have early childhood caries in the children of exposed group of mothers (18.5%) than the children of un-exposed group of mothers (29.8%) to the oral health care package of the programme (P<0.01).

Table 6: Distribution of the 'ECC status' of the index child by their mothers' exposure status to the programme

Exposure status	ECC Status				Total		*Significance	
	With ECC (dmft> 0)		Without ECC (dmft = 0)					
	No.	%	No.	%	No.	%		
Exposed	43	**(18.5)**	190	(81.5)	233	(100.0)	X^2=8.773	
Not exposed	97	**(29.8)**	228	(70.2)	325	(100.0)	Df=1	**P=0.003**

*Chisquare test has been performed

Table 7 shows the regression results for the comparison of ECC status between exposed and unexposed groups of mother swhile controlling for the potential confounders.

Table 7: Summary table of logistic regression analysis for the comparison of ECC status between exposed and unexposed groups of mothers

Dependent variable	Independent variables	Adjusted Odds ratio	P value	95% CI for Odd ratio	
				Lower	Upper
ECC status	Age of child	2.69	<0.001	1.77	4.11
	Eruption time	1.26	0.27	0.83	1.90
	Chronic disease	1.06	0.82	0.62	1.79
	Syrup medication	1.78	<0.05	1.08	2.96
	Education level	0.88	0.58	0.57	1.37
	Income level	1.01	0.94	0.65	1.56
	Exposure to Oral care	0.45	<0.001	0.29	0.70

Logistic regression results indicated that the full model containing all control variables was statistically significant, X^2 (7, N=558) = 39.96, P< 0.001. As shown in Table 6 only three of the seven control

variables made a unique statistically significant contribution to the model (Age of the child, Long term syrup medication, Exposure tooral healthcare package). It is noted in the final model, 'exposure to oral healthcare during pregnancy' was significantly (P<0.01) associated with less occurrence of early childhood caries after adjusting for seven control variables (OR: 0.416, 95% CI: 0.229 - 0.754), indicating that the children of whose mothers exposed to the programme had lower level of dental caries than the unexposed group.

Discussion

An interesting aspect of importance of pregnant women's oral health and awareness on the prevention of early childhood caries was explored from the present study. The findings confirmed the effectiveness of the oral healthcare package in educating pregnant mothers on preventive measures of ECC and reducing the level of ECC in their children which is the commonest chronic childhood illness in Sri Lanka. Children whose mothers exposed to the programme had significantly higher knowledge, attitude and practices on oral healthcare during early childhood and a lower prevalence of ECC in their children. It is noted that 'exposure to total oral healthcare package during pregnancy' is a significant predictor for the less occurrence of early childhood caries in young children. The odds ratio of 0.46 (C.I: 0.30 – 0.71) indicates, if the mother had exposed to the total Oral healthcare package during pregnancy, the odds of her child getting ECC decrease by a factor of 0.46, while all other factors being equal. The other two control variables made significant contribution to the model were age of the child and long term syrup medication. It has shown that the children who were exposed to long term syrup medication are 1.79 times more likely to have ECC than those who were not exposed to the long term syrup medication (Table: 7). The significant reduction of caries in the children of exposed mothers can be attributed to the significantly higher infant oral care practices possessed by the exposed mothers such as early initiation of tooth brushing, twice daily tooth brushing, using a soft bristled tooth brush and checking up the child's mouth for early carious lesions. It was recognized a high potential to improve the oral health of children through targeting oral health promotion programmes for pregnant mothers. As the findings revealed, the one year and 1 ½ year old children in Sri Lanka carried a high tendency for early childhood caries. The prevalence was 17.2% (n=46) among one year old children,while it was 32.4% (n=94) among 1 ½ year old children (Figure 5). This finding was slightly different from the findings of a previous study conducted in Kalutara district in Sri Lanka by Shahim (2003). It was reported; the prevalence of ECC was 23.3% in the children of less than one year age group while it was 66.7% among the children between 1-2 year age group. The same NIDCR diagnostic criteria were used in both studies [9].According to the figures of dental caries experience, the Mean 'dmft' was 0.36 among one year old children while it was 1.03 among 1 ½ year old children. It was meant that on an average at least one tooth is decayed in every 1 ½ year old child. It emphasizes the fact that early and rapid caries development starts soon after the eruption of deciduous teeth.(Table: 5).Similar outcome of the present study in prevention of early childhood caries was evident in a study carried out by Gomez & Weber (2001) on effectiveness of a caries preventive programme over four years in pregnant women from their fourth month of pregnancy and their offspring. It has been reported 97% of caries free children in the group enrolled in the mother and child preventive dental programme compared with the 77% caries free children in the control group. There was a statistically significant difference between the groups in caries-free status and caries prevalence [19].Findings of the present study were further supported by another study carried out by Zanata et al in 2003 [20]. They investigated a group of pregnant women until their infants were two years in age. Both control and experiment group of expectant mothers received health education on diet and oral hygiene, clinical examination and basic dental treatments such as fillings. The experimental group also received antimicrobial solution and topical fluoride. Then the two groups were recalled at 6, 12 and 24 months after delivery and the same interventions were repeated at each time. Finally the dental caries status of the children was assessed at the age of two years and it was found the caries activity was higher in the control group (33.3%) than the experimental group (14.7%).Another prospective clinical long term study conducted by Meyer et al (2010) also clearly shown a positive effect of an early oral healthcare programme on the oral health of toddlers, children and teenagers supporting the present findings [21].In contrast to the present findings, a study conducted by Honorio et al (2009) has concluded that none of the mothers' attitudes regarding diet and oral hygiene or their caries prevalence had an impact on their infants' oral health [22]. The major short comings of the programme however identified was the low participation rate where only 41.8% of mothers exposed to all components of the oral healthcare package. This factor is crucial since the programme

was found to be effective. Programme managers thus have to improve the screening and treatment completion coverage of the programme by taking remedial action to eliminate all the barriers which prevent the mothers from obtaining dental treatments during pregnancy as well as the providers from avoiding or delaying the appropriate care within pregnancy. It is recommended to further strengthen the activities of the oral healthcare programme with correct monitoring and supervision to reach all the antenatal mothers. Further research should be recommended to explore the challenges and barriers for oral healthcare during pregnancy and early childhood considering both patient and provider perspectives. A considerable proportion of 1 yr and 1 ½ yr old children presented with early dental decay and thus the first two years of childhood have proved to be more at risk for ECC. It reinforces the need for a comprehensive health education package on oral healthcare in early childhood to be delivered to the mother during the pregnancy as well as the post natal period (preferably at the age of 4 to 6 months to the baby, just before erupting the first primary tooth of the child).A system should be developed to facilitate obligatory screening for early childhood caries and oral health risk assessment of children by the age of 1 year to prevent early and rapid caries development among young children. Enhancing the preventive oral healthcare services for young children by providing fluoride preventive care and counselling services for risk behaviour groups are also further recommended.

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