CHAPTER 6: CONCLUSIONS AND RECOMMENDATION

6.1 Conclusions

We intended to assess the effectiveness of a comprehensive health intervention program which integrated the aim of preventing ECC with improving the nutritional status / dietary habits (and thus general health) of preschool children in a high risk and disadvantaged community in Kelantan. ECC is a multifactorial disease, strongly associated with poor diets, poor oral hygiene habits and badly affected the health and physical development of young children leading to underweight and stunting in disadvantaged families with low incomes and large family sizes. To combat this problem from becoming more serious, a combination of oral health and nutrition education approach needs to be planned and implemented.

We can conclude, the present study confirmed that Early Childhood Caries (ECC) is a very serious public health problem in the preschool and toddler population in Kelantan. It confirmed the findings of The National Oral Health Survey of Preschool Children in 2005.

The present study found the proxy population (of 5-6 year old preschool children) in the two disadvantaged districts (Tumpat and Pasir Mas) had almost every child affected by caries (97.9%) and severely too, compared to the national average (ie. more than three-quarters of them have more than 7 teeth affected by caries). The majority of preschool children in the proxy population also had malnutrition problems consisting of majority underweight (36.1% WAZ), stunted (24.7% HAZ) and one-third underweight (31.1% BMI-for-age). The majority had nutrient intake which were not adequate as compared to the daily recommended intake. Added sugar consumption was three times higher (205.1%) than the WHO (2003) recommendation. For dietary habits of sugary foods and drinks; “MILO” (with sugar or sweetened condensed milk)

consumption had the highest FFQ score (FFQ 84.6) with the majority consuming it 2 to 3 times a day, followed by "*cokelat*" or all types of sweets (FFQ 75.3) with nearly one-half (43.5%) consuming 2 to 3 times a day and ice-cream (67.5%) with nearly one-thirds (26%) consuming it 2 to 3 times a day. The fruits and cariostatic food consumption was low and not adequate when compared to RNI (2005). More than one-half of parents in the proxy population scored in the "moderate" category in knowledge, attitude and practices. In conclusion, almost all the preschool children in the proxy population have poor oral health and some general health problem related to growth.

To combat this problem, a health promotion intervention package was formulated, called "Toddler Intervention Package for Total Oral Health Program" or **TIPTOP** program, was implemented aimed at reducing ECC through oral health education, support, reinforcement and dietary advice. It involved participation of the mother, child and a multi-disciplinary team of health promoters including a nutritionist. It was applied to toddlers aged 2-3 years old who were divided into two groups: the intervention group and control. At baseline, none of the 2-3 year olds recruited into the study in both groups had any caries to start with (dmft=0). At the end of the study period spanning over 18 months, the intervention group showed more positive oral health and general health improvements as compared to the control group which followed the usual toddler health program.

In oral health outcomes, the majority of toddlers in the intervention group (77.5%) had low (dft<3) or no caries (dft=0) as compared to the control group (only 58.5%). The percentage of caries-free children in the intervention group was double (37.5%), as compared to the control. The odds ratio of intervention group having Early Childhood Caries was lower (OR=0.805) than the control group.

In general health outcomes, nearly three-quarters (72.5%) of toddlers in the intervention group had normal WAZ, more than three-quarters (80%) had normal HAZ

and majority (87.5%) had normal BMI-for-age. While in the control group, only one-third (39%) of toddlers had normal WAZ, one-third (34.1%) normal HAZ and 39% normal BMI-for-age.

In nutrient and diet intake outcomes, there was improvement in energy, protein, calcium, iron, zinc and vitamin C intake of toddlers in the intervention group at the end of the study period. In addition, added sugar intake was reduced to nearly one-half (42.9%) from 88.7 % to 45.8% after 18 months of intervention period in the intervention group. In contrast, only protein, iron, zinc, vitamin C and vitamin A intake were improved in the control group after 18 months of study period. Furthermore, in the control group, added sugar intake has actually increased by about one-third at the end of the study period. Most sugary foods and drinks consumption in the intervention group improved (ie was reduced) from baseline to final intervention while the opposite occurred in the control group. There was a large improvement in intake of fruits/vegetables and cariostatic foods consumption among toddlers in the intervention group as compared to the control group.

In terms of knowledge, attitudes and behavior outcomes, the majority (82.5%) of mothers' knowledge score was high, two-thirds (65%) had high attitude scores and almost all (95%) had high practices scores in the intervention group after receiving the TIPTOP program package. In contrast, the control group which followed the existing toddlers oral health program conducted by Oral Health Division, Ministry of Health showed just over one-third (39%) with high knowledge scores, less than one-half (43.9%) with high attitude scores and slightly more than one-half (58.5%) with high practices score in the control group , at the end of the study period.

In conclusion, evidence from the present study suggests that the health promotion intervention through the TIPTOP package was successful in not only reducing early childhood caries (ECC) but also improving the general health

development indices in toddlers. In other words the integrated oral health and nutrition program has been proven in the present study to give a significantly positive result.

Therefore the hypothesis that the TIPTOP intervention programme is more effective in preventing ECC as compared to the existing oral health program for toddlers and that it has a positive indirect impact on general health status by improving the nutritional status and dietary habits of the toddlers involved in the program is accepted. In addition, the TIPTOP intervention program meant to prevent ECC also improved the mother's knowledge, attitude and practices related to ECC among their preschool children (2-3 years old).

Finally, the present study therefore supports the recommendations by Camargo *et al*., (2012) that it is very important to integrate oral health into maternal and child health programs because their study in Brazil found that rates of preschool dental visits were lower than the rates for medical appointments. Other factors which influenced routine visits were also very similar to the present study ie. Low incomes, educational level, maternal behaviour, pain in the last six months and a high number of decayed teeth.

6.2 Recommendation

This health promotion intervention study which attempted to integrate elements of diet, nutrition and oral health in an integrated TIPTOP package was the first such study done in Malaysia. However due to the relatively small sample size and limitations of maintaining logistics in a long-term longitudinal study, a larger sample size is desirable in future.

We took note that the proxy population sample and study sample (toddlers) are different individuals from different families. Ideally, it would be better to have individuals from the same family to have some control for dietary variations. However, it was not possible because not every family have children at two age cohorts for example aged 5-6 year and 2-4 year. We recommend that future studies should consider, if practically possible, the proxy population to be recruited from siblings of the same family to justify the assumption that if no intervention was carried out at age 2-3 years old, a high prevalence of early childhood caries will occur among future toddlers.

In the meantime, a long term co-operation and commitment from other disciplines based in community health centers in particular nutritionists, pediatricians, physicians and other allied health professionals such as community, public health nurses, midwives etc. are needed to ensure adequate general health as well as oral health at an early age of life.

We recommend the protocol of health promotion intervention must be standardized and institutionalized for this initiative to be sustainable in the long term. We recommend modifications to the already excellent existing toddlers' health program in order to enhance the outcomes. Effective features that can be incorporated into the existing toddlers program include digital photo record and prints, SMS reminder services, patient friendly support policy for regular health center visits and targeted individualized home visits for high risk toddlers.

On the other hand, it was also observed that about 62.5% of the intervention group still experienced some caries although at a low and moderate category. These findings indicate the need for further improvements in future intervention study, with greater attention to the dietary behavior in particular of added sugar (and perhaps much hidden sugars too) to the child's food and drinks, as a sweetener, non-carbonated drink, candies, sweet sugary snacks and high-fat foods. The encouragement to take more fruits, vegetables, cariostatic foods and high-quality meals are also needed.

Early sessions of advice to expectant mothers with improved health education protocols need to be established and strengthened to advise pregnant women about healthy diets and provide guidance on infant feeding, emphasizing the value of breast feeding and the necessity of restricting nighttime bottle feeding and pacifiers to decrease ECC risk.

Involvement of other family members in the health promotion intervention activities will ensure more social support in lifestyle behavior modification such as dietary change, increasing the child's tooth brushing frequency as well as the whole family etc. For example, the periodic SMS message reminder service could be sent to everyone in the family instead of just the mothers so that everyone is involved. It is relatively cheap, easy and can be sent at any time.

We envisage that the greatest challenge would be how to maintain and sustain the initial good outcomes of oral and general health once the intervention study has stopped. The strength of the TIPTOP program was that it has provided empowerment for participants (mothers and child) to continue the existing health maintenance activities for general health and oral health in the long term. The TIPTOP program emphasized the importance for participants to sustain and integrate their healthy behavior in all aspects of their personal life. As a consequence, health behaviors are

sustained and long term improvement in health status will reduce their health care costs and improve their overall quality of life.

However in the long term, overall improvements in the social and economic conditions of the population have been shown to have significant impacts on health, including oral health, because socio-economic inequality in child oral health exist within developed countries and between countries with different levels of development (Do, 2012). It is therefore imperative that more social development should be channeled to these districts in Kelantan in order to reduce the health inequalities.

We also proposed that in order to gain a better understanding and insight into manpower and financial implications if TIP TOP program is to be implemented nationwide, an economic costing evaluation to measure the cost-benefit and cost-effectiveness of the new TIP TOP program as compared to the existing toddler oral health education program by the Ministry of Health need to be performed.

Finally, future social science research are also recommended to develop tailor made education and counseling methods unique to the needs of poor families based on family demographics, cultural/ethnic practices, food related environmental issues, preferred mass communication methods and potential use of advances in modern communications technology as they evolve and be accepted by society. We have shown that ECC is preventable through the TIPTOP program and the knowledge to deal with it is known. It is how we package and market the health promotion intervention for the client that makes the difference.

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