A health education program for the prevention of dental caries of preschool children

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Recently in Japan, the highest incidence rate of dental caries have been shown among infants, school age children, and even among adults in comparison with other diseases. The result from an investigation into the actual incidence of dental diseases (ministry of Health and Welfare, 1970), is shown in Figure 1. As for milk teeth, the average number of dental caries per person in Japan was higher than that of West Germany, the United States, and Denmark.

In Japan, when mothers noticed an outbreak of milk teeth caries in their children, some tried to take their children to the dentist's office. However, when this was attempted, almost all of them were surprised at the amount of time it took to make an appointment, and to see the dentist. For mothers, especially working mothers, this was very inconvenient. Others ignored the

caries until the decayed teeth fell out, and the permanent teeth cut. These mothers thought that when dental caries in the milk teeth disappeared, there would be no after effect on the cutting of the permanent teeth. But milk teeth caries have various detrimental influences on the cutting of the permanent teeth and on normal emotional and physical growth during the early child development stages. Therefore, it is significant that prevention of dental caries in milk teeth be started early.

It is a popular belief that the outbreak of dental caries has a relationship with the amount of sugar that is consumed. This idea is not too divergent from the research results of many epidemiologists who found that sugar was the most significant factor, among three factor, for the cause of dental caries. The other two factors being streptococcus mutans and a contaminated oral environment (Keyes, 1969). With this information, in order to prevent dental caries in children, people generally thought that excluding sweets and soft drinks as snacks was the only way. This idea was supported by the well known fact that the prevalence rate of dental caries in Japan decreased during World War II when people could not obtain

Fig. 1 Incidence Rate of Dental Caries
in Milk Teeth and Permanent Teeth

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sugar. But now, with its easy availability and accessibility, to decrease the use of sugar in our daily lives would be very difficult. Even if we did, it would not be healthy for children from the standpoint of mental hygiene. In addition, even if we could avoid sugar, it would not prevent dental caries entirely because of the other factors involved e.g., streptococcus mutans, a contaminated oral environment, etc.

Two of the authors, Tsubura and Ishii, noticed the following patterns from epidemiological surveys done on dental troubles in children who were cared for in nurseries in 1971. These children had been taken care of before their milk teeth had begun to cut, and had had no dental caries. But, some of the children who had experienced staying overnight outside of their homes suffered from dental caries (Ishii, et. al., 1975). From these results and other data, the researchers found that whether the children suffered from dental caries or not, was influenced by the ways they led their home lives in nurseries before their teeth began to cut. At the nurseries, the children were given similar snacks as one would find in the average home, e.g., cookies, sweets, fruits, soft drinks, etc.

The authors believed that in order to prevent dental caries in children, leading a normal home life i.e., establishing a normal healthy daily routine, especially as to the intervals of meals and snack, eating time, etc., would be the most appropriate and effective way in promoting and maintaining health from the viewpoint of the life sciences (Nohara, 1977a,b,c).

Leading a normal home life is heavily influenced by the amount of effort given by

each mother and the other family members. So, because the detrimental effects of dental caries during the early child development stages result later in a loss of time and money, it was thought that the young mothers should be fully aware of this situation and should be taught the correct attitudes and skills in order to help their children lead a normal home life. Thus our role has mainly been to encourage and to help the young mothers gain the appropriate knowledge and skills.

The authors planned and carried out field work to assess the present condition of dental health, and to evaluate their prevention theory through the use of a health guidance and health education program.

In this paper, the authors intend to report mainly on the outline of the survey, the way they contacted the subjects, the present level of participation, and the effectiveness of the health guidance and health education program.

Purpose

The purpose of this study was to prevent milk teeth dental caries in children by having them lead normal home lives in accordance with their developmental stage. This would contribute towards promoting the healthy growth of the child because a normal home life must be balanced during each developmental stage.

When a tooth is just beginning to cut, the surface organization of the tooth is not completely hardened. Because it takes approximately 3 years until the surface becomes hardened (Shioda, 1973), during this period, the tooth is the most vulnerable to an outbreak of dental caries. For this reason, this 3 year period is the most impor-

tant time for preventing dental caries. The first milk tooth usually cuts through the gums at about 6 months after birth. During the 3 years when the last permanent teeth cut, leading a normal home life must be begun from at least 6 months of age and continued to about 15 years of age. If a child continues to lead a normal home life for such a period of time, he will continue in this manner for the rest of his life.

Methodology

The subjects were selected from a group of pregnant women who lived in Musashino City, and who attended the mother's class at the Musashino Health Center from July 1974 to July 1977. Musashino City is located on the outskirts of the Tokyo Metropolitan area. The population as of July 1, 1979, was 135,123, with 67,946 males, and 67,177 females.

The observation period for each child was from 6 months after birth through preschool age. The survey will continue for a period

Table 1 Mother Questionnaire Responses

a) Age of Mother and Stage of Pregnancy

Age of Mother	3	4	5	Mother Pregnant	6	7	8	9	10	UK	Total
19											
21				1	2	1	1				5
23		3		10	10	11	3				37
25	3	1	6	16	29	25	12	2		1	95
27		2	8	30	33	30	17	2			122
29		3	9	19	18	11	7	1			68
31		1	1	6	4	4	4				20
33			2	4	4	2	2				14
35				1	3	1			1		6
Over 36									1		1
Total	3	10	26	87	103	85	46	7		1	368

b) Age and Education of Mother

Age of Mother	9	Years of Education	10-12	13	N	Total
19						
21		2	2	1		5
23	3	21	9	4		37
25	6	31	52	6		95
27	6	41	68	7		122
29	2	26	33	7		68
31	2	6	11	1		20
33	2	6	4	2		14
35	3	1	2			6
Over 36		1				1
Total	24	135	181	28		368

c) Employment Status of Mother

Employed	28
(including part time)	
Unemployed	326
No Response	14

d) The Rank of the Current Fetus in Comparison to Other Siblings

1st child	331
2nd child	33
3rd child	3
4th child	1

of 10 years starting in 1974 and ending in 1984.

The mother's classes are officially held in each district health center throughout Japan. At the Musashino Health Center, they are held every month, with the exception of January and August. Dr. Tsubara, the oral hygiene lecturer, emphasized the importance

of the mother's role in preventing dental caries in their children. She also stressed the harmful effects of dental caries on the child's development, and the advantages of not having dental caries. Our survey was explained to the subjects, and they were asked to complete one for each meeting. The questionnaire, which surveyed eating

Table 2 Content of Childrearing Meetings

1.	Certify names of subjects and age of child in order to decide which group they belong.
2.	Distribute questionnaire to mothers according to the developmental stage of child.
3.	Mothers complete questionnaire.
4.	Check teeth of children for cutting, dental caries, set of teeth, etc.
5.	Education and guidance in preventing dental caries. <ul style="list-style-type: none"> ◦ Knowledge of growth stage patterns. ◦ Setting of awakening and sleeping times. ◦ Setting of three meals and two snacks. ◦ Eating habits (refer to Table 3).
6.	Encouragement of establishing friendship bonds in order to decrease probability of dropping out of study. <ul style="list-style-type: none"> ◦ Participant name list distributed to each member. ◦ Each subject introduced to group.
7.	Measure height and weight of all children if requested by mother.
8.	Consultation in childcare.
9.	Announcement of next meeting.

Table 3 Outline of Eating Habits for Leading a Normal Home Life

Preparation of Food	Time Consideration/Other
1. Balanced diet in accordance with each developmental stage. <ul style="list-style-type: none"> ◦ 6 month stage <ul style="list-style-type: none"> — Suggestions in weaning diet i.e., materials, preparation, etc. — Meal and amount of milk drunk ratio. — Reducing to the use a nursing bottle (to prevent dental caries caused by the use of a nursing bottle). ◦ After weaning period <ul style="list-style-type: none"> — Meal and material suggestions e.g., seaweed, vegetables, volume of milk, etc. 	1. Discipline during meals i.e.. In order to finish eating in a normal period of time, mothers must arrange the environment properly and make her child concentrate on eating. <ul style="list-style-type: none"> ◦ Time limits of meals and snacks <ul style="list-style-type: none"> — Milk. . . drunk within 15 minutes. — Meals . . . eaten within 30 minutes. — Snacks . . . eaten within 15 minutes.
2. Seasoning suggestions e.g. light salt and sugar (effective in preventing an unbalanced diet, and so called adult's diseases in the future.)	2. Miscellaneous snacks. Food eaten at anytime other than for meals or snacks are to be restricted to a cup of tea or water without sugar.
	3. Cleaning of the oral environment <ul style="list-style-type: none"> ◦ Rinse out mouth (when child is able to do so). ◦ Drink water.

habits, included diet, tastes in food, and their awareness in preventing dental caries etc. When a pregnant woman mailed back the questionnaire, she and her unborn child were counted as one subject. When there was a foetal death, the subject was dropped from the study. The number of responses at the affirmation of birth was 368. The attributes of the mothers are shown in Table 1 (a-d). As the study progressed, new entries of mothers and their children were added as subjects. Their data are treated separately, and are excluded from this report.

Each child's teeth had been checked at 6 month intervals, beginning at the age of 6 months after birth and continuing through preschool. Twice a year, in accordance with their stage of development, these children had been brought to a childrearing meeting. The content of some of these meetings are shown in Tables 2&3. Each meeting concentrated on one aspect of childrearing, which mother should be carried out at least.

Results and Discussion

Each subject (mother and child) were required to attend a childrearing meeting every 6 months during the preschool period

of the child. Each subject had the chance of being contacted three times to participate in each meeting when necessary when they did not respond to the prior contact. Each meeting was held during the following corresponding months of age after the birth of the child: 6, 12, 18, 24, 30, 36, 42, 48, 54 (4½ years), 60 (5 years), 66 (5½ years), and 72 (6 years). Figure 2 is a model of the contact process showing an example of the attendance after the first, second, and third contacts at the first two meetings.

At the first meeting (6 month stage) mothers were asked to participate a child-rearing meeting and reply by postcard. This was the first contact. Not all were present at the meeting. Also, a small number of the subjects were dropped from the group, as is shown at the bottom of the graph. The following month after the first meeting, those who were absent were again contacted and asked to participate in a childrearing meeting and again asked to reply by postcard. This was the second contact with the subjects. By this time, however, the children were 7 months of age. If the subjects had not attended a childrearing meeting after this second contact, then a third contact was

Fig. 2 Model of Contact Process

made in much the same way as the second one had, the following month. All those subjects who participated in these meetings as a result of these three contacts were regarded as participants of the first meeting i.e., the 6 month stage meeting. Those subjects who had not taken part during this first meeting i.e., the 6 month stage meeting, remained on the list of subjects because they were asked to participate in the next meeting i.e., the 12 month stage meeting when the children became 12 months old. And so the contact process was begun and repeated again.

The total number and percentage of postcards sent and returned at each con-

tact is shown in Table 4. By the end of July, 1979, this survey had run for 5 years and 1 month. During this period, all meetings during the 6 month, 12 month, and 18 month stages had been completed. Since all of the subjects did not participate at the same time, the developmental stage of all the children varied.

The average number of participants who returned postcards for the first 3 meetings (6, 12, and 18 month stages) was about 30%. The observation of these 3 meetings showed the average number of postcards sent was about 2 times the number of subjects. For example, at the 12 month stage, the total number of postcards sent was 614,

Table 4 Number of Postcards Sent and Returned

Meeting by Developmental Stage of Child	Number of Postcards Sent and Returned					Total N
	Card Status	First Contact	Second Contact	Third Contact	Total	
Affirmation of Birth	Sent Returned	368 299(81.3)	59 40(67.8)	11* 4(36.4)	438 343(78.3)	438/368:1.19
6 Month Stage	Sent Returned	323 101(31.3)	214 66(30.8)	124 22(17.7)	661 189(28.6)	661/323:2.07
12 Month Stage	Sent Returned	313 116(37.1)	185 55(29.7)	116 16(13.8)	614 187(30.5)	614/313:1.96
18 Month Stage	Sent Returned	297 113(38.0)	170 34(20.0)	114 16(14.0)	581 163(28.1)	581/297:1.96
24 Month Stage	Sent Returned	223** 82(36.8)	134 21(15.7)	95 13(13.7)	452 116(25.7)	—
30 Month Stage	Sent Returned	160 57(35.6)	90 14(15.6)	63 7(11.1)	313 78(24.9)	—
36 Month Stage	Sent Returned	118 28(23.7)	86 16(18.6)	65 7(10.8)	269 51(19.0)	—
42 Month Stage	Sent Returned	87 17(19.5)	63*** 3(4.8)	51 6(11.8)	201 26(12.9)	—
48 Month Stage	Sent Returned	44 11(25.0)	29 3(10.3)	23 3(13.0)	96 17(17.7)	—
54 Month Stage	Sent Returned	15*** 0(0.0)	12 1(8.3)		27 1(3.7)	—
Total	Sent Returned	1948 824(42.3)	1042 253(24.3)	662 94(14.2)	3652 1171(32.1)	—

Note: * --- including 1 case which responded to 4th communication
 ** --- excluding 3 cases } which were present at the meeting before
 *** --- excluding 1 case } their corresponding months

() ----- shows percent of responses to postcards

which was about 2 times the number of eventual subjects (313). Also from this table, it can be seen that the first contact for each meeting showed the highest number of returns. In contrast, as can be expected, the third contact showed the lowest response (under 20%) for all the meetings (Nohara, et. al., 1978a). (The 24 month and above meetings have not yet been completed). From these results, since the first contact was seen as the most effective and the second and third contacts had the function of maintaining contact with the subjects.

Table 5 shows the number of subjects present during the meeting at each developmental stage. The number of participants and the participation rate for each meeting is shown in the last two columns of Table 5. These rates show an almost 60% participation rate. The 12 month stage meeting was the highest with 59.6%.

Table 6 shows the number of the subjects who had dropped out of the study during the past 5 years. At the beginning of the study, the number of mothers was 368. At the time of the first meeting, the number had decreased to 330 because 38 mothers had dropped out. The explanation for these drop outs is shown in Table 6 (Nohara, et. al., 1978b). A subject that was considered a drop out was one that fell into one of three categories; feotal death, change of residence, or the situation where the post-card was returned by the post office. (As mentioned before, all those subjects who did not participate in the meeting were still considered to subjects who were contacted for the next stage meeting). For the 12 month stage meeting, the number of participants decreased to 314. Since the childrearing meetings will continue for 4 more years and as the participation rate continues to decrease,

Table 5 Number of Subjects at Each Meeting

Meeting by Developmental Stage of Child	Total Number of Subjects	Number of Subjects at Each Meeting (Age of Child)			Total Attendance	Participation Rate
		Past Criteria*	On Criteria	Before Criteria		
6 Month Stage	330				189	57.3(%)
12 Month Stage	314				187	59.6
18 Month Stage	297	295	2		163	54.9
24 Month Stage	278	214	11	53	119	—
30 Month Stage	270	148	12	110	78	—
36 Month Stage	254	111	6	137	51	—
42 Month Stage	251	75	11	165	27	—
48 Month Stage	246	37	6	203	17	—
4.5 year Stage	245	0	14	231	2	—

* Criteria = Target Date i.e., correspondence of age of child to appropriate meeting e.g., 6 months = 6 month meeting (on C).

the definite number of subjects at each developmental stage is not yet clear. (The data for the 5 year, 5½ year, and 6 year stage meetings were not yet completed as of the end of July, 1979).

Almost all of the subjects who had dropped out, did so due to a change of residence. But, there were some subjects who moved from Musashino City and continued to participate in the study, even though it took them more than 2 hours to reach the Musashino Health Center.

There were many factors that influenced participation at each meeting e.g., weather, temperature, vacation, season, the physical condition of the child, conflicting engagements, etc. (The authors presented these factors at the 43rd General Meeting of the Japanese Society of Race Hygiene).

From these results, it seems that participation in the meetings during each developmental stage depended on the mother's

awareness of whether she thought dental health care was important or not.

How many mothers knew the different methods of preventing dental caries (X/N), how many practiced the prevention of dental caries (Y/N), and how many mothers knew how to prevent dental caries and so put this knowledge into use (Z/X)? This data is shown in Figure 3. As to knowledge, at the 6 month stage, the most mentioned method was oral cleaning mainly rinsing mouth and brushing teeth (64.6%). The next most frequent response was limitation of sweets (47.1%). As to actual practice, during the 6 month stage, again the most frequent response was limitation of sweets (25.9%).

In contrast, the mothers pointed out a more varied range of responses when their children reached the 36 month stage. All the categories showed a much higher percentage than the responses at the 6 month stage. The item which had the highest response

Table 6 Number and Reasons of Dropouts

Meeting by Developmental Stage of Child	Number of Subjects	Reasons for Dropping Out			Total
		Address* Unknown	Change of Residence	Foetal Death	
6 Month Meeting	330	7	8	1	16
12 Month Meeting	314	9	7	1	17
18 Month Meeting	297	9	10		19
24 Month Meeting	225	7	1		8
30 Month Meeting	161	11	2	3	16
36 Month Meeting	118	2	1		3
42 Month Meeting	87	1	2	2	5
48 Month Meeting	44	1			1
4.5 Year Meeting	15				

* Returned by Post Office

was leading a normal home life (100%) in the area of relationship of knowledge and practice (Z/X). This means that of all those mothers with children 36 months of age who knew that leading a normal home life i.e. establishing a normal healthy daily routine, was effective (X=30), were also the same group of mothers who said that they put this knowledge into practice with their children in their daily lives (Z=30). (The total number of mothers who practiced this method without knowledge of its usefulness was Y=49.

N=51.). As can be seen from Figure 3, it seems that our health guidance and health education program had been effective in communicating the knowledge and practice in preventing dental caries in children from the 6 month stage to the 36 month stage.

As for current habits, what was the amount of increased practice compared to the last meeting? At 12 months of age, (see Fig. 4), oral cleaning and leading a normal home life showed a response of nearly 70% and limitation of sweets, and limitation in the use

Fig. 3 Effect of Health Guidance and Health Education Program on Knowledge and Practice in the Prevention of Dental Caries

of a nursing bottle showed a response rate of 65.8%. (This last item was stressed as a major point at the 6 month meeting). About half of the mothers' current practice showed an increase as compared to the last meeting. As to the 36 month stage, various kinds of items showed a higher practice rate than the same items did at the 12 month stage. However, practice from the last meeting (30 month stage) showed a smaller percentage compared with that at the 12 month stage. From these results, it seems that as the child develops, mothers unconsciously are practicing the prevention of dental caries

in the normal home lives of their children.

Summary

The authors supported the theory that leading a normal home life i.e. establishing a normal healthy daily routine especially as to eating, e.g., intervals of meals and snack, eating time, taste preferences, etc. was the most effective method in the prevention of dental caries in children. This method was also effective in promoting and maintaining health from the viewpoint of the life sciences.

The field survey has been planned and is being carried out in Musashino City for a

Fig. 4 Effect of Health Guidance and Health Education Program on Practice In the Prevention of Dental Caries as Compared to the Last Meeting

period of 10 years, from 1974 to 1984, in order to make a survey of the present incidence of dental caries in children, and to evaluate the theory of prevention through the use of a health guidance and health education program.

A mother and her child was considered as one subject. At the first meeting, when the child was 6 months of age, there were 330 subjects. Observations were made at 6 month intervals beginning at 6 months of age and continuing through preschool. Postcards were used to contact the subjects. If the individual did not participate after the first contact, a second and if necessary, a third contact was made. The highest rate of participation was after the first contact. The rates of participation was nearly 60% at the first three meetings (6, 12, and 18 month stages).

On various kinds of items, it is shown that the health guidance and health education program has been effective. The long term survey is just about half completed, and so the authors cannot clearly make conclusions at this point. Preventing a decline in the number of subjects and evaluating the effectiveness of the health guidance and health education program are the main goals of this survey.

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References

- Ishii Kinnichi, Tsubura Fumi et.al. (1974a): Ha To Ikuji (Teeth And Childcare), MDA, (91), 2-11
- Ishii Kinnichi, Tsubura Fumi et.al. (1974b): Ha To Ikuji (Teeth And Childcare), MDA, (92), 2-14
- Ishii Kinnichi, Tsubura Fumi (1975): Nyuuyohji No Ushyokumenneki Ni Tsuite No Kohsatsu - Nyuujin Ni Okeru Ekigakuchyohsa - (Observation On Immunity For Dental Caries Of Infants - A Epidemiological Survey At Nursary Homes -), Shiyoh, 23(1), 17-22
- Keyes, P.H. (1969): Present And Future Measures For Dental Caries Control, J.A.D.A. (79), 1395-1404
- Ministry Of Health And Welfare, Japan (1970): Shika Shikkan Jittai Chyohsa (An Investigation Into The Actual Condition On Dental Diseases)
- Nohara Miyoko (1977a): Ha To Shyohgai Kenkoh (Teeth And Health Through Life), Quintessence Journal, 1(7), 7-12
- Nohara Miyoko (1977b): Ha To Shyohgai Kenkoh (Teeth And Health Through Life), Quintessence Journal, 1(8), 7-16
- Nohara Miyoko (1977c): Ha To Shyohgai Kenkoh (Teeth And Health Through Life), Quintessence Journal, 1(9), 7-12
- Nohara Miyoko, Tsuchiya Motoi, Ishii Kinnichi, Tsubura Fumi (1978a): Nyuuyohji No Ushyoku Yoboh Ni Kansuru Kenkyuu - Dai 6 Pohh - (Study On Prevention Of Dental Caries Of Children - Report 6 -), 44 (supplement), 70-71
- Nohara Miyoko, Tsuchiya Motoi, Tsubura Fumi, Ishii Kinnichi (1978b): Nyuuyohji No Ushyoku Yoboh Ni Kansuru Kenkyuu - Dai 7 hohh - (Study On Prevention Of Dental Caries Of Children - Report 7 -), 44 (supplement), 72-73
- Shioda Kenji (1973): Enamel Shitsu No Kohzoh To Ushyohku No Hassei (The Structure On Quality Of Enamel And Outbreak Of Dental Caries, J.J.D.A. 26(9), 54

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〔和文抄録〕

乳幼児期のう歯予防のための健康教育

野 原 三洋子 土 屋 基 粒 良 フ ミ 石 井 欣 一

わが国におけるう歯の発生は、幼児期より急激な増加を示し、就学期には高い罹患率を示している。めざましい成長発達を示すはずの幼児期におけるう歯の多発進行は、幼児の身心の発達に好ましくない影響を及ぼすことが知られている。従来う蝕の発生には蔗糖が極めて深く関与していることが知られ、極端な甘味制限と歯磨きの徹底が唯一の予防法と考えられてきた。Keyes.P.H は疫学的な観点から、う歯の発生に汚染された口腔内環境、ミュータンス球菌の存在及び蔗糖の存在の3つをあげている。現代のわが国の社会情勢の中で、蔗糖を摂取せぬための極端な甘味制限は極めて困難で、たとえ実行出来たとしても成長期の幼児の精神衛生上問題が多い。また徹底した歯磨きについてもう歯発生の予防効果が明確でないばかりでなく、かえってエナメル質を傷つける事になる場合も出てくる。う歯発生の予防が、現代の日常生活の中で、できるだけ無理なく自然にできること

がのぞまれるわけである。粒良、石井は乳児院における疫学調査より、食生活を中心とした規則正しい生活がう歯発生予防に効果的であるという事を考察した。そこで著者らは、この理論の実証を一般家庭における幼児で行なうべく東京都武蔵野保健所で開催された1974年7月から約3ヶ年の母親学級受講者のうちから希望者をつのり、「むし歯予防のつどい」一母親講座を月1回年10回開催してきている。対象者は出産確認のできた母子一組を1対象者として330から出発した。そして子供の対象者の生後6ヶ月から就学前まで経年観察をし、現在にいたっている。本研究では1.開催通知連絡とその対応一出席率一と対象者数の推移、2.毎回のつどいにおける健康教育の方法とその効果についてをつどいのほぼ終了している6ヶ月、12ヶ月、及び18ヶ月のグループについて検討し、6ヶ月毎の健康教育が効果的であるという結論の一端を得た。