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Buddhi Bangara Project on oral health promotion: a 3- to 5-year collaborative programme combining support, education and research in Nepal

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Knevel RJM, Neupane S, Shressta B, de Mey L. Buddhi Bangara Project on oral health promotion; a 3- to 5-year collaborative programme combining support, education and research in Nepal.

Abstract: *Objective:* The overall purpose of the Buddhi Bangara Project (BBP) is to investigate if oral health promotion (OHP) will be a realistic way to improve the oral hygiene and dental awareness of Nepalese schoolchildren aged 5–12 years. This study is the first aspect of the overall project. Dental hygiene students from Kantipur School of Dentistry, Kathmandu and the Dental Hygiene Programme at the INHOLLAND University in Amsterdam were actively involved in this assessment phase as well as the implementation phase which included oral health education activities. This descriptive study is the first phase of a larger longitudinal study directed towards improving the oral health of children in Nepal. *Methods:* The first phase involves the assessment of children in several schools, one of which acts as a control group. It is directed toward the baseline data collected prior to the implementation of the OHP initiatives. Qualitative data on knowledge about oral health was collected through observations and a questionnaire. The World Health Organization community index of treatment needs was used to assess the clinical status of the participants. *Results:* The data show that knowledge about preventing oral diseases is high, but awareness about the benefits of fluoride is low. It also suggests that the oral health of the examined children is affecting their quality of life in several different ways. The social status of participants appears to influence their dietary intake as well as their choice of professionals to visit when experiencing pain. *Conclusion:* It appears that children in Nepal have oral health problems and oral health does appear to influence their quality of

life. The impact of the OHP activities have yet to be determined.

Key words: campaigns; care; collaborative approach; collective; dental hygiene education; dental hygiene research; developmental countries; knowledge; oral health; prevention individual; problems; research; status

Introduction

A Bulletin of the World Health Organization (WHO) in September 2005 states that provision of health information alone has not been shown to produce long-term behaviour changes. Isolated interventions, which merely focus on changing oral health behaviours, are not likely to achieve sustainable improvements in oral health and mass media are generally ineffective in promoting either knowledge or behaviour change (1).

Oral health promotion efforts should not be solely focussed on influencing the general public or schools. It is equally important to target decision-makers and influential individuals in the local community such as head teachers, local politicians or community (2, 3).

The 'Buddhi Bangara Project (BBP)' (buddhi bangara means wisdom teeth) started in 2005. The project combines support, education and research. It aims to motivate the Nepalese people's awareness of oral self-care and to promote community involvement in oral health education programmes.

Through this project the development of dental hygiene education and the profession in Nepal are also supported (4). The project involves people at many levels. Its aim is to provide support without creating dependency.

Health promotion and evaluation

In the Ottawa Charter the key areas of health promotion are outlined as follows: promoting health through public strategy, creating supportive environments, developing personal skills, strengthening community actions and reorienting health services (5). To assess the quality of oral health strategies the WHO presented criteria (1, 6). These criteria are described in Fig. 1.

It is widely acknowledged that the quality of oral health promotion (OHP) evaluation is generally weak and that evaluation of OHP activities is a complex and difficult task. There is a change in emphasis from oral health education towards a broader OHP approach (7).

Evaluation designs should be relevant to the stage of development of a programme. Evaluations need to be tailored to suit the activity and the circumstances of individual programmes. Is has been shown that programmes are best evaluated employing a combination of different research methodologies (quantitative and qualitative (8).

It is also important that clinical aspects as well as the impact on oral health-related quality of life are being evaluated (2). The OHP evaluation outcome model modified from Nutbeam is an excellent point of reference for this project. This model describes a variety of evaluation measures:

- health and social outcomes (morbidity, quality of life and equity);
- intermediate health outcomes (healthy lifestyles, effectiveness of health services and healthy environments);
- health promotion outcomes (health literacy, social influence and action, healthy public policy) and
- health promotion actions (education, facilitation and advocacy) (7).

This model was used to help structure the project as well as the evaluation study conducted within the project.

Multi-level preventive and cooperative approach

Most dental Non-governmental Organisations (NGOs) are characterized by curative approaches based on technical interventions and the integration of the local community is often very low (9, 10). In developing countries treatment with traditional techniques is too costly and not realistic. Hence, the focus of the BBP is directed towards health promotion rather then treatment. Basic emergency care will always be a great priority. However the BBP project is not about treating as many patients as possible. It is based on the importance of making a contribution towards the training of local health workers (9, 10) Disadvantaged populations need access to simple oral health care combined with information and preventive activities. This type of care, delivered by assistants or health-care workers in the community, rarely becomes a reality (9).

Programmes need to be adapted to ensure that they are integrated and accepted by the host community. Furthermore efficiency needs to be improved; communities as a whole need to benefit from such projects in the long term (7, 9). To reach

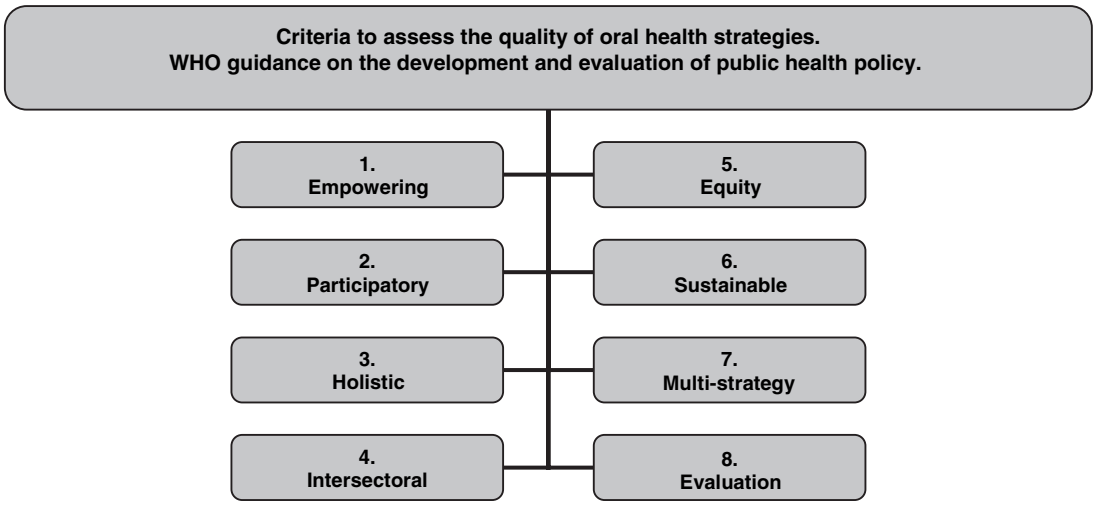

Fig. 1. Criteria to assess the quality of oral health strategies.

larger parts of the population, the BBP focused on the training of rural women and teachers. Efforts have been made to involve local community members in all aspects of the project.

Pradhan and Yee (11) emphasize the need for NGOs to be open for collaboration and to learn from each other and to share resources. At an international level, the BBP cooperates with the Japanese NGO 'Buddhi Bangara'. This NGO supports the Kantipur School of Dentistry (KSD) by providing equipment and taking care of maintenance. As the establishment of KSD this Japanese NGO has been involved in the training of dental hygienists and dental technicians at KSD.

A Dutch dentist who works together with a Dutch volunteer group was involved in the implementation of the programme as well as R. Yee from United Mission to Nepal, Oral Health Programme.

Study design

The overall purpose of this project is to investigate if OHP will be a realistic way to improve the oral hygiene and dental health or oral health awareness of Nepalese schoolchildren aged 5–12 years. This study is the first phase of a larger longitudinal study designed to explore the outcomes of the BBP. It describes the baseline data which was collected from a population of 300 children who have been examined clinically at baseline and will be assessed annually over the next 3–5 years.

The project includes dental hygiene students and faculty from KSD and INHOLLAND University. It involves the assessment of children in several schools, including private and public schools, one of which acts as a control group. It also involves OHP activities with the children and their caregivers. Teachers from selected schools were trained in OHP and supported by simple teaching tools. Data on oral health status was generated from five groups of children; two government schools (Ganesh School and Bansabari school), a private school (Stephens International School), a monastery (Kopan Monastery) and a school for mentally challenged children (Navanjoti centre). Nepalese dental hygiene students first asked the participants questions, using a structured questionnaire (concerning their teeth and their knowledge about the prevalence and prevention of dental diseases); the questionnaire was based on a previously tested instrument used in Nepal by Yee for the National Pathfinder survey on oral health (12). The questions were asked in the Nepali language to avoid any misunderstandings.

Further data was collected by using the WHO Community Index of treatment needs to assess levels of Community Periodontal Index (CPI); the special designed WHO periodontal

probe was used (13, 14). The index teeth 16, 11, 26, 36, 31 and 46 were examined. As the children are under 15 years, only bleeding and calculus were recorded. The prevalence of caries in the first permanent molar (M1) was also recorded using the numerical system according to the WHO standards (15). To classify the presence of debris the Simplified Oral Hygiene Index (OHI-S) by Greene and Vermillion was used. The examiners (five dental hygiene students) followed a 2-day calibration course and reached Kappa values $\kappa = 0.84$.

After the collection of baseline data every child was instructed to brush his/her teeth twice a day (after breakfast and before going to bed). Individualized instructions were given (Scrub method) and the technique was demonstrated in the children's mouths (while the participants were holding hand mirrors). Guidance and additional instructions were also given when needed. A multi-tufted toothbrush and toothpaste containing fluoride was provided to the children. The children also received information about the development and causes of oral diseases such as caries, gingivitis and periodontitis. The benefits of fluoride and the influence of dietary intake on oral health were discussed (Fig. 2).

Teachers' training workshops on oral health education (why to brush, how to brush, dietary intake and the importance of fluoride) were implemented, so that they could reinforce the oral health activities. At one government school, only baseline data was collected but no individual OHP activities were carried out.

Consent

Letters were sent to the principals of the participating schools and institutions to explain the purpose and method of the study. Letters of consent have been signed by the teachers or caretakers.

Fig. 2. Examining and instructing Nepali children and their caretakers.

Results baseline study

The initial baseline data collection and programme implementation was conducted in April 2006, during the civil war. Unfortunately, large-scale demonstrations started in Nepal on the 6th of April and lasted till the 24th of April. These demonstrations turned violent as security forces opened fire on crowds, beat protestors and made hundreds of arrests. A number of people were killed and it is estimated that 2000 people in Kathmandu Valley were injured during the demonstrations. Curfews were announced and there was a ban on public gatherings. It was difficult to conduct our programme during this period and we had to be flexible in our planning.

Oral hygiene habits and knowledge about oral health

In total, 309 children participated, not counting the mentally challenged children. The data from these children will be analysed separately. The average age of the children was 10.5 years. Most children use their own toothbrush (before the intervention). Only a small percentage uses a family member's toothbrush. Twelve per cent use their finger, charcoal or salt, while 8% identified that they use wood sticks. There was no difference in the use of dental aids between the children from the different schools. Thirty-six per cent of the children brush their teeth at least once a day, and 27% brushes their teeth twice a day. The rest of the children brush their teeth several times a week or less. It is common in Nepal to brush teeth in the morning prior to eating.

The mean OHI-S index of all participants was 2.0 (see Fig. 3). This means that most of the exposed surfaces of the index teeth were covered with soft debris for more than one-third, but not more than two-thirds. At the private school, the mean OHI-S index was 1.46. At the governmental schools, the mean OHI-S was 2.06.

Knowledge about the fact that brushing teeth can prevent tooth decay seemed to be high amongst the subjects surveyed (80%). The same applies to the fact that brushing can prevent gum disease (75%). Knowledge about the role of sugar in soft drinks and sweet products appears to be high also (approximately 70%). Sixty-three of the subjects seem to be aware of the fact that tobacco has a bad influence on oral health. Knowledge about fluoride appears to be low in all schools (see Table 1).

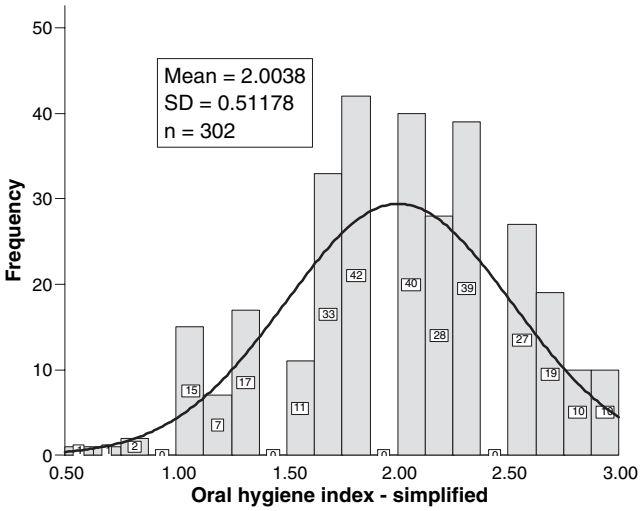

Fig. 3. Simplified Oral Hygiene Index of all participating children.

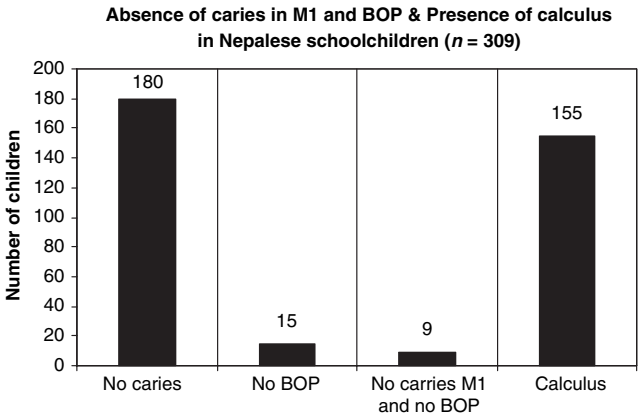

Fig. 4. Absence of caries, Bleeding On Probing (BOP) and the presence of calculus in Nepalese schoolchildren.

Prevalence of caries, bleeding on probing and presence of calculus

Only 3% of the children we examined did not have caries in the first permanent molars and did not show any bleeding on probing. Thirty-eight per cent of the children showed visible, untreated, caries in at least one permanent primary molar (Fig. 4).

The prevalence of caries in the children examined seemed to be higher in the private school than in both governmental schools. The lowest caries prevalence was found in the young monks at Kopan Monastery (Figs 5 and 6).

Although the amount of caries in the permanent teeth present at the subject's age group seems to be low, it was reported by the examiners that the amount of caries in the deciduous teeth is high. In the 2004 pathfinder survey, Yee found that caries incidence of all age groups in Nepal are within the goals recommended by the WHO and the FDI World Dental Federation except among 5 years old (12).

The WHO recommendations prescribe that a crown is recorded as sound if it shows no evidence of treated or untreated clinical caries. The stages of caries that precede cavitation, as well as other conditions similar to the early stages of caries, are excluded because they cannot be reliably diagnosed (15). The examiners wrote on the examination forms that although it felt like a sound surface, radiographs would probably show different findings. Only 4% of the children did not show any form of gingivitis. A CPI score of two is dominant in every school. In 50% of the examined children calculus was present.

Table 1. **Knowledge about the effect of fluoride**

	Agree		Disagree		Do not know	
Knowledge about fluoride, school and question	Count	%	Count	%	Count	%
Bansabari						
Using fluoride is harmless	33	42	1	1	45	57
Fluoride is added to some brands toothpaste	25	33	2	3	51	64
Fluoridated water protects teeth	25	33	4	5	48	62
Ganesh						
Using fluoride is harmless	28	19	1	1	119	80
Fluoride is added to some brands toothpaste	20	14	1	1	125	85
Fluoridated water protects teeth	20	14	6	4	121	82
Stephens						
Using fluoride is harmless	2	13	1	6	13	81
Fluoride is added to some brands toothpaste	3	19	1	6	12	75
Fluoridated water protects teeth	3	18			14	82
Kopan Monastery						
Using fluoride is harmless	3	8			37	92
Fluoride is added to some brands toothpaste	2	5	1	3	37	92
Fluoridated water protects teeth	3	8			37	92

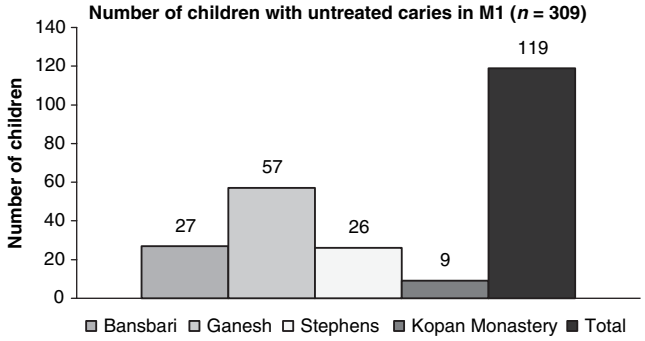

Fig. 5. Number of children with untreated caries in first permanent molar (M1).

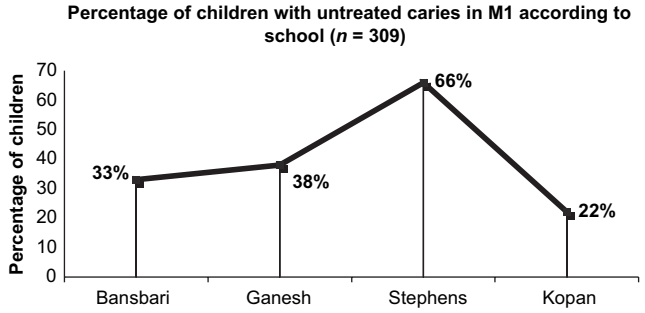

Fig. 6. Percentage of children with untreated caries in first permanent molar (M1) according to school.

Quality of life aspects related to oral health

The children were asked how often they experienced toothache or other oral discomfort the past year. Results showed that 29% of the children experienced toothaches regularly or often, while another 20% rarely experienced toothaches. Based on these results it can be concluded that 49% of the children experienced some form of toothache or oral discomfort in the past year (Figs 7 and 8).

Ninety-five (38%) of the examined children who reported they experienced pain mentioned that the problems didn't affect them. However, the pain did affect the other children's quality of life in different ways. The most frequent impact they expressed was that they could not eat or had trouble sleeping. They also mentioned they could not laugh or smile and some had trouble eating (Fig. 9).

Twenty-two per cent of the children (n = 64) were not satisfied with the appearance of their teeth. In addition, 11% of the children said that other children made fun of them because of the appearance of their teeth and another 26% of the children said they avoided smiling because of their teeth (Fig. 10).

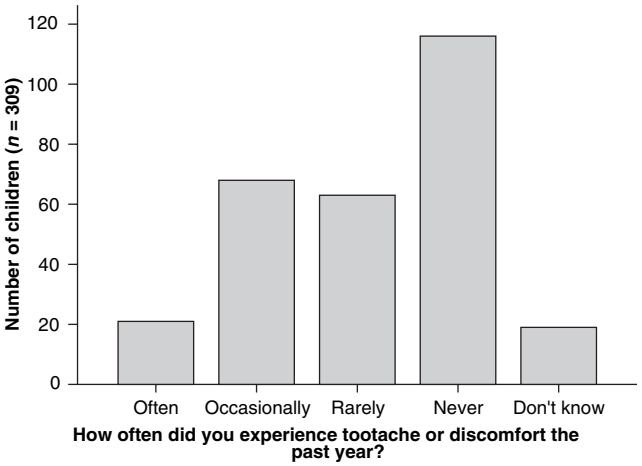

Fig. 7. Number of children experiencing toothache or discomfort the past year.

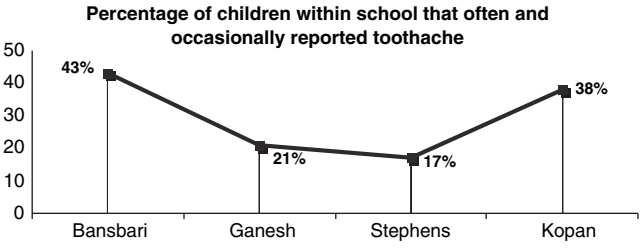

Fig. 8. Percentage of schoolchildren that often and occasionally reported toothache.

Twenty-five per cent of all the subjects described the health of their gums and teeth as good or very good, while 40% rated the health of their gums and teeth as average. Twenty per cent of the subjects rated the health of their teeth and gums as poor or very poor.

When pain is being experienced, 40% of the participants from the government schools and monastery will visit a medical doctor. The children also mentioned visiting the medicine shopkeeper or a health post worker. In the monastery, 33%

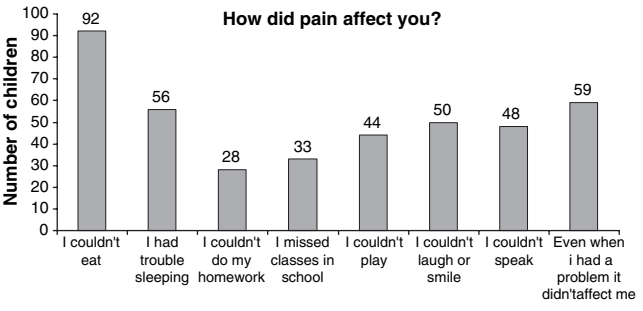

Fig. 9. Effect of dental pain on the examined Nepalese children (n = 309).

Fig. 10. Twenty-six per cent of the examined children claimed to avoid smiling because of their teeth.

mentioned they would visit other persons in case of pain or discomfort (varying from brothers, fellow monks to traditional healers). This has probably to do with the fact that they are living in more isolated areas and that the monastery has its own clinic. In the private schools, only 10% indicated that they would visit a doctor in case of pain and the rest indicated that they would visit a dentist (Table 2).

Dietary intake

The intake of biscuits, soft drinks and sweetened fruit juices (smoothies) is the highest at the private school. These children also consumed the most fruit. It is remarkable that tea with sugar is drunk several times a day by more than 50% of the children in the monastery. Tea is traditionally very popular in Nepal, and it is served with lots of sugar and hot milk. At the monastery the intake of sweets, biscuits, soft drinks, sweetened juices and fruits is lower (Table 3).

Discussion

Most of the children in this study claim to brush their teeth at least once a day. The figures show that only 28% of the participants brushes twice a day. Emphasis in the OHP activities should therefore be put on brushing twice a day. Also, the time of tooth brushing is important. Traditionally Nepali people brush their teeth in the morning before their meal. An emphasis should be put on changing this behaviour into brushing after meals in the morning and before going to bed.

The results also show that it is very important to address the role of fluoride in fighting decay. Most of the participants did not know if their toothpaste contained fluoride. The role of fluoride in preventing tooth decay is not well known in all groups.

It will be important to identify brands of fluoridated toothpastes to the study participants. As there is a high level of illiteracy it is important to have examples of the packaging from different brands, to illustrate the available products. Although an advocacy project related to fluoridated toothpaste resulted is an increased total market share of fluoridated toothpaste to 90% in 2002 (16), this project does not appear to have affected the knowledge level of the children in our study.

The majority of the participants thought that fluoride toothpaste was more expensive than non-fluoridated toothpaste (approximately 10 Nepal Rupee which is equivalent to 0.13$). This emphasized the need to keep the price of fluoridated toothpastes low (e.g. by removing taxation on quality fluoride toothpaste), so that the poorer socio-economic classes can also benefit (16, 17).

The data in caries prevalence in Nepal are difficult to interpret, as there are big differences between the regions. Research has shown that there is a decrease in the overall caries prevalence in Nepal, but its prevalence in the deciduous teeth is still high (18, 19). The initial findings in our study show that 38% of the children have (untreated) caries in at least one M1. The level of caries in the private school was higher while the mean OHI-S was lower. The children had

Table 2. **Description according to school of whom a child would visit in case of pain**

	Who would you visit in case of pain						
	Dentist	Dental hygienist	Doctor	Private paramedic	Medicine shopkeeper	Government health post worker	Others
School							
Bansabari (%)	29.5	1.3	39.7	1.3	10.3		17.9
Ganesh (%)	16.4		36.3	4.1	7.5	10.3	25.3
Stephens (%)	56.3		25.0		6.3		12.5
Kopan Monastery (%)	5.0	2.5	32.5	2.5	5.0	2.5	50.0

Table 3. **Dietary intake according to school**

		School			
		Bansabari (%)	Ganesh (%)	Stephens (%)	Kopan Monastery (%)
Consumption fruit	Several times a day	2.5	21	23.5	
	Every day	17.5	15.8	41.2	22.5
	Several times (2–3) a week	25.0	23.3	17.6	27.5
	Once a week	33.8	27.4	5.9	40.0
	Several times a month	16.3	29.5	5.9	5.0
	Never	5.0	2.1	5.9	5.0
Consumption biscuits	Several times a day	5.1	3.5	11.8	2.5
	Every day	28.2	27.8	41.2	20.0
	Several times (2–3) a Week	25.6	29.9	29.4	27.5
	Once a week	20.5	21.5	11.8	32.5
	Several times a month	14.1	11.1	5.9	5.0
	Never	6.4	6.3		12.5
Consumption soft drink	Several times a day		1.4		
	Every day	4.9	4.8	18.8	7.5
	Several times (2–3) a week	24.7	15.8	25.0	7.5
	Once a week	22.2	24.0	12.5	37.5
	Several times a month	23.5	24.7	31.3	27.5
	Never	24.7	29.5	12.5	20.0
Consumption sweetened juice	Several times a day		2.1	5.9	
	Every day	6.3	11.0	29.4	15.0
	Several times (2–3) a week	16.3	15.2	29.4	12.5
	Once a week	12.5	17.2	11.8	22.5
	Several times a month	22.5	17.9	17.6	12.5
	Never	42.5	36.6	5.9	37.5
Consumption chewing gum with sugar	Several times a day	5.1	8.3		2.5
	Every day	38.0	20.0	23.5	12.5
	Several times (2–3) a week	38.0	30.3	29.4	27.5
	Once a week	12.7	11.0	35.3	15.0
	Several times a month		9.0	5.9	12.5
	Never	6.3	21.4	5.9	30.0
Consumption sweets	Several times a day	5.5	10.6	11.8	
	Every day	31.5	18.4	29.4	12.5
	Several times (2–3) a week	23.3	35.5	29.4	32.5
	Once a week	17.8	13.5	11.8	15.0
	Several times a month	11.0	7.1		10.0
	Never	11.0	14.9	17.6	30.0
Consumption milk with sugar	Several times a day	1.3	1.4		
	Every day	30.0	34.5	56.3	17.5
	Several times (2–3) a week	16.3	12.4	6.3	5.0
	Once a week	3.8	10.3	6.3	2.5
	Several times a month	5.0	4.1		10.0
	Never	43.8	37.2	31.3	65.0
Consumption tea with sugar	Several times a day	17.5	15.2	6.3	52.5
	Every day	65.0	73.1	50.0	40.0
	Several times (2–3) a week	2.5	6.2	6.3	2.5
	Once a week		1.4	6.3	
	Several times a month	5.0	0.7		
	Never	10.0	3.4	31.3	5.0

better oral hygiene, but their dietary intake was different. This probably reflects the fact that the social status of these children is better and 'welfare food or comfort food' (cariogenic food) is within reach. Because of differences in social status (income), the children at the governmental schools consume less sweets, biscuits and soft drinks. The consumption of such foods was even lower in the community of the monks. In this group, the frequent intake of tea with sugar is a threat to their dental health.

Social status seems to influence who is visited in case of oral pain. Results show that at the private school most children would visit a dentist (parents can afford this) where at the other schools a medical doctor or other disciplines are more likely to be accessed.

Knowledge about the prevention of gum disease and tooth decay appears to be high among all groups. However, only 4% of the children were free of any sign of gingivitis. Knowledge about prevention of the disease is not visible in the present oral health of the examined children. The results of this baseline study are similar to earlier studies in Nepal and other developing countries, where examiners also found that almost all children examined showed early signs of gingivitis, a high level of untreated caries and where a majority of the children suffered from tooth pain (9, 16, 20, 21).

This data showing variations among the children in the different schools will guide the individualization of programmes towards different circumstances and habits of the children. A quarter of the children expressed that they are not satisfied with the appearance of their teeth or that they were teased because of their teeth. The children also reported that they frequently had pain in their mouth the past 12 months, resulting in not being able to eat, play, sleep or go to school. Oral health seems to have an impact on quality of life of most of the examined children; as only 38% claimed that the experienced pain the past 12 months did not affect them negatively.

Conclusion

It is not surprising to find that children in Nepal have oral health problems and that these problems may be in part related to their socio-economic status. For many of the children, it does appear that their quality of life is affected by their oral health. The data by this study was helpful in providing contextual information about the sites involved in the project. This then allowed us to more readily individualize the programmes to meet the children's needs. At the monastery for instance, we need to educate about the possible effects of frequent intake of tea with sugar.

The BBP aims to be a collaborative project combining support, education and research on several levels and targets different groups. Adaptation of the programme and embedment in the local community is important to stay successful and to offer sustainable support to the local community. The local community is actively involved in this project which hopefully contributes to create an opportunity to enable more Nepali individuals and communities to achieve good oral health.

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References

1 Watt RG. Strategies and approaches in oral disease prevention and health promotion. *Bull World Health Organ* 2005; **83 (9):** 711–718.

2 Petersen EP, Kwan S. Evaluation of community-based oral health promotion and oral disease prevention – WHO recommendations for improved evidence in public health practice. *Community Dent Health* 2004; **21 (Suppl.):** 319–329.

3 Petersen EP, Kwan S. *Oral Health Promotion: an Essential Element of a Health-promoting School*. WHO information series on school health, document 11. World Health Organisation, Geneva, Switzerland, 2003.

4 Knevel RJM. Dental hygienists on top of the world: supporting oral health education in Nepal. *Int J Dent Hyg* 2005; **3:** 205–212.

5 Ottawa Charter for Health Promotion. *First International Conference on Health Promotion*. Ottawa, Charter adapted at an International Conference on Oral Health Promotion, The move towards a new publich health, November 17–21, 1986, Ottawa, Ontario, Canada, 1986.

6 WHO Regional Office for Europe, Anderson L, Anderson L, Doyle N *et al. Health Promotion Evaluation: Recommendations to Policy Makers*. Copenhagen, WHO Regional Office for Europe, 1998.

7 Watt RG, Harnett R, Daly B *et al.* Evaluating oral health promotion: need for quality outcome measures. *Community Dent Oral Epidemiol* 2006; **34:** 11–17.

8 Nutbeam D. Evaluating health promotion – progress, problems and solutions. *Health Promotion Int* 1998; **13:** 27–44.

9 Palenstein Helderman W, Benzian H. Implementation of a basic package of oral care: towards a reorientation of dental NGOs and their volunteers. *Int Dent J* 2006; **56:** 44–48.

10 Benzian H, Gelbier S. Dental aid organisations: baseline data about their reality today. *Int Dent J* 2002; **52:** 309–314.

11 Pradhan A, Yee R. Basic package of oral care (BPOC) in Nepal. *Dev Dent* 2003; **3:** 27–31.

12 Yee R, Maveen M. *The Nepal National Oral Health 'Pathfinder' Survey. Summary for the Nepal Dental Association*, 2004. http://www.nda.org.np.

13 Epidemiology, Etiology and Prevention of Periodontal Diseases Report of WHO Scientific Group. *WHO Scientific Group on Epidemiology, Etiology and Prevention of Periodontal Diseases*. Geneva, World Health Organization, 1978, WHO Technical Report Series 621.

14 Ainamo J, Barmes D *et al.* Development of the World Health Organization (WHO) community periodontal index of treatment needs (CPITN). *Int Dent J* 1982; **32:** 281–291.

15 Ainamo J, Barmes D, Beagrie G *et al. WHO Oral Health Country/Are Profile Programme*. Sweden, WHO Headquarters Geneve, Oral Health Programme (NPH), WHO Collaborating Centre, Malmö University. http://www.whocollab.od.mah.se/expl/methods.html.

16 Yee R, McDonald N, Walker D. An advocacy project to fluoridate toothpastes in Nepal. *Int Dent J* 2003; **53:** 220–230.

17 Yee R, Sheiham A. The burden of restorative dental treatment for children in Third World Countries. *Int Dent J* 2002; **52:** 1–9.

18 Milsom KM, Rijal K, Lennon MA. Oral health status of 12-year-old children in Nepal in 1994. *Int Dent J* 1997; **47:** 88–93.
19 Koirala S, David JD, Khadka R, Yee R. Dental caries prevalence, experience and treatment need of 5–6-year-old, 12–13-year-old and 15-year-old children of Sunsari district, Nepal. *J Nepal Dent Assoc* 2003; **5:** 12–24.
20 Kerosuo E, Kerosuo H, Kallio P, Nyandini U. Oral health status among teenage schoolchildren in Dar es Salaam, Tanzania. *Community Dent Oral Epidemiol* 1986; **14:** 338–340.
21 Shidara EK, McGlothlin JD, Kobayashi S. A vicious cycle in the oral health status of schoolchildren in a primary school in rural Cambodia. *Int J Dent Hygiene* 2007; **5:** 165–173.