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Oral health status of students at the age of 12-15 years in Southern Highlands Province of Papua New Guinea: results of a descriptive epidemiological study

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SUMMARY

A sample of 555 students from three geographically and socioculturally different areas within the Southern Highlands Province, between the ages of 12 and 15 years, was examined in June 1995 to assess the oral health status for planning, monitoring and evaluation purposes. The prevalence of dental caries was found to be 57%, with a DMFT (decayed, missing and filled teeth) score of 1.70 (± 2.25) with DT, MT and FT scores of 1.47, 0.12 and 0.10 respectively. 54% of students had active caries and 27% had a DMFT score more than 3. Gingivitis was prevalent among students and visible calculus was present in 35% of them. Only 29% were dentally fit and did not need treatment. About 3% needed some form of orthodontic treatment, and endodontic and cosmetic treatment were respectively needed in 3.5% and 2% of the children.

Introduction

The study was carried out in June 1995 in Southern Highlands Province, where there is a scattered population of 393,000 in a total land area of 26,000 km^2. People in the province are grouped into 18 language groups, each having distinct cultural values and traditions.

Information on oral health status of students in Papua New Guinea is scarce. This study was undertaken to obtain baseline information about present oral health status in order to assess future treatment needs for the planning, monitoring and evaluation of oral health service programs in Southern Highlands Province.

Materials and Methods

Sample methodology

Sample locations were selected from Ialibu, Nipa and Koroba districts in the eastern, central and western geographical zones respectively of the province. People in these districts speak different languages and have different sociocultural values and traditions. Ialibu District is more developed than the other two districts, in terms of infrastructure and living standards. Differences between urban and rural student populations were not taken into account, because only 2% of the population in Southern Highlands Province is considered to be urban.

The sample of 555 was drawn from the total student population of about 40,000 by using a stratified cluster sampling technique in which 3 clusters of the age group of 12-15 years were selected from schools in the 3 sample locations. The index age group of 12-15 years was selected instead of index ages of 12 years and 15 years, because of difficulties in determining actual age.

Conduct of examination

Oral examinations were done in daylight at the sample locations using probes and mouth mirrors. Findings were recorded according to well-defined criteria recommended by the World Health Organization (1,2). Dental caries was recorded as present only when there was detectable softened floor, undermined enamel or softened wall.

Periodontal treatment needs, including the

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need for dental scaling, polishing and oral hygiene instructions, were recorded as calculus present, with or without inflammation of gums, in one or more sextants. Enamel hypoplasia requiring cosmetic treatment was recorded as present when the enamel surfaces of anterior teeth showed pitted or worn-off areas with discolouration. The need for endodontic treatment was recorded when there were one or more carious anterior teeth with exposed pulp, fractured crowns with involvement of pulp or fractured crowns without involvement of pulp but with discolouration or signs of apical infection.

The need for orthodontic treatment was recorded when there was maxillary over-jet estimated to be more than 8 mm, anterior cross-bite, over-bite that could damage the palatal gum, midline shift of more than 4 mm, crowding of more than 4 mm or spacing more than 4 mm.

About 10% of the total sample underwent a repeat examination to check the validity of the observations. A survey of attitudes, knowledge and practices was also conducted among students of the same sample, through a questionnaire.

Results

On completion of data collection, 610 examinations had been made. The results given here follow the analysis of data from 549 subjects (6 subjects were absent and 55 subjects underwent repeat examination). The sexes have been combined and differences between subgroups have been evaluated to a limited extent. The results represent only one age group between 12 and 15 years; however, this is an internationally recognized sentinel group for monitoring oral health status in general. The results are set out in Tables 1, 2, 3, 4 and 5.

Discussion

The study has demonstrated that the mean DMFT indicator of caries experience in children 12-15 years old is lower than 3, the

TABLE 1

EXPERIENCE OF DENTAL CARIES AND ITS SEQUELAE AT THE AGE OF 12-15 YEARS

Expression of dental caries experience*	% in Nipa	% in Koroba	% in Ialibu	Total No**	Total as % ***
One or more decayed, missing or filled teeth	55%	51%	64%	312	57%
One or more active caries	52%	45%	62%	297	54%
Decayed, missing and filled teeth (DMFT) score more than 3	23%	24%	34%	150	27%
Dental caries free	45%	49%	37%	237	43%
Past experience of dental restorative treatment	5%	5%	6%	29	5%
Past experience of dental extraction	7%	15%	11%	59	11%

* Expression of experience could be interpreted as level of dental caries or size of the problem and situation in relation to provision of treatment for dental caries
** Out of the total sample of 549
*** Percentage for the province (sexes and subgroups have been combined)

goal set by the World Health Organization for the year 2000, although the prevalence is as high as 57% (Table 1). The high standard deviation of 2.25 (Table 2) suggests that there is a high-risk group that has a very high incidence of caries. The very low MT and FT components of the DMFT score indicate very low coverage by the school dental services.

The difference in caries prevalence between Ialibu and Nipa districts (Table 1) is significant at the 1% level (Z statistic = 2.876). The difference is very significant at the 0.1% level between Ialibu and Koroba districts (Z statistic = 3.378). There is no significant difference between Nipa and Koroba districts (Z statistic = 0.523). Variations in dietary practices may account for these differences. Further investigations, including analysis of fluoride content in drinking water, should be carried out to explain the difference.

The pilot survey conducted in Tari District of the Southern Highlands Province in 1985 (3) demonstrated that caries prevalence at the age of 12 years was 30% and the DMFT score was 1.1 with a standard deviation of 1.6. The increasing trend in caries prevalence over a period of 10 years could be attributed to a rapid change of diet from traditional fibrous and starchy foods to commercially available refined foods. The caries prevalence in this study population could also be considered high when compared with previous studies in the National Capital District of Papua New Guinea and other developing countries such as Ghana and Zimbabwe (4-6).

In the National Capital District, caries prevalence was almost the same as the average in Southern Highlands Province, but it was less than that of Ialibu District. The DMFT score was much lower than that of Nipa and Ialibu districts of Southern Highlands Province (Table 4). This situation could be attributed to fluoridation of the reticulated water supply system that existed about eight years back in the National Capital District. A long-term longitudinal study should be carried out in order to determine the trends carefully, because the tendency of caries experience to increase in a low DMFT population is slow and its effect may vary in different age groups.

About one-third (35%) of the students had calculus with or without gingivitis in one or more sextants (Table 3) and needed dental prophylactic periodontal treatment, which includes dental scaling, polishing and oral hygiene instructions. This situation could be attributed to lack of knowledge in oral health and lack of good oral hygiene practices.

The significant difference in periodontal

TABLE 2

DECAYED, MISSING AND FILLED TEETH (DMFT) SCORES AT THE AGE OF 12-15 YEARS

DMFT components	Mean for Nipa District	Mean for Koroba District	Mean for Ialibu District	Mean for the province*
DMFT	1.47 (±1.95)**	1.36 (±1.91)	2.15 (±2.64)	1.70 (±2.25)
DT (decayed teeth)	1.26	1.11	1.92	1.47
MT (missing teeth)	0.07	0.28	0.13	0.12
FT (filled teeth)	0.13	0.08	0.09	0.10

* For the total sample (sexes and subgroups have been combined)
** Standard deviation

treatment needs between districts could be related to differences in oral hygiene practices in different sociocultural groups and the degree of coverage of health education programs. When compared with the previous study in Tari District (3) 10 years before, the periodontal treatment needs in Nipa District are greater and those in Ialibu and Koroba districts less (Table 4). There could be multiple reasons for this difference. A decreasing trend could be attributed to increasing awareness of oral health and increasing living standards in some districts. Differences in diagnostic criteria could also be responsible, to a certain extent, for differences between the two studies.

The percentage of students who needed some form of orthodontic intervention was comparatively low and there was no significant difference between districts (Table 3). Relatively high needs for advanced dental treatment such as endodontic and cosmetic restorative treatment indicate that reasonable resources should be allocated to improve and maintain the quality of care available.

Only 29% of the student population in the province were orally fit and did not need any form of dental treatment (Table 3). Provision of treatment for dental caries and periodontal diseases would demand more resources, although other oral diseases and conditions are of minor public health importance in this group in Papua New Guinea. The knowledge of the students about common oral diseases (dental caries and periodontal diseases) was poor, despite the priority given to oral health education in schools. Oral hygiene practices such as regular brushing of teeth were also poorly carried out, although the attitudes towards dental treatment were good (Table 5). This situation seems to be a problem in the National Capital District as well (7).

The results of the survey have shown that the majority of the student population have been deprived of basic dental health care. This situation can be directly attributed to lack of availability of services and poor access to available services. In Southern Highlands Province, for a total population of 393,000,

TABLE 3

TREATMENT NEEDS FOR COMMON ORAL HEALTH PROBLEMS AT THE AGE OF 12-15 YEARS

Treatment need	% in Nipa	% in Koroba	% in Ialibu	Total No*	Total as %**
Need for restorative treatment	52%	45%	62%	297	54%
Need for periodontal treatment***	59%	31%	20%	194	35%
Need for orthodontic treatment	4%	3%	2%	14	3%
Need for endodontic treatment for one or more anterior teeth	4%	3%	4%	19	3.5%
Need for cosmetic treatment for enamel hypoplasia of one or more anterior teeth	3%	2%	2%	12	2%
No treatment needed: orally fit	19%	34%	33%	159	29%

* From the total sample of 549
** Percentage for the province (sexes and subgroups have been combined)
*** Includes scaling, polishing and oral hygiene instructions

TABLE 4

COMPARISON OF THE PREVALENCE OF DENTAL CARIES, DMFT SCORE AND NEED FOR PERIODONTAL TREATMENT IN THE PRESENT STUDY WITH THE RESULTS OF PREVIOUS STUDIES

	Southern Highlands Province				National Capital District	Zimbabwe		Ghana	
	Tari District 1985[a]	Nipa District 1995	Koroba District 1995	Ialibu District 1995	1991[b]	Urban 1988[c]	Rural 1998[c]	Urban 1991[d]	Rural 1991[d]
Prevalence of dental caries	30%	55%	51%	64%	56%	28%	21%	32%	12%
DMFT score	1.1 (±1.6)*	1.47 (±1.95)	1.36 (±1.91)	2.15 (±2.64)	1.43 (±1.80)	0.57 (±1.13)	0.49 (±1.42)	0.69	0.18
Periodontal treatment needed	45%	59%	31%	20%	-	-	-	-	-

[a] Reference 3
[b] Reference 4
[c] Reference 6
[d] Reference 5
* Standard deviation

scattered in a land area of about 26,000 km^2, there are only one dental officer and five dental therapists, stationed in three hospital dental clinics. In the past many years, rapidly growing financial and managerial problems in the health sector have prevented the dental services from increasing the number of dental clinics and trained dental staff.

Standard outreach school dental clinics do have their limitations not only because of the high cost of mobile equipment, travelling allowances and transport, but also because of the very poor road structure and the very rugged land forms in the province, with mountain elevations varying from 800 m to 4400 m above sea level. In view of the magnitude of the problem and the financial and other difficulties, an alternative low-cost primary health care approach of providing services should be given priority (8).

At present there are 42 dentally trained community health workers (CHWs) in the province who are providing emergency and preventive dental care, only on demand, at the aid post level. The priority should be given to health education, detection of dental defects and provision of treatment in schools, and all the dentally trained CHWs should be mobilized to take part in all the outreach school health activities in their catchment areas. Referral support for school dental clinics conducted by dentally trained CHWs should be given by hospital-based dental clinics and visiting clinics of dental therapists. These visiting clinics should be organized in central locations at regular intervals and could also be used as training opportunities for dentally trained CHWs.

In order to improve the participation of students in schools, they should be organized into forming school health committees. These committees should give the leadership to students in school health activities and could make promotional and preventive activities a part of day-to-day life in school. The utilization of the resources of schools in these activities could make them economical, self-reliant and sustainable. Some form of training should be given to teachers, committee members of

TABLE 5

RESULTS OF SURVEY OF ATTITUDES, KNOWLEDGE AND PRACTICES

Category	% Nipa District	% Koroba District	% Ialibu District	Total % for the province
Who think it is worth having a regular dental checkup	68%	72%	79%	73%
Who are happy at the thought of dental treatment	91%	95%	90%	92%
Who prefer to have a filling than a dental extraction	93%	97%	98%	96%
Who know that dental caries and periodontal diseases could be prevented	38%	40%	66%	48%
Who brush their teeth as a habit*	31%	38%	57%	42%

* Who brush their teeth regularly as a habit either with a factory-made brush or a brush made of bush materials, with or without tooth paste

school health committees and a selected number of student leaders on health promotion and preventive activities. School health activities should be supported by dentally trained CHWs and other health workers in their catchment areas and oral health activities should be integrated with general health activities whenever possible. The chances for success of community-based programs are high because of the favourable attitudes of students towards oral health.

Dentally trained community health workers (CHWs)

Ordinary CHWs become dentally trained CHWs when they are given inservice training in emergency and preventive dental care. The period of training may vary from three weeks to three months, depending on the skills and knowledge they have at the time of training. They are capable of performing health education, antibiotic treatment for oral infections, uncomplicated dental extractions, zinc oxide eugenol dressings and dental scaling using hand instruments. They have been given basic sets of dental hand instruments and locally made collapsible dental chairs. Some of them have been given further training for a period of one week in atraumatic restorative technique (ART) and separate sets of instruments for ART.

Aid posts

Aid posts are the most peripheral service-providing units in the primary health care structure in Papua New Guinea, and they are staffed by community health workers who provide basic preventive and curative care. There are about 300 households served by each aid post. Dentally trained CHWs may be appointed to aid posts in central locations where people from surrounding aid post areas could also come for treatment.

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