

Dental Caries in University Students

by

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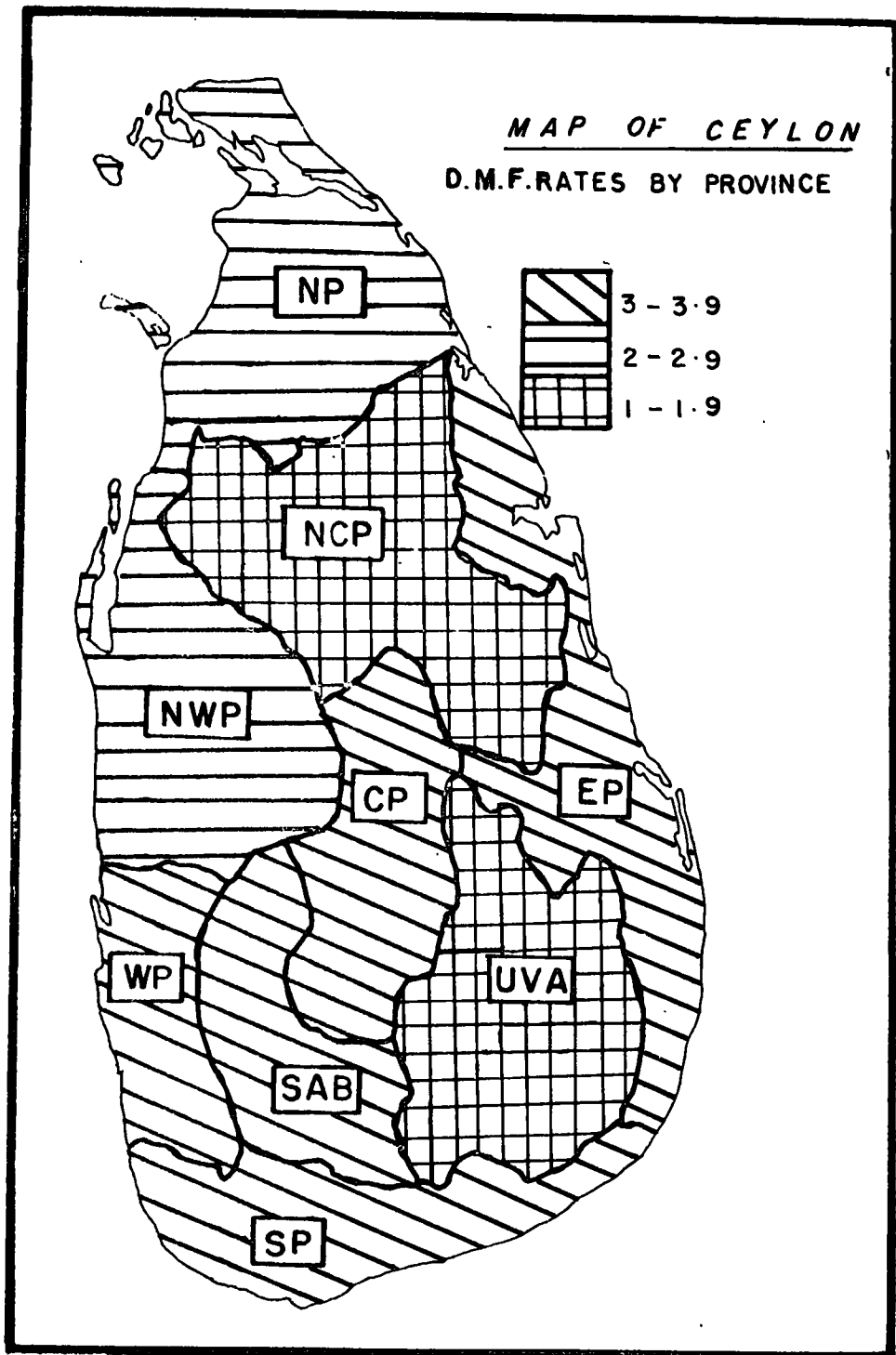
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INTRODUCTION

Dental surgeons from occidental countries, plagued with the problem of dental caries, have been impressed by its low incidence in Ceylon, especially among the rural population (Hoffman, 1963). The incidence of dental caries in Ceylon, though low, is still problematic. Its differential incidence in different segments of the population—a fact that has been noted by every clinician—suggests that the study of dental caries in this country would be a fruitful one. Considerable research on the subject has been conducted in occidental countries and the fluoride content of water has been identified as an important causative factor. (American Dental Association, 1950; Adler, 1951; Atonsky, 1951; Mackenzie, 1952; Mc Kay, 1953; Dean, 1954). Research connected with dental caries is, today, more or less limited to the survey type of study (Day and Sedwick, 1935; Klein and Palmer, 1940; Blackerby, 1943; Burnett, 1960; Hoffman, 1963), and is generally based on one of two separate but inter-related procedures. One is directed towards the elimination or reduction of hazards to dental health or lessening of the consequences of such hazards; the other to the determination of the administrative efficiency in the application of the means selected for attaining the goals of a program. Such studies consist in the main of correlations of caries prevalence with such characteristics as age, sex, nationality, nutritional habits and the like and present us with a composite picture of the situation in a given place and at a given time. In Ceylon, no such studies have been undertaken. This cannot be because dental caries failed to make the necessary impact on those concerned with the subject, for studies dealing with dental caries have been undertaken but they have been limited to the examination of the diet and life habits of individuals with a view to finding out peculiarities of individuals in the Ceylon scene, which could conceivably account for the relative absence of caries. This paper is the result of a survey of the prevalence of dental caries in students admitted to the University of Ceylon, Peradeniya, in 1962. Its overall plan has been based on the study made by Burnett (1960) in Edinburgh and like it, this study too has been restricted to University students who are ideal for such a study because they constitute a group more or less representative of the country, concentrated in one spot.

METHOD

A sample of 500 students was randomly selected from the names of those admitted to follow courses at the Peradeniya campus of the University of Ceylon in 1962. The students were requested to report to the Dental School where they were examined. Information



regarding home address, parental income, type of water used and oral hygiene were obtained from them and recorded on a card. A clinical examination was then conducted with a mouth mirror and an explorer and all decayed, missing and filled teeth were noted. For the purpose of comparison of the prevalence of dental caries in the different groups that constituted the sample, the D. M. F. Rate was utilised to express quantitatively their occurrence in a particular group. This rate is an expression of the average number of decayed, missing and filled teeth per person in a group and is obtained by summing the number of decayed, missing and filled teeth in persons of a particular group and dividing the sum by the number of persons in that group. A second measure of caries prevalence that has been utilised in studies of this type is the percentage of persons having one or more carious teeth. It has been amply demonstrated that this measure bears a close relationship to the D. M. F. Rate (Knutson, 1944) and that the one could be easily derived from the other by the use of the formula $97 - Y = 97 (0.524)^X$ where X is the D. M. F. Rate and Y is the percentage of persons having more than one carious tooth. This measure is simpler to compute and the data necessary for it easier to obtain as a large number could be examined adequately for purposes of computing the measure with the tongue blade examination alone. Yet, the D. M. F. Rate was preferred in this study, because, first, being the more popular measure its use facilitates international comparisons and secondly, the relationship between the two measures has not been established for Ceylon as yet.

THE SAMPLE

Of the sample of 500 selected, 17 persons (representing 3.4% of the sample) were not available for examination. The 483 that participated in the study were 277 males and 206 females whose ages ranged between 17 and 19 years. The majority came from the Western Province (Table 1) and from homes where the income was less than a 3,600/- per annum (Table 2). Unfortunately, data on the entire University population are not available to ascertain how representative of the University population is the sample. This information, however, is of no value as the purpose of the study is to compare caries prevalence in the different groups that constitute the sample. The sample has been broken into groups for this purpose according to

- (1) sex ;
 - (2) the area from which the student comes ;
 - (3) the parental incomes ;
 - (4) the type of water used ;
- and (5) the method used for cleansing the teeth.

SEX DISTRIBUTION

Of the 483 students, 59 males (20.1% of the males) and 35 females (16.1% of the females) making a total of 94 students (19.5% of the sample) had no decayed, missing or filled teeth. The D. M. F. Rate for males was 3.20 and for females 3.34. The D. M. F. Rate for the total sample was 3.28. The rate for males did not significantly differ from that for females.

The D. M. F. Rates are extremely low. Studies conducted in England and Scotland (Burnett, 1960) indicate that the D. M. F. Rates for comparable persons in these countries is nearly five times that in Ceylon (Table 3). American figures (Burnett, 1960) are lower than the English figures but yet remarkably higher than that of Ceylon (Table 4).

GEOGRAPHICAL DISTRIBUTION

Caries prevalence rates have been known to vary for populations of different geographic areas. These variations have been not only intrastate but interstate also (Blackerby, 1943). The realisation of this fact serves a dual purpose. It has helped on the one hand the identification of a causative factor and on the other, focussed attention on the differential dental needs of communities. University students came from all parts of the island. As has already been pointed out, the majority of the sample came from the Western Province which is the most densely populated province. The Eastern Province, the North Central Province and the Province of Uva which are sparsely populated were represented on the sample by a very small number (Table 1). Table 5 shows the D. M. F. Rates for students from the different provinces. The D. M. F. Rates for the North Central Province and the Province of Uva are extremely low while the rates for the Western, Eastern and Southern Provinces and the Province of Sabaragamuwa are relatively high. The sex distribution of students in the sample from the different provinces vary. There are more females than males in the sample from the Western, Eastern and North Central Provinces (Table 1). As the D. M. F. Rate for males is not significantly different from that for females, this sex difference in the constitution of the provincial groups cannot be considered responsible for the difference noted in the D. M. F. Rates in the different provinces. Some other factor must be responsible. The incidence of caries in the different provinces permits the division of the country into two blocks—the one comprising the Western, Southern, Central and Eastern Provinces and the Province of Sabaragamuwa with dental needs greater than the other which consists of the Northern, North Western and North Central Provinces and the Province of Uva (see Map).

PARENTAL INCOME

Income has only an indirect effect on dental caries. One channel which it is thought to work through is that of diet. Increased consumption of carbohydrates, particularly the refined ones, (Jameson, 1947; Sognaes, 1948; Toverud, 1949) increased susceptibility to caries. The richer individuals generally consume more carbohydrates in the refined form than the poorer and consequently are more susceptible to caries than their less fortunate brethren. A second channel through which income is thought to effect dental caries is that of neglect. Richer folk consult their dentists more frequently than the poorer and consequently could arrest the damage to their teeth. This line of action does not make the poorer classes more susceptible to caries but merely increases dental mortality. The cumulative effects of neglect is reflected not in a higher D. M. F. Rate but in the variations of the components of that rate. While the richer folk tend to have filled teeth or decayed teeth that could be filled, the poorer have missing teeth or decayed teeth that must be extracted.

If the thesis that the carbohydrate consumption is related to the prevalence of dental caries is correct, then one should expect a higher D. M. F. Rate among the higher income groups, on the assumption that these income groups have the wherewithal to consume large quantities of refined carbohydrates. The thesis that the fluoride content of water consumed is an important causative factor suggests on the other hand, that income has no relationship to caries prevalence unless of course, different income groups are concentrated in different areas.

Table 6 shows the D. M. F. Rates by income. The high income group has a relatively high caries prevalence. The moderate income group has a lower D. M. F. Rate than the low income group. The D. M. F. Rates for the latter two groups are not significantly different. The difference between them and the rate for the high income group is statistically significant. These findings suggest a relationship to carbohydrate consumption. Table 7 shows the distribution of income groups according to the province from which the students come. The average parental income of a student is relatively high in the Western, Central, Northern and Eastern Provinces and relatively low in the Province of Uva. Correlation with the D. M. F. Rate for the province reveals a positive relationship (coefficient of correlation +0.25) which is not statistically significant. The distribution of the different income groups in the different provinces reveals differential concentration. The high income group is over represented in the Western Province, the moderate in the Central, Northern and Eastern Provinces and the Provinces of Uva and Sabaragamuwa.

ORAL HYGIENE

Diet controls dental caries through the determination of the environment of the teeth rather than through changes in the resistance of the tooth itself (Bunting, 1935). On the basis of this contention, it has been argued that immediate brushing after ingestion of food should decrease the incidence of caries lesions. The scientific evidence, however, questions the usefulness of tooth brushing as a caries preventive measure (Eastlick, 1948). The dentifrice preparations used in oral hygiene, on the other hand, have been found to have an effect on caries prevalence (Grove and Grove, 1942; Kesel, 1948), though the available data do not permit a definite conclusion. In this study, students were asked what preparations they have used for oral hygiene and on the basis of the answers given by them, it was possible to group them into three groups :

- (1) those who have used, for the larger part of their lives, tooth paste with brush ;
- (2) those who have used "tooth powder" with forefinger as brush ;
- and (3) those who have used charcoal (burnt wood) with a forefinger as brush.

Table 8 shows the D. M. F. Rates for these groups. Those who used tooth powder had the lowest D. M. F. Rates while those who used tooth paste had the highest. The figures, however, reveal no statistically significant difference to justify the conclusion that the one is better than the other. The differences noted could well be a reflection of the income groups

or geographic distributions, both of which could conceivably vary the accessibility to the different dentifrice preparations used. Higher income groups tend to use tooth paste more frequently than the lower income groups while the latter prefer the powder.

TYPE OF WATER

Yet another factor that was considered in this study was the type of water used. Those who used well water (hard water) as will be seen from Table 10, tend to have a lower D. M. F. Rate than those who used pipe borne water (soft water) or the two combined. The figures, however, are not statistically significant. Here, the important factor appears to be income rather than water. The relationship between the two is shown in Table 11. The higher income groups are over represented in the pipe borne water group while the lower are over represented in the well water group.

DISCUSSION

Significant differences in D. M. F. Rates have been noted when the students were grouped :

(1) according to the province from which they came
and (2) according to parental income.

Differences in D. M. F. Rates have also been noted when the grouping was (1) according to sex ;

(2) according to the dentifrice preparation used ;
and (3) according to the type of water used.

But these differences are not statistically significant.

The most important factor influencing variations in the D. M. F. Rates appears to be income. The difference noted in the rates of grouping based on other criteria appears to exist because of a relationship that these criteria have to income. The upper income groups have a higher D. M. F. Rate. Other groups that have a high D. M. F. Rate have also a disproportionately large share of upper income group individuals.

The difference in the D. M. F. Rates in the income groupings support the thesis that caries prevalence is dependent more on the consumption of refined carbohydrates than on any other factor. However, no definite statement could be made until more extensive investigations have been conducted.

The purpose of this study was to secure a picture of the dental needs of University students on the one hand and of the country on the other as far as dental caries was concerned. Only prompt and adequate dental treatment can prevent the ill effects of dental

caries. But the dental resources of a nation are usually inadequate to meet the total-dental needs of that nation. Consequently some type of arrangement must be made so that the resources are fully exploited. This study indicates that in Ceylon

- (1) caries prevalence is remarkably low ;
and (2) the higher income groups are most in need of dental attention.

The problem of dental care and attention has two distinct aspects :

- (1) the correction of the defects as they occur ;
and (2) the correction of defects accumulated through neglect.

American studies (Jordan, 1952; Waterman and Knutson, 1953) indicate that even in a country like the United States of America, where caries prevalence is extremely high, the former aspect of the problem constitutes the larger one both from the point of view of costs and dentist hours involved. While the ideal is no doubt to correct every defect in every one as and when it occurs, expediency demands that the day to day, year to year correction process be concentrated in those communities where the accumulated defects tend to be maximal. Identification of these communities must be on an empirical basis from studies such as this.

TABLE 1

Areas from which the Students Come.

Province	Male	Female	Total
Western	80 (16.6)	92 (19.3)	172 (35.9)
Southern	67 (14.2)	40 (8.2)	107 (22.5)
Central	44 (9.0)	27 (5.7)	71 (14.7)
Northern	33 (6.7)	27 (5.7)	60 (12.4)
Eastern	1 (0.2)	5 (1.0)	6 (1.2)
North Western	24 (4.8)	10 (2.1)	34 (6.9)
North Central	6 (1.2)	2 (0.4)	8 (1.6)
Sabaragamuwa	15 (3.0)	3 (0.6)	18 (3.6)
Uva	7 (1.3)	0	7 (1.3)
Total	277 (57.0)	206 (43.0)	483 (100.0)

Note : Figures in parentheses are percentages.

TABLE 2
Parental Income of Students.

Income	Male	Female	Total
Low Under Rs. 3,600/- per annum.	164	71	235
Moderate Rs. 3,600/- to Rs. 6,000/- per annum.	99	106	205
High Over Rs. 6,000/- per annum.	14	29	43
Total	277	206	483

TABLE 3
D.M.F. Rates of Students born and living in Scotland, England and Ceylon.

	SCOTLAND		ENGLAND		CEYLON	
	No: of Students	D.M.F. Rate	No: of Students	D.M.F. Rate	No: of Students	D.M.F. Rate
Male	255	17.7	254	16.3	277	3.2
Female	294	18.0	256	16.6	206	3.34
Total	549	17.9	510	16.5	483	3.28

Note. Data for Scotland and England from Burnett (1960)

TABLE 4
Comparison of D.M.F. Rates for Ceylon University Students with various Occidental Countries.

University	No: of Students in Sample	D.M.F. Rates.
Indiana	3,234	10.12
Minnesota	4,348	11.08
Utah	1,954	13.20
Oregon	582	14.12
Washington	611	14.64
Edinburgh	674	16.78
Ceylon	483	3.28

Note: Data for occidental students from Burnett (1960).

TABLE 5

D. M. F. Rates by Province.

Province	No. of Students	D. M. F. Rate
Western	172	3.9
Southern	107	3.55
Central	71	3.15
Northern	60	2.28
Eastern	6	3.50
North Western	39	2.32
North Central	8	1.37
Uva	7	1.70
Sabaragamuwa	18	3.50
Total	483	3.28

TABLE 6

D. M. F. Rates by Income Group.

Income Group	No. of Students	D.M.F. Rate
Under Rs. 3,600/- per annum	235	3.12
Rs. 3,600/- to Rs. 6,000/- per annum	205	3.03
Over Rs. 6,000/- per annum	43	4.8
Total	483	3.28

TABLE 7

Distribution of Income Groups by Province.

Province	Over Rs. 6,000/- per annum	Rs. 3,600/- to Rs. 6,000/- per annum	Under Rs. 3,600/- per annum	Total	Average Income per student.
Western	26 (15.12)	66 (38.36)	80 (46.52)	172 (100.0)	Rs. 321.50
Southern	7 (6.56)	41 (38.33)	59 (55.11)	107 (100.0)	Rs. 278.50

Central	4 (5.63)	39 (54.93)	28 (39.44)	71 (100.0)	Rs. 315.50
Northern	3 (5.00)	31 (51.67)	26 (43.33)	60 (100.0)	Rs. 304.17
Eastern	0	6 (100.0)	0	6 (100.0)	Rs. 400.00
North Western	1 (2.94)	13 (38.23)	20 (58.83)	34 (100.0)	Rs. 272.06
North Central	0	3 (37.50)	5 (62.50)	8 (100.0)	Rs. 243.75
Uva	0	1 (14.28)	6 (85.72)	7 (100.0)	Rs. 144.45
Sabaragamuwa	2 (11.11)	5 (27.78)	11 (61.11)	18 (100.0)	Rs. 275.00

Note. Figures in parentheses are percentages.

TABLE 8

D. M. F. Rates according to Dentifrice Preparation used.

Dentifrice Preparation	No. of Students	D. M. F. Rate.
Tooth Paste	144	3.5
Tooth Powder	187	2.6
Charcoal	152	3.03

TABLE 9

Income Groups and the Dentifrice Preparation used.

Dentifrice Preparation	Under Rs. 3,600/- per annum	Rs. 3,600/- to Rs. 6,000/- per annum	Over Rs. 6,000/- per annum	Total
Tooth Paste	38 (26.4)	77 (53.4)	29 (20.2)	144 (100.0)
Tooth Powder	114 (61.16)	65 (34.70)	8 (4.14)	187 (100.0)
Charcoal	83 (54.65)	63 (41.33)	6 (4.02)	152 (100.0)

Note. The figures in parentheses are percentages.

TABLE 10

D. M. F. Rates by Type of Water used.

Type of Water	No. of Students	D. M. F. Rate
Well Water	344	3.1
Pipe borne Water	107	3.46
Combined	32	3.59
Total	483	3.28

TABLE 11
Income Groups and type of Water used.

Water used	Under Rs. 3,600/- per annum	Rs. 3,600/- to Rs.6,000/- per annum	Over Rs.6,000/- per annum	Total
Well Water	196 (56.96%)	133 (38.66%)	15 (4.38%)	344 (100.0%)
Pipe borne Water	29 (27.09%)	53 (49.54%)	25 (23.37%)	107 (100.0%)
Combined	10 (31.30%)	19 (49.31%)	3 (9.39%)	32 (100.0%)

REFERENCES

- ADLER, P. (1951). Connections between Dental Caries Experience and Water borne Fluorides in Population with low Caries Incidence. *J. dent. Res.*, 30, 368—381.
- AMERICAN DENTAL ASSOCIATION (1950). Idaho Children show Effects of Fluorides. *J. Amer. dent. Ass.*, 41, 226—227.
- ATONSKY, D. (1951). Some observations on Dental Caries in Central China. *J. dent. Res.*, 30, 53—61.
- BLACKERBY, P. E. (1943). Intrastate Geographic Variations in Dental Caries Rates. *J. Amer. dent. Ass.*, 30, 1241—1245.
- BUNTING, R. W. (1935). Diet and Dental Caries. *ibid.*, 22, 114—122.
- BURNETT, J. B. (1960). Dental Disorders of Students. *The Proceedings of the British Students' Health Officers Association*. Edinburgh.
- DAY, C. D. M. AND SEDWICK, H. J. (1935). Studies on the incidence of Dental Caries. *Dent. Cosmos*, 77, 442—452.
- EASLICK, K. A. (1948). *Dental Caries*. St. Louis: The C. V. Mosby Co.
- GROVE, C. J. AND GROVE, C. T. (1942). Actions of Ammonia on Lactobacillus and Salivary Mucin. *J. Amer. dent. Ass.*, 29, 1215—1216.
- HOFFMAN, W. (1963). Why do the People of Ceylon have such Beautiful and Healthy Teeth. *Ceylon med. J.*, 8, 76—86.
- JAMESON, W. (1947). Place of Nutrition in Public Health Program. *Amer. J. publ. Hlth*, 37, 1371—1373.
- JORDAN, W. A. (1952). The Askov Dental Demonstration. *J. Amer. dent. Ass.*, 45, 430—442.
- KESSEL, R. G. (1948). Effectiveness of Dentifrices, Mouth Washes and Ammonia-urea Compounds in the Control of Dental Caries. *J. dent. Res.*, 27, 244—258.
- KLEIN, H. AND PALMER, C. E. (1940). On the Epidemiology of Dental Caries. *Symposium on Dental Caries. Bicentennial Conference*, Philadelphia: University of Pennsylvania Press.
- KNUTSON, J. W. (1944). An Index of the Prevalence of Dental Caries in School Children. *Publ. Hlth. Rep. (Wash.)*, 59, 253—263.
- MACKENZIE, F. W. (1952). Prevention of Dental Caries by Administration of Fluorine in Public Water Supplies. *Lancet*, 1, 961—984.
- MC KAY, F. S. (1953). An Appraisal of the Water borne Fluoride Dental Caries Relationship. *Amer. J. publ. Hlth*, 43, 700—703.
- SOGNAES, R. F. (1948). Analysis of Wartime Reduction of Dental Caries in European Children. *Amer. J. Dis. Child.*, 75, 792—821.
- TOVERUD, G. (1949). Dental Caries in Norwegian Children during and after the Last World War. *Proc. roy. Soc. Med.*, 42, 249—258.
- WATERMAN, G. E. AND KNUTSON, J. W. (1953). Studies on Dental Care Services for School Children. *Publ. Hlth Rep. (Wash.)*, 68, 583—589.