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A SURVEY OF THE PERIODONTAL CONDITIONS OF DENTAL STUDENTS IN INDIA AND NORWAY

by
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INTRODUCTION

The introduction of reproducible indices, suitable for statistical analysis, for the evalution of periodontal disease (*Schour & Massler*, 1947; *Russell*, 1956; *Ramfjord*, 1959), and the amount of soft and calcified debris on the teeth (*Ramfjord*, 1959; *Greene & Vermillion*, 1964) has resulted in many surveys of different world population groups during the last two decades. Extensive reviews of these epidemiologic studies have been presented by *Russell* (1960), *Löe* (1963) and *Waerhaug* (1966).

The results from these surveys have established that the severity and prevalence of periodontal disease are higher in Asian (*Marshall-Day & Shourie*, 1949; *Gupta*, 1964; *Russell et al*, 1965) and African (*Littleton*, 1963) countries than in the United States (*Greene*, 1960) and Scandinavia (*Brandtzaeg & Jamison* 1964). The reason for these differences have been attributed to various factors as race, nutrition and socio-economic conditions. However, the most important cause is apparently the diverse levels of oral hygiene amongst the countries.

The author had the privilege to accept an invitation from The Dental Council of India* to teach periodontology** at the Dental Schools of the

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Universities of Calcutta, Patna, Lucknow and Bombay. Since relatively high periodontal disease scores have been reported from India, it was considered worthwhile to compare the periodontal conditions of the Indian and the Norwegian dental students. These two groups were considered as being fairly comparable in years of education, age and socio-economic status so that a comparison without too many conditioning factors could be made.

MATERIAL AND METHODS

In order to avoid inter examiner error all examinations were performed by the author and recorded by a trained dental assistant. The Periodontal Index (PI; *Russell*, 1956) and the Simplified Oral Hygiene Index (OHI-S; *Green & Vermillion*, 1964) were used to asses the gingival condition and the amount of debris and calculus. The author had previously been calibrated in the use of these indices by Professor Jens Waerhaug who had been calibrated by Drs. Russell and Greene (*Waerhaug*, 1967). Calibration of the examiners is extremely important if the obtained data are to be compared with those from other surveys in which these indices have been applied. Intra examiner error may also be important. The author's examiner error was established and found negligible in a pilot study in Oslo. All students were examined in a regular dental chair with ample artifical light, using a mouth mirror and an explorer. A dental assistant recorded information about smoking habits, betel leaf chewing, age, sex and years in the dental school. The students were given no advance notice that they were to be examined to prevent the possibility that they might employ unusual cleaning procedures before the examination.

The information collected on the examination forms was transferred to punch cards and processed by a computer at the Department of Mathematics at the University of Oslo. All punch cards were verified prior to the computer operation in order to eliminate discrepancies in the final results.*

Table I shows the number of students examined, their age, sex and whether or not they smoked or chewed betel leaves. As can be seen from the table, the mean age is about the same in the Indian cities and in Oslo. Therefore, the age of the students is disregarded in the evaluation of differences between the groups.

Only 12 subjects admitted betel nut chewing (pan chewing). None of these could be called a real »pan chewer» since they only occasionally used to try a »pan» during the day.

* The valuable cooperation with cand. real. A. R. Tinderholt is highly appreciated.

Table I.

Number of Students According to Age, Sex and the Use of Tobacco and Betel

Place (City)	Total No. of Students	Male	Female	Age Range	Mean Age	Smokers	Betel Chewers
Calcutta	31	30	1	18—26	21.78	0	1
Patna	20	19	1	19—26	22.45	0	0
Lucknow	98	94	4	18—32	22.17	36	11
Bombay	81	60	21	20—27	24.34	16	0
Total India	230	193	27	18—32	22.69	52	12
Oslo	70	53	17	20—35	23.89	17	0

Tobacco smoking was less common in the Indian than in Oslo students previously examined. The author suspects however that more Indian students were smokers than would admit to the dental assistant upon questioning. However, anyone denying smoking was classified as a nonsmoker.

Twenty-seven out of 230 dental students examined in India were females, as compared to 17 out of 70 in Oslo. Sex differences have been considered in comparison of findings although the uneven proportion of the sexes between the two groups reduces the reliability that might otherwise be placed on such considerations.

RESULTS

Table II shows the mean values and the standard deviations (S.D.) for the different indices in the groups. No calculus was present in the Oslo students and therefore no calculus scores were recorded. It is evident that there is great variance in all of the groups, since the S.D. is consistently high.

Table II.

Mean Periodontal Index, Calculus Index, Debris Index and Oral Hygiene Index

City	Periodontal		Calculus		Debris		Oral hygiene	
	Index	S.D.	Index	S.D.	Index	S.D	Index	S.D.
Calcutta	1.398	0.849	1.596	0.595	1.354	0.638	2.951	1.114
Patna	1.437	1.346	0.999	0.861	1.249	0.543	2.249	1.207
Lucknow	1.098	1.032	1.130	0.615	1.540	0.603	2.671	1.148
Bombay	1.145	1.034	0.907	0.558	1.588	0.657	2.495	1.115
Total India	1.184	1.049	1.103	0.656	1.507	0.632	2.610	1.152
Oslo	0.319	0.329	0.000	0.000	0.466	0.342	0.466	0.342

There is a striking difference in all scores between India and Oslo. The Patna and Calcutta students show the highest periodontal scores of the Indian groups. Oral hygiene scores also vary while the Calcutta students show a much higher calculus score than those from other cities.

Table III presents the mean periodontal scores for all teeth examined in males and females grouped together. The teeth are classified according to Haderup's system. In both India and Norway the mandibular teeth have higher periodontal scores than the maxillary teeth. In India the mandibular molars have the highest scores, followed by the mandibular incisors and maxillary molars. Maxillary and mandibular bicuspids and upper front teeth show the lowest scores. In Norway the maxillary and mandibular incisors evidence the lowest scores.

Table IV and Table V illustrate the same pattern in both sexes separately. Figure 1 is a graphical illustration of Tables IV and V. Table II illustrated the difference in mean PI scores between India and Oslo. A detailed analysis of this difference is given in Tables VI, VII, VIII and IX.

The tables show the percentage distribution and the number of male and female students in subgroups of PI in all Indian cities and Oslo. The mean values and the S.D. of the CI-S, DI-S and OHI-S in the group are also presented.

In India (Table VI) 30.5 % of the males had a PI score between 1.01 and 2.0, 10.3 % between 2.01 and 3.0. 6.5 % had scores higher than 3.0, while the remaining 47.3 % was distributed between PI scores 0.1—1.00.

The females in India (Table VII) also show about the same pattern of distribution, however, the total number of females is considerably less.

The CI-S, DI-S and OHI-S follow the PI in an almost perfect straight line relationship.

In Oslo (Table VIII) 35.8 % of the males had a PI score between 0.0 and 0.1, 18.9 % between 0.11 and 0.2. Only 3.8 % had scores between 1.01 and 2.00, and no male scored higher than 2.01.

The highest percentage (29.4 %) of females in Oslo (Table IX) had PI scores from 0.0 to 0.1. No female scored higher than 0.8. Again the small number of females should be considered.

A trend towards linear relationship between PI and OHI-S is clearly distinguishable.

Figure 2 is a graphic presentation of the data in tables VI, VII, VIII and IX. Two peaks are readily observed. The Indian dental students have their peak in the PI scores between 1.01 and 2.0, while the Norwegian dental students have their peak in the PI group 0.0 to 0.1.

Table III.

Mean Periodontal Index for the Individual Teeth According to Haderup's System in Males and Females Grouped Together

	Right side								Left side								
	Molars		Premolars		Front teeth				Front teeth			Premolars		Molars			No. of students
	0.40	0.44	0.37	0.35	0.28	0.22	0.16		0.13	0.13	0.19	0.18	0.30	0.41	0.36	Oslo	70
	1.30	1.25	0.92	0.89	0.90	0.87	0.80		0.73	0.75	0.76	0.73	0.85	1.36	1.29	All India	230
Upper	1.10	1.06	0.89	0.85	0.85	0.89	0.73		0.67	0.71	0.73	0.79	0.85	1.24	1.20	Bombay	81
jaw	1.32	1.23	0.95	0.89	0.86	0.75	0.71		0.60	0.64	0.71	0.64	0.79	1.26	1.15	Lucknow	98
	1.30	1.30	0.95	0.95	1.10	1.05	1.05		1.10	1.20	1.00	0.70	0.70	1.89	1.70	Patna	20
	1.77	1.71	0.90	0.97	1.03	1.10	1.13		1.03	0.87	0.84	0.87	1.16	1.68	1.71	Calcutta	31
	7	6	5	4	3	2	1	±	1	2	3	4	5	6	7		
	1.71	1.70	1.10	1.29	1.58	1.94	1.97		1.81	1.45	1.30	1.23	1.45	2.04	1.87	Calcutta	31
	2.45	1.89	1.45	0.90	1.75	2.00	1.70		1.65	1.90	1.55	1.20	1.20	2.74	2.15	Patna	20
Lower	1.71	1.73	0.94	1.01	1.22	1.44	1.37		1.31	1.26	1.13	1.02	1.09	1.53	1.46	Lucknow	98
jaw	1.62	1.61	1.25	1.20	1.27	1.44	1.42		1.38	1.42	1.32	1.11	1.24	1.64	1.56	Bombay	81
	1.74	1.70	1.11	1.11	1.33	1.56	1.50		1.43	1.40	1.26	1.10	1.20	1.74	1.61	All India	230
	0.88	0.56	0.40	0.36	0.21	0.33	0.33		0.30	0.31	0.21	0.16	0.22	0.55	0.32	Oslo	70

Table IV.

Mean Periodontal Index for the Individual Teeth According to Haderup's System in Females

	Right side							Left side								
	Molars		Premolars		Front teeth			Front teeth			Premolars		Molars			No. of students
	0.53	0.63	0.63	0.59	0.18	0.18	0.12	0.06	0.06	0.06	0.13	0.25	0.38	0.20	Oslo	17
	0.81	0.74	0.74	0.65	0.67	0.85	0.59	0.52	0.69	0.59	0.62	0.74	0.93	0.96	All India	27
Upper	0.76	0.71	0.66	0.60	0.66	0.85	0.62	0.52	0.55	0.62	0.60	0.71	0.95	0.95	Bombay	21
jaw	1.05	0.80	1.05	0.80	0.80	0.80	0.55	0.55	0.55	0.55	1.05	1.05	1.05	1.05	Lucknow	4
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00	Patna	1
	2.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00	6.00	2.00	1.00	1.00	1.00	2.00	Calcutta	1
	7	6	5	4	3	2	1	1	2	3	4	5	6	7		
	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	6.00	6.00	6.00	Calcutta	1
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	Patna	1
Lower	1.30	2.05	0.80	0.80	1.30	1.30	1.55	1.30	1.05	1.05	0.55	0.55	0.80	0.80	Lucknow	4
jaw	1.38	1.57	1.14	1.33	1.57	1.66	1.62	1.43	1.28	1.14	1.05	1.00	1.50	1.28	Bombay	21
	1.33	1.59	1.07	1.22	1.48	1.56	1.56	1.37	1.22	1.11	0.96	1.70	1.50	1.33	All India	27
	0.80	0.44	0.50	0.47	0.24	0.18	0.18	0.18	0.12	0.06	0	0.20	0.75	0.31	Oslo	17

Table V.

Mean Periodontal Index for the Individual Teeth According to Haderup's System in Males

	Right side								Left side								
	Molars		Premolars		Front teeth				Front teeth			Premolars		Molars			No. of students
	0.37	0.38	0.29	0.27	0.31	0.24	0.17		0.15	0.15	0.23	0.19	0.32	0.42	0.41	Oslo	53
	1.37	1.31	0.95	0.92	0.93	0.88	0.83		0.75	0.75	0.78	0.74	0.87	1.42	1.34	All India	203
Upper	1.28	1.25	1.03	1.00	0.98	0.96	0.83		0.78	0.83	0.83	0.91	0.96	1.40	1.36	Bombay	60
jaw	1.37	1.30	0.99	0.94	0.91	0.80	0.77		0.65	0.69	0.77	0.67	0.82	1.31	1.20	Lucknow	94
	1.32	1.32	0.95	0.95	1.11	1.05	1.05		1.11	1.26	1.05	0.74	0.68	1.94	1.74	Patna	19
	1.77	1.70	0.87	0.93	1.03	1.07	1.13		1.03	0.70	0.80	0.87	1.17	1.70	1.70	Calcutta	30
	7	6	5	4	3	2	1	±	1	2	3	4	5	6	7		
	1.70	1.69	1.07	1.27	1.57	1.93	1.97		1.80	1.43	1.28	1.20	1.30	1.89	1.73	Calcutta	30
	2.53	1.94	1.47	0.89	1.79	2.05	1.74		1.68	1.95	1.58	1.21	1.21	2.83	2.21	Patna	19
Lower	1.78	1.76	0.99	1.07	1.27	1.50	1.41		1.35	1.31	1.18	1.09	1.16	1.61	1.53	Lucknow	94
jaw	1.76	1.69	1.35	1.21	1.23	1.43	1.41		1.42	1.53	1.45	1.20	1.38	1.76	1.72	Bombay	60
	1.80	1.71	1.12	1.09	1.32	1.56	1.49		1.44	1.42	1.28	1.11	1.22	1.77	1.65	All India	203
	0.90	0.60	0.37	0.32	0.21	0.38	0.38		0.34	0.38	0.26	0.21	0.22	0.49	0.33	Oslo	53

Table VI.

Percentage Dictribution in PI Groups of Males in India

Periodontal index	Calculus index	(S.D.)	Debris index	(S.D.)	O.H.I.	(S.D.)	No. of students	Percent in group
0 – .1	.27	.25	.77	.35	1.03	.36	5	2.5
0.11 – .2	.56	.41	.73	.19	1.29	.47	15	7.4
0.21 – .3	.44	.33	.87	.39	1.31	.62	15	7.4
0.31 – .4	.85	.46	1.15	.45	2.00	.80	10	4.9
0.41 – .5	.74	.17	1.24	.34	1.98	.39	9	4.4
0.51 – .6	.54	.36	1.13	.26	1.67	.57	9	4.4
0.61 – .7	.89	.46	1.28	.24	2.17	.62	12	5.9
0.71 – .8	1.21	.23	1.63	.35	2.83	.50	8	3.9
0.81 – .9	.85	.36	1.11	.50	1.96	.79	9	4.4
0.91 – 1.0	1.24	.54	1.51	.41	2.76	.65	15	7.4
1.01 – 2.0	1.34	.50	1.82	.54	3.16	.78	62	30.5
2.01 – 3.0	1.67	.51	1.93	.62	3.60	.98	21	10.3
3.01 – 4.0	2.10	.51	2.20	.51	4.30	.97	5	2.5
4.01 – 5.0	2.50	.35	2.43	.57	4.93	.84	5	2.5
5.01 – 6.0	2.33	.58	2.17	.29	4.50	.87	3	1.5
6.01 – 7.0	0	0	0	0	0	0	0	0
7.01 – 8.0	0	0	0	0	0	0	0	0

Table VII.

Percentage Distribution in PI Groups of Females in India

Periodontal index	Calculus index	(S.D.)	Debris index	(S.D.)	O.H.I.	(S.D.)	No. of students	Percent in group
0 – .1	.17	0	.33	0	.50	0	1	3.7
0.11 – .2	.67	0	1.00	0	1.67	0	1	3.7
0.21 – .3	.33	0	.67	0	1.00	0	1	3.7
0.31 – .4	.50	0	1.33	0	1.83	0	1	3.7
0.41 – .5	.73	.53	1.10	.22	1.83	.75	5	18.5
0.51 – .6	0	0	0	0	0	0	0	0
0.61 – .7	.67	.24	1.42	.12	2.08	.35	2	7.4
0.71 – .8	0	0	0	0	0	0	0	0
0.81 – .9	.67	.71	1.54	.32	2.21	1.00	4	14.8
0.91 – 1.0	.33	0	2.00	0	2.33	0	1	3.7
1.01 – 2.0	1.04	.59	2.09	.54	4.14	.81	9	33.3
2.01 – 3.0	2.00	0	.83	0	2.83	0	1	3.7
3.01 – 4.0	1.67	0	2.50	0	4.17	0	1	3.7
4.01 – 5.0	0	0	0	0	0	0	0	0
5.01 – 6.0	0	0	0	0	0	0	0	0
6.01 – 7.0	0	0	0	0	0	0	0	0
7.01 – 8.0	0	0	0	0	0	0	0	0

Table VIII.

Percentage Distribution in PI Groups of Males in Norway

Periodontal index	Calculus index	(S.D.)	Debris index	(S.D.)	O.H.I.	(S.D.)	No. of students	Percent in group
0 — .1	0	0	.40	.28	.40	.28	19	35.8
0.11— .2	0	0	.45	.39	.45	.39	10	18.9
0.21— .3	0	0	.28	.10	.28	.10	3	5.7
0.31— .4	0	0	.46	.37	.46	.37	4	7.5
0.41— .5	0	0	.08	.12	.08	.12	2	3.8
0.51— .6	0	0	.50	.44	.50	.44	3	5.7
0.61— .7	0	0	.75	.12	.75	.12	2	3.8
0.71— .8	0	0	1.00	0	1.00	0	1	1.9
0.81— .9	0	0	.67	.33	.67	.33	3	5.7
0.91—1.0	0	0	.88	.34	.88	.34	4	7.5
1.01—2.0	0	0	1.00	0	1.00	0	2	3.8
2.01—3.0	0	0	0	0	0	0	0	0
3.01—4.0	0	0	0	0	0	0	0	0
4.01—5.0	0	0	0	0	0	0	0	0
5.01—6.0	0	0	0	0	0	0	0	0
6.01—7.0	0	0	0	0	0	0	0	0
7.01—8.0	0	0	0	0	0	0	0	0

Table IX.

Percentage Distribution in PI Groups of Females in Norway

Periodonsal index	Calculus index	(S.D.)	Debris index	(S.D.)	O.H.I.	(S.D.)	No. of students	Percent in group
0— .1	0	0	.10	.15	.10	.15	5	29.4
0.11— .2	0	0	.33	.17	.33	.17	3	17.6
0.21— .3	0	0	.17	0	.17	0	1	5.9
0.31— .4	0	0	.56	.35	.56	.35	3	17.6
0.41— .5	0	0	0	0	0	0	0	0
0.51— .6	0	0	.39	.35	.39	.35	3	17.6
0.61— .7	0	0	0	0	0	0	0	0
0.71— .8	0	0	.83	0	.83	0	2	11.8
0.81— .9	0	0	0	0	0	0	0	0
0.91—1.0	0	0	0	0	0	0	0	0
1.01—2.0	0	0	0	0	0	0	0	0
2.01—3.0	0	0	0	0	0	0	0	0
3.01—4.0	0	0	0	0	0	0	0	0
4.01—5.0	0	0	0	0	0	0	0	0
5.01—6.0	0	0	0	0	0	0	0	0
6.01—7.0	0	0	0	0	0	0	0	0
7.01—8.0	0	0	0	0	0	0	0	0

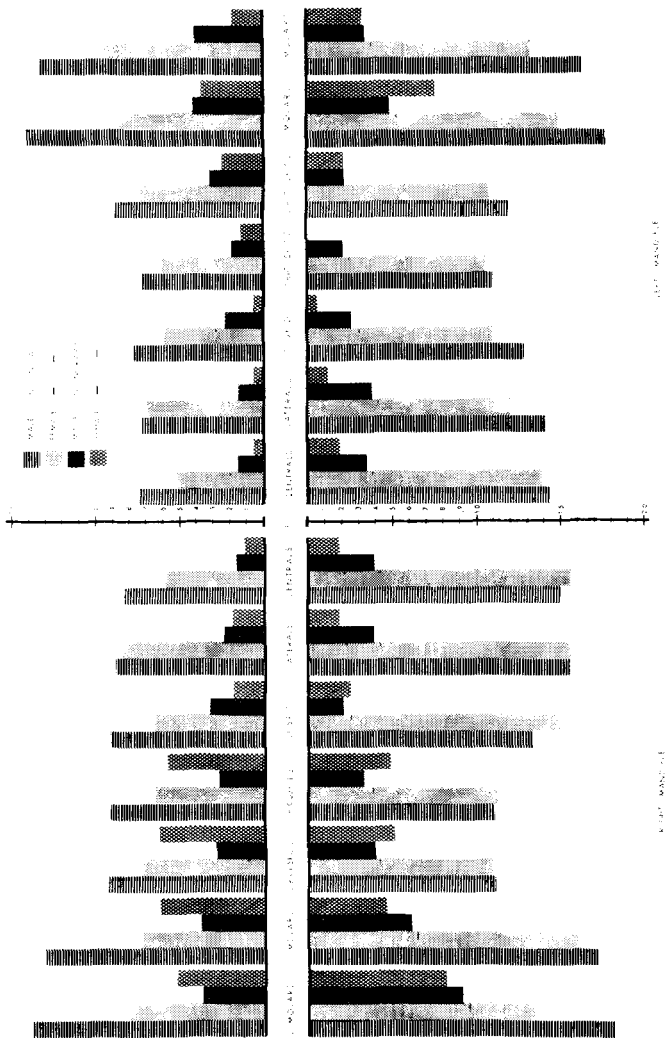

Fig. 1 Mean periodontal index by teeth and sex in India and Norway.

Table X shows the number of students with one or more true periodontal pockets (pockets extending below the cemento-enamel junction). There was a marked difference between the percentage of pockets and also in the range of the number of pockets in the students.

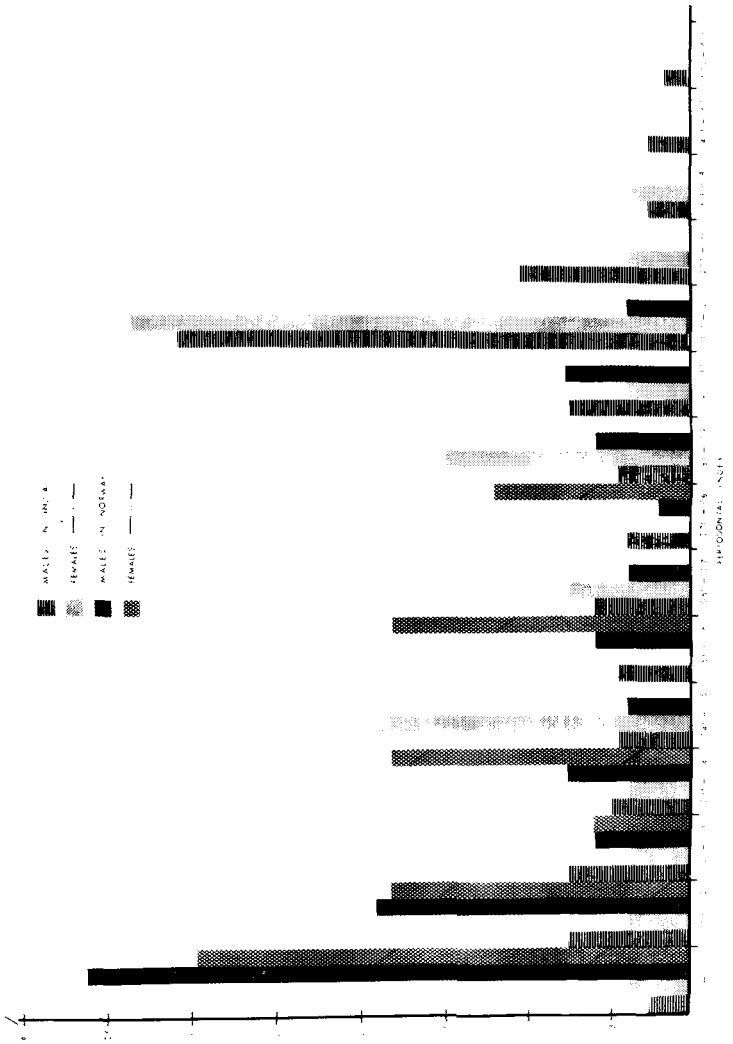

Fig. 2 Percentage distribution of dental students in PI groups.

Statistical Analysis of the Material

The effects of sex, tobacco smoking, betel nut chewing on the PI, CI-S DI-S and OHI-S were considered in the cities of India and Oslo.* Table XI was compiled for an analysis of variance.

* The author is indebted to Dr. D. C. Hurst, Chairman, Department of Biostatistics, University of Alabama in Birmingham, for providing his expertise in the application of statistics to the material.

Table X.

The Number of Students With One or More True Periodontal Pockets

Place (City)	Total Number of Students	No. of Students With Pockets	Range for the Number of Pockets in One Student	% of Students With Pockets
Calcutta	31	9	1—18	29.03
Patna	30	9	1—25	45.0
Lucknow	98	23	1—23	23.47
Bombay	81	13	1—28	16.05
Total India	230	54	1—28	23.48
Oslo	70	5	1—3	7.14

Table XI.

Mean Values of PI, CI, DI and OHI-S

Cities		Periodental index	No.	Calculus index	No.	Debris index	No	Oral Hygiene index	No.
Patna	FS'	.893	1	.167	1	1.333	1	1.500	1
	MS'	1.466	19	1.044	19	1.245	19	2.289	19
Calcutta	FS'	2.351	1	2.000	1	.833	1	2.833	1
	MS'	1.256	29	1.535	29	1.316	29	2.850	29
	MBS'	4.571	1	3.000	1	3.000	1	6.000	1
Lucknow	MSB	1.603	11	1.409	11	1.757	11	3.167	11
	MSB'	.946	25	1.027	25	1.487	25	2.513	25
	MS'B'	1.081	58	1.135	58	1.534	58	2.670	58
	FS'	.911	4	.958	4	1.583	4	2.541	4
Bombay	MS	1.515	16	1.021	16	1.594	16	2.615	16
	MS'	1.088	44	.920	44	1.583	44	2.504	44
	FS'	.985	21	.794	21	1.595	21	2.389	21
Oslo	MS	.399	18	.000	18	.657	18	.657	18
	MS'	.291	35	.000	35	.419	35	.419	35
	FS	.348	5	.000	5	.372	5	.372	5
	FS'	.273	12	.000	12	.277	12	.277	12

M — Male
F — Female
B — Betel
B' — No Betel
S — Smokers
S' — Non Smokers

The Indian Groups

The table shows that females had a lower mean in PI scores and also in OHI-S scores as compared to the males. Smokers had higher PI and OHI-S scores than nonsmokers. The comparison of betel chewing and smoking versus smoking and no betel chewing could only be undertaken in the Lucknow group. The first mentioned group showed higher mean scores. Significance tests were applied to these differences in scores.

Table XII.
Significance Tests of the Variances in Table XI

INDIA

	Cities Male Nonsm. No Betel	Cities Female Nonsm.	Smoker, No Bet. vs Nonsm. No Betel	Male Nonsm. vs Female Nonsmoker	Smoker vs Nonsmoker
Russell's Periodontal Index	NS	NS	NS	NS	NS
Calculus Index	**	NS	NS	*	(Calcutta Deleted) NS
Debris Index	NS	NS	NS	NS	NS
Oral Hygiene Index	NS	NS	NS	NS	NS

LUCKNOW, INDIA

	Male Smoker Betel vs No Betel
Russell's Periodontal Index	NS
Calculus Index	NS
Debris Index	NS
Oral Hygiene Index	NS

OSLO, NORWAY

	Male Smoker vs Female Smoker	Male Nonsm vs Female Nonsm.	Smoker vs Nonsmoker
Russell's Periodontal Index	NS	NS	NS
Debris Index	NS	NS	**

INDIA vs *OSLO*

	Smoker No Betel	Nonsmoker, No Betel	All Subjects
Russell's Periodontal Index	**	**	**
Debris Index	**	**	
Oral Hygiene Index	**		

Significant * $0.05 > p > 0.01$ Highly Significant ** $p < 0.01$

From this table it is clear that within India there is no statistically significant difference between males and females, smokers versus nonsmokers when PI, DI-S and OHI-S are considered.

Males from Calcutta had a significantly higher calculus index than the males from any other city, as shown by Duncan's multiple range test. Also, male nonsmokers showed a significantly higher calculus index than female nonsmokers in India.

Due to the limited number of pan chewers the effect of betel could be assessed only in the Lucknow group. Male betel chewing smokers did not differ significantly from no betel chewing smokers.

There was no significant difference between the sexes in PI and DI in the Oslo dental students. When the data from both sexes were pooled, smokers had significantly greater DI score than did nonsmokers.

Indian Group versus the Oslo Group

Since there was no statistically significant difference between the sexes in the findings from either the Indian cities or from Oslo, the data from both sexes were combined in this analysis. There was a highly significant statistical difference between the Indian groups and the Oslo group in the PI and DI-S. The Indian groups had the highest score for smokers, nonsmokers and also when all subjects were grouped together.

Since the mean periodontal scores between the Indian groups and the Oslo group were so different and since the same pattern of difference existed in the OHI-S, an interesting question arises: Is the highly significant difference in PI caused by other factors than comparable differences in the OHI-S? In other words: Are other factors (social, race, nutrition . . .) than OHI-S influencing the higher PI scores in the Indian dental students?

An analysis of covariance was made to answer this question. Since the Norwegian students had no calculus, comparisons of equal groups of DI were done.

Table XIII.

Mean Values in Comparable Groups of Debris Index in India and Oslo

		Groups of Debris Index to be Compared						
		0.333	0.500	0.667	0.833	1.000	1.167	Total No. of Students
All India	Mean PI	0.363	0.158	0.310	0.551	0.798	0.622	
	No. of Students	7	5	11	19	30	9	81
Oslo	Mean PI	0.177	0.241	0.394	0.494	0.889	0.526	
	No. of Students	15	8	11	6	5	4	49

Table XIII shows the number of students in India and Oslo with the same mean values (0.333, 0.500, 0.667, 0.833, 1.000 and 1.167) in subgroups of DI and corresponding mean scores of PI. The table is illustrated in Figure 3.

It can readily be seen from the graph that there is no statistically significant difference in PI scores when equal groups of Debris Index in Indian cities and Oslo are compared. A significance test verified this. Therefore, although Indian dental students have an appreciable higher degree of periodontal disease (as estimated by Russell's Periodontal Index) than Norwegian dental

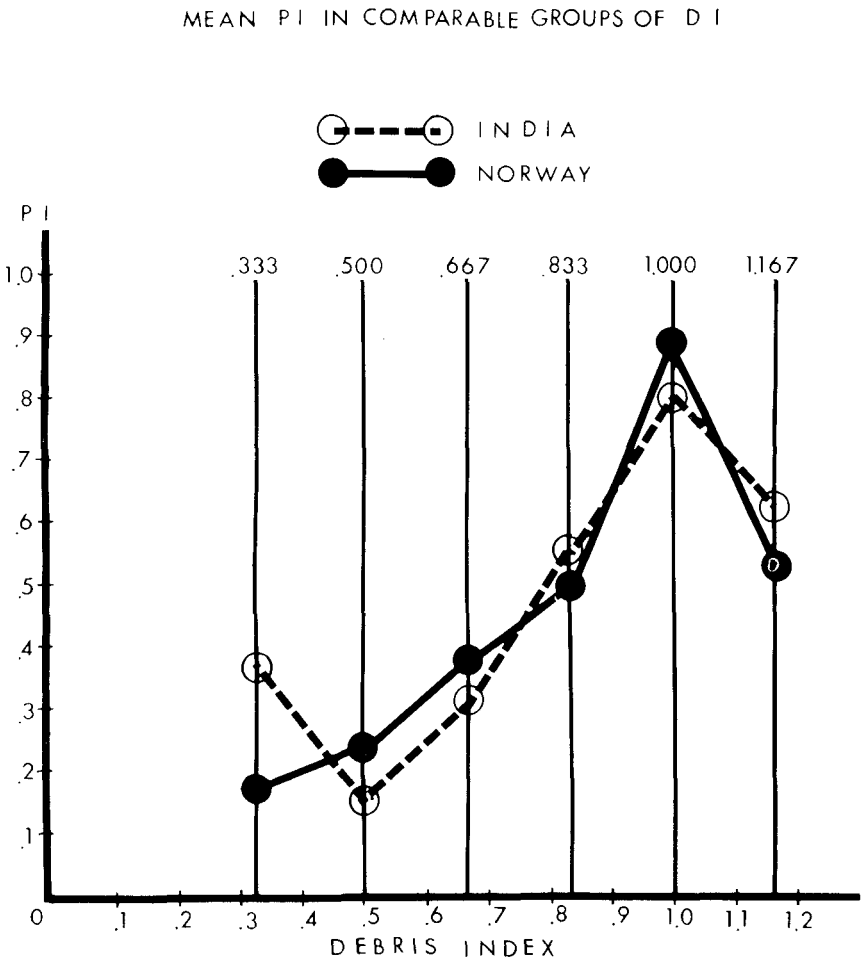

Fig. 3.

Table XIV.

Correlation Coefficients in all Indian Cities and Oslo

	CORRELATION COEFFICIENTS			
	India		Oslo	
Correlations	r	S.D.	r	S.D.
PI and CI	0.680	0.0355	—	—
PI and DI	0.590	0.0430	0.498	0.0904
PI and OHI-S	0.711	0.0376	0.498	0.0904

students, this difference may be attributed exclusively to the difference in oral hygiene, which was estimated with the Simplified Debris Index.

The correlation coefficients (r) with standard deviations (S.D.) between PI and CI-S, DI-S and OHI-S were calculated for all Indian students grouped together and for the Norwegians students. The values for (r) did not vary to any great extent and are summarized in Table XIV.

Regression coefficients were also calculated but provided no additional information and are not presented.

DISCUSSION

Dental students supposedly represent a select population group and, therefore, cannot be easily compared to other strata of populations. One would expect dental students to represent a group that would be recognizant of factors influencing periodontal health.

Therefore, one might want to test this hypothesis by comparing the results of this study with similar studies in Indian cities and Oslo. Unfortunately such a comparison is difficult. At present there is no published study, which applies the indices used in this report, that deals with Norwegian or Indian dental students. *Chawla and Chaudry* (1957) examined the medical students in Lucknow, but a comparison of this group of students with dental students is not easily made, since prevention of periodontal disease can hardly be expected to be included in the curriculum of the medical schools. Furthermore, no reproducible index was used in their study. They found, however, a slightly higher percentage of gingivitis in females than in males. This could not be confirmed by the present author, but admittedly the number of female dental students is a questionable basis for dispute. *Heylings* (1961) on the other hand found less gingivitis in female than in male undergraduate students at the University of Leeds.

Many surveys have been done in other population groups in India. *Chawla et al* (1963) examined 1000 individuals between the ages of 12—30 years in urban Lucknow and did not find a single mouth free from periodontal disease in the subjects examined. This agrees closely with the present data from dental students in Lucknow.

Basu and Dutta (1963) reported the findings in 1000 subjects from Calcutta using the Periodontal Disease Index (PDI; *Ramfjord* 1959) and could not find any sex difference in the PDI scores. The findings in the dental students in India confirmed this.

Again comparison is hampered by the limited numbers of published studies using the same indices as in this report although an attempt to evaluate the differences between the PI score (*Russell*, 1956) and the PDI score (*Ramfjord*, 1959) has been reported by *Jamison* (1968).

Greene (1960) reported the periodontal conditions in urban and rural Bombay using the PI. He found a mean periodontal score of 1.36 in the age group 19—22 years in the rural population. Unfortunately, he did not report the periodontal score in any urban population of this age. The mean periodontal index score of the dental students in Bombay was found to be 1.15 in this study. If all influencing variables between the two groups are disregarded, there is a lower PI in the dental students than in the rural groups of inhabitants in Bombay at approximately the same age. Obviously this comparison is only reasonably valid, and if statistical tests were applied, the difference might very well disappear.

The OHI was used by *Greene* (1960). In this study the simplified OHI-S was scored. Therefore, no comparison of the oral hygiene level can be undertaken. *Greene* (1960) when comparing groups of similar oral hygiene in his material found a statistically significant difference between the periodontal scores in India and Atlanta, Georgia. Such a difference did not exist between India and Oslo in the dental students. Therefore, the difference in PI scores between the groups in this report can be contributed to the different levels of oral hygiene alone. This conclusion is supported by *Russell* (1957), *Russell* and *Ayers* (1960), *Waerhaug* (1967) and *Holmes and Collier* (1968). The Indian diet contains more carbohydrates than proteins (*Gopalan*, 1955), but evidently this does not influence the periodontal conditions to any appreciable extent, since the Norwegian students with their higher intake of proteins had the same periodontal scores in equal groups of Debris Index. It is surprising that *Cheraskin et al* (1968) could report more improvement in the gingival state after 15 days of protein supplementation and prophylaxis than after prophylaxis alone.

Waerhaug (1967) examined different population groups in Ceylon using

the PI and the OHI-S. When the dental students in India are compared to his findings (Table VI, p. 214) for persons in age group 20—29 with 13 15 years of schooling we find that the mean periodontal score for his group was 1.12 while the Indian dental students had a mean PI score of 1.18. Therefore, one might possibly state that the Indian dental students had about the same mean periodontal scores as had a relatively comparable group in Ceylon. Again this statement excludes consideration of many of the variables in epidemiologic surveys. However, the results might reflect the calibration of the present author with Dr. Waerhaug in the use of Russell's Periodontal Index, and that the negligible difference in score between the comparable group of the Ceylon population and the Indian dental students depicts the true situation.

A comparison of the OHI-S scores between Ceylon and Indian dental students is difficult due to the wide groups of OHI-S in Waerhaug's report. However this might be considered superfluous since a close relationship between the Periodontal Index and the level of oral hygiene has been established for a great number of populations around the world (*Russell*, 1963; *Ash et al* , 1963). These reports contradict the observations of *Chawla et al* (1959) who could not find a highly positive correlation. *Chawla et al* (1959) reported a correlation coefficient of 0.37 between palaque and gingivitis. In the present study the correlation coefficient between DI-S and PI was 0.590 and 0.680 for the CI-S and PI in the Indian students (Table XIV). *Ash et al* (1964) reported correlation coefficients of 0.626 and 0.725 between plaque and gingivitis in their study on the effectiveness of manual versus electric toothbrushes. It seems that the results from this study agree fairly well with their study. The discrepancy between the correlation coefficient reported by *Chawla et al* (1959) and those in the present study may be explained in differences in the scoring systems or their application of the examiners and by differences in the populations examined. *Chawla et al* (1959) examined persons between twelve and thirty years. This wide age span might hide the positive correlation between plaque and gingivitis which is established for the early changes in periodontal disease (*Löe et al*, 1965). *Basu and Dutta* (1963) examined the adult population in Calcutta and found an increase in the severity of periodontal disease by increasing age from 12—30 years. It might be possible that the correlation between plaque and gingivitis is reduced when more severe forms of periodontal disease are encountered. This seems reasonable since maximum scores for plaque may occur in the younger age groups before the maximum scores for periodontal disease are found. In the older age groups maximum scores for both plaque and periodontal disease are a common finding (*Russell*, 1960; *Waerhaug*,

1967). An index for the appraisal of subgingival plaque would be useful and might reveal linear relationship between plaque and periodontal disease over a wider age span than the indices available at present.

The correlation coefficient between the PI and CI-S was slightly higher than the correlation coefficient between PI and DI-S in this study. The DI-S varies with the oral hygiene efforts at the day of the clinical examination. The CI-S does not. Therefore the higher correlation coefficient between PI and CI-S would be expected since in humans the calculus always in covered with a layer of micro organism which is accepted as the major cause in the etiology of periodontal disease (*Waerhaug*, 1966).

Brandtzaeg and *Jamison* (1964) surveyed the periodontal conditions in Norwegian army recruits applying the PI and the OHI-S. They reported a mean PI of 0.80 and a mean Debris Index of 0.97. As expected, these scores are considerably higher than the equivalent scores for the dental students in Oslo. However, a comparison of the groups seems justified. The recruits had a mean age of 20.5 years, the mean age for the dental students was 23.9 years. Since there was no sex difference in scores for the dental students this variable may be deleted. The recruits, and the dental students also, come from all parts of Norway. Fortunately, the years of school completed have been evaluated in the recruits. When the group with 10 or more years of schooling is compared with the dental students we find a mean PI score of 0.72 and mean DI-S score of 0.89 for the recruits. The scores for the dental students were 0.32 and 0.47 respectively. (The dental students scale the teeth for each other; therefore the DI-S and not the OHI-S, which includes calculus score, is compared). A reasonable explanation for the difference in scores between such equal groups seems to be a reflection of the milieu in the dental school in Oslo with focus on prevention of periodontal disease by improved oral hygiene. The different scores of PI in the subgroups of the recruits were explained by oral hygiene variations. This finding was corroborated in the present material.

Relatively little information is available about the distribution of the periodontal scores for the separate teeth in the mouth. A few reports (*Löe et al*, 1965; *Lindhe & Koch*, 1966), applying the Gingival Index (*Löe-Silness*, 1963) on various population groups in Scandinavia have been published recently. The dental students in Oslo had the same pattern — i.e. the mandibular teeth showed higher scores than maxillary teeth; the molars scored higher than the other teeth and the incisors, in general, had the least score.

The Indian dental students presented almost the same pattern, but the mandibular incisors scored approximately the same as the molars. It is tempting to explain this as a result of the higher calculus scores in the Indian

group and the fact that calculus tends to accumulate on the mandibular incisors. *Mehta et al* (1955) investigated the effect of betel nut chewing and found that the teeth of the mandibular left side where the quid is kept in the mucobuccal fold were more affected by periodontal disease than the teeth of the right mandibular side. However, no consideration was directed to the oral hygiene index in the chewers or nonchewers. In the Indian dental students the mandibular incisors were almost as much affected as the mandibular molars, and no particular difference could be found between the two sides of the mandible. As stated above, there was no statistically significant difference between the betel group and the no betel group on this study. This might explain why the distribution of the PI scores of the individual teeth in this study could not confirm the observations of *Mehta et al* (1955). Only 11 dental students answered affirmatively to the question about pan chewing. Obviously so small a group cannot be safely compared to the other. Therefore, the lack of statistical significance between the betel and no betel group in both PI, DI-S, CI-S and OHI-S scores found in the dental students might be caused by the small number of »pan chewers», However, tobacco smoking and betel chewing, both thought to interfere with periodontal health, should be considered independently in comparable groups with other epidemologic variables. Until now there has been no objective study to evaluate the relationship of these two variables in periodontal surveys.

A possible detrimental effect of smoking on the periodontal conditions was not established in this study, neither in Indian nor in Norweigian dental students. This is in contradiction with many other reports (*Pindborg*, 1947: *Frandsen & Pindborg*, 1949; *Herulf*, 1951; *Arnö et al*, 1959; *Summers & Oberman*, 1968 and *Solomon et al*, 1968). A critical evaluation of the criteria and the applied statistics in some reports reveals areas for dispute about the adverse effect of smoking on the periodontium. In this study the lack of significant differences between the smokers and the nonsmokers might be attributed to the young subjects examined and that the effect of tobacco on the periodontium would be found in older persons.

The observation that DI-S is significantly lower in nonsmokers versus smokers in Oslo seems to contradict the nonsignificant difference in Periodontal Index. An explanation for this debatable observation might be the lack of sensitivity of the Periodontal Index as a tool to measure minute differences in gingival conditions in a group where the gingiva by most clinicians would be judged to be healthy or »normal». In addition, the number of smokers was limited both in Indian cities and in Oslo.

SUMMARY

A survey of the periodontal conditions of the dental students at the Universities of Calcutta, Patna, Lucknow, Bombay in India and the University of Oslo, Norway, was undertaken. *Russell's* Periodontal Index and the Simplified Oral Hygiene Index by *Green* and *Vermillion* were applied. Analysis of variance and covariance were used to detect differences among the scores of the cities. The results indicated:

1. Indian dental students had higher scores than the Norwegian dental students. The differences in scores of both the Periodontal Index and the Simplified Oral Hygiene Index was statistically highly significant.
2. No statistically significant differences were found between the scores for betel leaf chewers versus nonbetel leaf chewers.
3. No statistically significant differences were found in the Periodontal Index of smokers versus nonsmokers, either in India or in Oslo. Smokers in Oslo had a statistically significant higher Debris Index score than the nonsmokers.
4. There was no statistically significant difference in any of the applied scoring systems between females and males, either in India or in Norway.
5. When students with equivalent Debris Index scores were compared, no statistically significant difference was found between the Indian and Norwegian groups in the Periodontal Index scores.

RÉSUMÉ

ENQUÊTE SUR LES AFFECTIONS PARODONTALES CHEZ DES ÉTUDIANTS EN ART DENTAIRE EN INDE ET EN NORVÈGE

Une enquête a été entreprise sur les affections parodontales des étudiants en art dentaire des Universités de Calcutta, Patna, Lucknow et Bombay en Inde, et de l'Université d'Oslo en Norvège. On a utilisé l'indice parodontal de *Russell* et l'indice simplifié d'hygiène buccale de *Green* et *Vermillion*. Des analyses de variance et de co-variance ont servi à mettre en évidence les différences entre les valeurs obtenues dans les différentes villes. Les faits suivants ressortaient des résultats:

1. Les valeurs trouvées chez les étudiants en art dentaire de l'Inde étaient plus élevées que celles trouvées chez les étudiants en art dentaire de Norvège. Les différences entre les valeurs étaient hautement significatives du point de vue statistique tant pour l'indice parodontal que pour l'indice simplifié d'hygiène buccale.

2. Aucune différence statistiquement significative n'a été mise en évidence entre les valeurs trouvées chez les sujets mastiquant les feuilles de bétel et celles trouvées chez les sujets ne mastiquant pas les feuilles de bétel.

3. Aucune différence statistiquement significative n'a été mise en évidence entre l'indice parodontal des fumeurs et celui des non fumeurs, ni à Oslo ni en Inde. Les valeurs trouvées pour l'indice des débris des fumeurs à Oslo étaient significativement plus élevées que celles des non fumeurs.

4. Il n'existait dans aucun des systèmes d'évaluation utilisés de différence statistiquement significative entre les sujets des deux sexes, ni en Inde ni en Norvège.

5. Lorsqu'on comparait des étudiants ayant pour l'indice des débris des valeurs équivalentes, aucune différence statistiquement significative dans les valeurs de l'indice parodontal n'a été trouvée entre les groupes indiens et norvégiens.

ZUSAMMENFASSUNG

EINE ÜBERSICHT DER PERIDONTALEN VERHÄLTNISSE BEI ZAHNÄRZTLICHEN STUDENTEN IN INDIEN UND IN NORWEGEN

Bei den zahnärztlichen Studenten der Universitäten von Calcutta, Patna, Lucknow, Bombay in Indien und der Universität von Oslo, Norwegen, wurde eine Zahnfleischuntersuchung durchgeführt.

»*Russel's* Periodontal Index« und der »Simplified Oral Hygiene Index« von *Greene & Vermillion* wurden angewandt. Statistische Methoden wurden benutzt, um Unterschiede in den Werten der Gruppen festzustellen.

Die Resultate ergaben:

1. Die indischen zahnärztlichen Studenten hatten höhere Werte als die norwegischen zahnärztlichen Studenten. Die Unterschiede der Werte von sowohl dem »Periodontal Index« als auch dem »Simplified Oral Hygiene Index« waren statistisch sehr signifikant.

2. Statistich nicht signifikant waren die Unterschiede in den Werten der betelkauenden Personen gegenüber der Personen die nicht Betel kauen.

3. Statistisch nicht signifikant waren die Unterschiede im »Periodontal Index« von Rauchern gegenüber Nichtrauchern, sowohl in Indien als auch in Norwegen. Raucher in Oslo hatten statistisch einen signifikant höheren »Debris Index« Wert als Nichtraucher.

4. In keinem der angewandten Systeme gab es statistisch signifikante Unterschiede zwischen Frauen und Männern, weder in Indien noch in Norwegen.

5. Bei einem Vergleich von Studenten mit gleichen »Debris Index« Werten konnten statistisch keine signifikanten Unterschiede zwischen den indischen und norwegischen Gruppen in den »Periodontal Index« Werten festgestellt werden.

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