A PRELIMINARY INVESTIGATION OF THE DIETARY HABITS OF INDIAN UNIVERSITY STUDENTS*

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Little information on the dietary pattern of the South African Indian population is available. With the exception of a study on the nutritional status of Indian schoolchildren in Pretoria,[17,19] and a study of Indian families resident in the northern area of Durban,[14] no data regarding their dietary pattern, nutritional status in general or nutritional status in relation to socio-economic status are available. Data reflecting these aspects are of importance, not only from a national nutritional planning point of view, but also in order to assess the dependence of the high incidence of conditions such as diabetes and degenerative vascular disorders on the nutritional pattern, as these conditions appear to be initiated, at least in part, by the eating habits of this population group.[7]

As a preliminary study it was decided to determine the dietary pattern of Indian university students. This group of the population was selected for study because it was felt that some group differences which could influence the pattern of food intake, such as socio-economic status, age and activity pattern, would be eliminated to a large degree, thereby simplifying the study to some extent.

It has been shown that students pay little attention to their diets, that malnutrition may be present and that a better nutrition could improve their intellectual performance.[9] In discussions held with students it has become evident that only a few had an idea of what is understood by 'good' nutrition. It is therefore felt that the need for nutrition education has not been fully realized by parents, teachers and health and education departments alike.

The present investigation was undertaken to study the effects of the students' way of life on their dietary pattern during the university term. The students live at home, board or stay in the university hostel and were, for this study, grouped in this way.

Owing to the situation of the University College on an island in the Durban Bay, isolated from the city and suburbs, most of the students spend their lunch period for 5 days of the week on the campus. For lunch the students, with the exception of the hostel residents, depend on sandwiches which they bring from their homes or boarding establishments, and/or on items for sale at the college cafeteria. It is therefore important to know:

1. Whether the students have any nourishment before leaving for college and what they eat during the day up till the evening, when they probably would have a cooked meal, and also to what extent their weekday breakfasts and lunches contribute to their day's food intake.
2. How the average daily nutrient intake of the different student groups compare with the allowances recommended by the South African National Nutrition Council.[15]
3. Whether there is a difference in nutrient intake between weekdays and weekends.
4. How the average daily nutrient intakes of the different groups compare with one another.

The choice of method in a nutrition study is necessarily a very individual one as each investigation has its own particular problems. Modifications of existing methods are, therefore, inevitable. In this respect it has been pointed out that 'the best method to use depends on the objective of the study and the hypothesis to be tested. There is a need for greater classification in defining over-all objectives and then fitting the dietary method to the objective.'[9]

Several known methods have been used to study dietary habits of college students, ranging from large-scale questionnaire-type dietary histories with interviews,[24] 7-day food-intake records,[16,18,21,22] and inventory records in institutions,[12] to detailed weighed-food-intake studies of smaller groups coupled with chemical analyses to determine the composition of the diets.[1-3]

In the planning, execution and interpretation of any survey the value and limitations of the method chosen must be kept in mind before drawing conclusions or evaluating the results. This has been borne out by Epstein *et al.*,[10] who found that 'In general women tend to underestimate their dietary intake, while men as a group tend to overestimate it', and Chalmers *et al.*,[5] who stated that for characterizing a group by its mean intake, a one-day record was found to be the most efficient when the relative importance of the number of days was compared with the number of subjects, i.e. rather more subjects than more days. On the average it was immaterial which day was chosen, since no 'day effect' could be observed with the exception of college groups, which seemed to have a lower intake over weekends.

Young *et al.*[23] found that for the mean of a group, the dietary history gave distinctly larger values than the 7-day record when applied to schoolchildren, pregnant women

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and male industrial workers. Differences between methods when applied to college students living and eating in college dormitories were much smaller. Hueneman and Turner[11] showed that dietary histories obtained by the interview method were found to have very little quantitative value and their value as dependable data in research programmes involving small numbers of cases must be regarded as extremely uncertain. Burke[4] preferred to express the results of a dietary history by using a rating scale rather than nutrient figures which 'give an unjustified impression of the accuracy of the data'.

From the above it is clear that the selection of a reliable method for determining nutrient intake is a difficult task, and despite its shortcomings it was decided that a modified questionnaire-type method would best suit the present investigation.

SUBJECTS AND METHOD

Interviewers

Twelve senior physiology students acted as interviewers. These students were instructed in the interviewing technique and especially in the task of assessing food portions. The use of a team of interviewers was felt to be a feasible procedure as it has been found that interviewers sharing similar backgrounds and training and working as a team were able to obtain comparable data.[6]

Sample

The 838 students were divided into 6 groups, 3 each of men and women living in the university hostel, at home or elsewhere. A random sample of $\frac{1}{8}$ was drawn from each group. The division thus obtained is given in Table I.

TABLE I. DIVISION OF SUBJECTS IN GROUPS

	Men			*Women*		
	% of student population	*Number*	*Sample*	*% of student population*	*Number*	*Sample*
Hostel	12	102	18*	7	51	10†
Home	42	348	43	13	109	14
Elsewhere	23	192	24	3	26	—‡

* Sample was 13 but 5 added to equalize representation of hostel women.
† A minimum of 10 is needed for a satisfactory sample.
‡ Number too low.

With this selection it was found that all students living 'elsewhere' had full board and lodging with families and could be termed 'boarders'.

Although the influence of religion was not taken into consideration it is of interest to note the distribution of religions among the students, i.e. 59% Hindu, 34% Moslem and 7% Christian.

The Questionnaires

Each selected student, on making the appointment for an interview, was given two questionnaires to complete. In one the student was requested to detail one specific weekday's intake of food in household measurements and to indicate whether this was representative of his average normal food intake. The other questionnaire concerned his health record and dietary and living habits.

At the interview the height and weight of the subject were measured and a finger-prick blood sample was obtained. The interviewer checked the two completed questionnaires with the student, thereby familiarizing himself with the student, then completed a further questionnaire designed to assess the week's average food intake, making a distinction between weekdays and weekend consumption.

The questionnaire was designed in such a way that information on the consumption of the basic foods—(*a*) cereals, (*b*) milk and milk products, (*c*) protein-rich foods, (*d*) vegetables and fruit, (*e*) sugars, and (*f*) fats—could be assessed. From this data the calorie and vitamin-A intakes could be calculated. The size of the food item in each group which would give similar average amounts of nutrients was calculated and designated as 1 unit. From the total number of units consumed daily the mean intake for each person was calculated of each food group during the whole week, as well as for weekdays and weekends separately.

Table II gives the nutrient per unit. These figures were used to convert the unit intake of an individual into his nutrient intake by making use of the Short Method of Dietary Analysis of Leichsenring[12] and of the rapid method for Qualitative Appraisal of Food Intakes of Groups of Thomas *et al.*[20]

As a measure of the adequacy of an individual's nutrient intake, the following parameters were adopted: If the average unit intake of the 6 food groups for an individual or group were found to be 5 in each case, it was assumed that the subject or group was almost adequately nourished, falling short, however, mainly in calories, i.e. about 1,000/day for men and 500/day for women. In all the other nutrients except iron and vitamin A, the women would be well supplied, whereas the men would need some additional protein, vitamin A, thiamine, riboflavin and niacin. But these extra requirements were expected to be met by the necessarily higher intake of cereals, sugars and fats.

Haemoglobin Determination

Haemoglobin determinations were conducted on 102 of the total of 109 selected subjects by the cyanmethaemoglobin method of Dacie and Lewis.[8,22]

Statistical Procedure

In the statistical analysis it was assumed that all the characteristics under investigation follow the normal distribution in the population, so that the t-test could be applied to all the observed means. In comparing one group of students with another, the f-test was first performed on the observed variances, and where a significant value F was obtained, the Mann-Whitney U-test was used to test for a significant difference between the observed means. In comparing weekdays with weekends for the same group of students the difference between the two values of each nutrient was calculated for each student, and a test done to see whether the mean difference was significantly different from O. Any decision as to whether a difference was significant or not was taken at the 5% level.

RESULTS

Breakfast

A cereal, usually in the form of bread, with tea, coffee or sometimes milk, and an egg or protein equivalent, and seldom fruit, appeared on the average student's breakfast menu (Table III).

Sixteen per cent of the men staying at home, 4% of the men boarders and 7% of women staying at home had only tea or coffee or nothing at all for breakfast. Most of the

TABLE II. NUTRIENT VALUES OF DIFFERENT FOOD UNITS

Group	Portion	Calories	Protein G	Fat G	Calcium mg.	Iron mg.	Vit. A IU	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.
		Unit calculations									
(*a*) Cereals	1 unit	78	2·4	0·6	11	0·5	—	·04	·02	0·4	—
(*b*) Milk	1 unit	83	4·4	5·0	142	0·1	215	·04	·18	0·1	0·8
(*c*) Protein-rich	1 unit	80	6·5	6·0	15	1·0	—	·05	·08	1·7	—
(*d*) Vegetables and fruit	1 unit	51	1·6	—	18	0·9	568	·07	·06	0·7	11·3
(*e*) Sugars	1 unit	75	—	—	—	—	—	—	—	—	—
(*f*) Fats	1 unit	54	—	6·0	—	—	115*	—	—	—	—
Total		421	14·9	17·6	186	2·5	898	·20	·34	2·9	12·1
Total × 4		1,684	59·6	70·4	744	10·0	3,592	·80	1·36	11·6	48·4
Recommended allowance:											
Men		2,650	65·0	73·6	700	9·0	4,000	1·00	1·60	15·0	40·0
Women		2,150	55·0	59·7	600	12·0	4,000	·80	1·40	12·0	40·0

*Taking butter as equivalent to ½ fat intake.
1 unit cereal is equivalent to 1 slice bread, ½ cup cooked porridge, ⅓ cup cooked rice.
1 unit milk is equivalent to ½ glass (120 ml.), milk in 3 cups of tea or coffee, 20 G cheese.
1 unit protein-rich is equivalent to 1 egg, 30 G cooked meat, 30 G cooked fish, ½ cup cooked dried beans, 25 G nuts.
1 unit vegetables and fruit is equivalent to 100 G vegetable or fruit, e.g. 1 medium potato, ½–⅔ cup cooked vegetable, small apple or banana, ½ orange.

TABLE III. NUTRIENT INTAKE OF SUBJECTS CONTRIBUTED BY BREAKFAST AND LUNCH

	Number of students	Cereal*						Tea/coffee			Milk†				Protein‡				Fruit
		Nothing	0 units	1–2 units	3–4 units	5–8 units	> 8 units	Never	Once	Twice	0 units	1 unit	2 units	3 units	0 units	< 1 unit	1 unit	> 1 unit	
		Percentage students																	
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Breakfast																			
Men at home	43	16	16	63	21	—	—	19	81	—	79	7	14	—	65	—	35	—	—
Men boarders	24	4	4	54	33	9	—	0	100	—	96	—	4	—	41	21	38	—	4
Women at home	14	7	21	57	22	—	—	50	50	—	92	—	8	—	79	14	—	7	21
College lunch																			
Men at home	43	—	—	21	58	21	—	49	51	—	84	—	16	—	3	16	81	—	7
Men boarders	24	—	—	0	67	33	—	58	42	—	96	—	4	—	—	21	79	—	8
Women at home	14	—	—	22	71	7	—	86	14	—	79	—	21	—	—	36	64	—	21
Breakfast/lunch combined																			
Men at home	43	—	—	7	16	72	5	12	44	44	74	2	19	5	—	12	60	28	7
Men boarders	24	—	—	—	8	88	4	—	58	42	92	—	8	—	—	17	54	29	12
Women at home	14	—	—	7	36	57	—	50	36	14	72	—	21	7	—	29	64	7	43

*1 unit is equivalent to 1 slice bread.
†1 unit is equivalent to ½ cup milk.
‡1 unit is equivalent to 1 egg.

men had tea or coffee, and only half of the women; a few drank milk. Thirty-five per cent of the men staying at home, 59% of men boarders and only 14% of women living at home had some protein for breakfast, while more women than men had fruit.

The 'College Lunch' (Tables III and IV)

Sixty-one per cent of home and boarder men and 71% of home and boarder women had 3 - 4 slices of bread, and 25% men and 7% women 5 - 8 slices for lunch in the form of sandwiches, which they brought with them or bought at the cafeteria. Of the sandwiches eaten 95% were white bread, 81% were spread with butter and 80% had a protein filling in the form of cheese, egg or a curry dish with meat. All except one of the men living at home had some animal protein for lunch. About half the men bought tea or coffee at the cafeteria, compared with only 14% of the women.

In Table IV the frequency of college lunches is given and from these data it can be seen that the majority, i.e. 79%, of the non-hostel students had lunch at the college on all 5 weekdays.

It is interesting to note that of the hostel students all the men and 90% of the women ate some brown bread

TABLE IV. FREQUENCY OF PARTAKING OF LUNCH BY NON-HOSTEL STUDENTS

Group	Frequency (% students)				
	1/week	*2/week*	*3/week*	*4/week*	*5/week*
Men at home	2	5	7	5	81
Men boarders	0	0	8	17	75
Women at home	7	14	0	0	79

every day. For the men 76% of the bread eaten was brown, whereas for the women this amounted to 84%. All the bread in the hostel was spread with butter in the kitchen and served as toast for breakfast and with both the other meals.

Contribution of Average Weekday Breakfast and Lunch to the Day's Nutrient Intake

From the combined figures in Table III it can be seen that all the students had something to eat during the day on weekdays: They all had some form of cereal and, in addition, 11% of the men and 36% of the women ate 3 - 4 slices of bread and 78% of the men and 57% of the women ate 5 - 8 slices of bread. Fifty percent of the women and only 8% of the men had no tea or coffee during the day,

whereas 28% of the women and 20% of the men had milk. All the men and women had some protein during the day, mainly contributed by their lunch. Only 14% of the men and 29% of the women had less than 1 unit, i.e. the nutritional equivalent of 1 egg, whereas 58% of the men and 64% of the women had 1 unit and 28% men and 7% women had 2 or more units.

The mean protein content of the breakfast and lunch combined was calculated on the unit system and found to be:

Men at home 26·6 G protein, representing 41% of 65 G recommended.

Men boarders 26·3 G protein, representing 40% of 65 G recommended.

Women at home 23·0 G protein, representing 42% of 55 G recommended.

Only 9% of the men and 43% of the women ate fruit, yet, as can be seen from Table V, the students living at home as well as the boarders appeared to have had an adequate intake of fruit for normal nutrition and a higher intake of fruit and vegetables during weekends when compared with weekdays.

TABLE V. MEAN DAILY INTAKE IN UNITS OF THE 6 FOOD GROUPS

Group	*Period*	*Cereals*	*Milk*	*Protein*	*Vegetables and fruit*	*Sugars*	*Fats*
Men in hostel	Whole week	10·14	3·91	4·00	3·62	7·55	8·64
	Weekdays	10·26	3·96	4·19	3·55	7·59	8·73
	Weekends	9·90	3·81	3·47	3·76	7·43	8·44
Men at home	Whole week	8·70	2·83	4·65	5·33	7·56	7·08
	Weekdays	9·02	2·80	4·03	4·70	7·50	7·15
	Weekends	8·11	2·84	6·31	6·85	7·15	6·88
Men boarders	Whole week	9·41	2·84	5·03	4·56	7·41	7·00
	Weekdays	9·52	2·81	4·80	4·31	7·38	7·05
	Weekends	9·24	3·14	5·62	5·21	7·48	6·90
Women in hostel	Whole week	5·46	3·95	3·07	3·99	6·58	6·46
	Weekdays	5·52	3·99	3·00	3·96	6·34	6·40
	Weekends	5·34	3·86	3·26	4·05	7·13	6·60
Women at home	Whole week	5·60	2·93	4·01	4·75	9·13	5·97
	Weekdays	5·75	2·94	3·53	4·31	9·21	5·94
	Weekends	5·25	2·88	5·23	5·76	8·95	6·04

The students spent a considerable sum of money on snacks and non-nutritious items at the college cafeteria. The students, including the hostel students, regularly bought mineral water and sweets. Of the 109 students studied, only 2% drank no minerals; 10% less than 3 bottles; 51% 3 - 7 bottles; 25% 8 - 14 bottles and 12% more than 14 bottles per week. Of the 109 students studied, 6% ate no sweets; 55% spent less than 15c/week, 35% between 15 and 35c/week and 4% more than 35c/week on sweets.

Comparison of Mean Daily Unit Intake for Whole Week, Weekdays and Weekends

Table V shows that the hostel men and women had a greater mean intake of milk than the home and boarder students. The home and boarder students, on the other hand, had a greater mean intake of the protein-rich foods, vegetables and fruit. Yet the hostel students did not fall much short of the adequate average of 4 units per day in these groups. The higher intake of protein-rich foods for the home and boarder students made up in protein for their low intake of milk.

The difference between weekday and weekend intakes was small for hostel students, but was more marked in the other groups. Especially for men living at home there was a marked increase in their protein-rich food, vegetable and fruit intake over the weekends and a decreased intake of cereals. All the students ate less cereal over the weekends than during weekdays.

Mean Daily Nutrient Intake in Relation to Corresponding Recommended Allowances (Table VI)

The South African reference man should weigh 160 lb. and the reference woman 130 lb.[15] In contrast to this, the average weight for the male students in this study was found to be 129 lb. and that of the women 102 lb., and the calorie allowances used were therefore calculated for these average weights.

Table VI shows that all the student groups had an adequate, and in some cases an excess, intake of the nutrients when compared with recommended allowance values. The men living at home and men boarders, however, had a significantly lower intake of riboflavin than that recommended, possibly because of their lower milk intake. The women showed a mean intake of iron below the recommended allowances which was found to be significant for the hostel students. This low intake of iron could be accounted for by their relatively low intake of the protein-rich food group. This lower iron intake could account for the relatively low haemoglobin levels which were found in the women (Table VIII).

It has been recommended that fat should provide 20 - 30% of the total calories in the diet.[15] However, the dietary fat intake for all the student groups in this study account for more than 30% of their total calorie intake.

From Table VI it can be seen that protein intakes were adequate for the men living at home and boarders. The contributions of animal and vegetable proteins were calculated separately and the mean values show an almost similar pattern distribution for all the groups, with the exception of women who had higher intake of animal than vegetable protein. Furthermore, the total protein intake of the latter group was low.

The home and boarder students had a significantly higher ascorbic acid intake than the remaining group. This could be accounted for by their higher intake of fruit and vegetables.

Standard deviations were found to be the highest for calcium, vitamin A and ascorbic acid, most likely due to a wide variance in milk, vegetable and fruit intakes. The variances for all the nutrients were also found to be greater for the home and boarder students than for the hostel students. This last group, however, used the same menu and were therefore more likely to show a related or similar intake pattern.

Comparison of Mean Daily Nutrient Intake for Weekdays with that of Weekends

From Table VII it can be seen that both the men and the women hostel students had an almost similar nutrient intake on weekdays as during weekends. The only significant differences were that men hostel students had a markedly higher intake of calories and fats and a slightly higher intake of all nutrients on the weekdays. This may be

accounted for by the fact that they skipped some meals during weekends due to sleeping late or going out. For the women hostel students the differences were found to be insignificant throughout.

The most significant differences were found for men living at home who, on weekdays, had a significantly lower intake of all nutrients, except calcium. Their weekend nutrient intakes were, therefore, higher but were also found to be the most variable. According to the subjects the reason for this pattern was that being at home during weekends they had more leisure time and could, therefore, enjoy three good meals per day. The women living at home showed a similar pattern of food intake during weekends to that of the men.

Comparison of Mean Daily Nutrient Intake of Men and Women for Whole Week, Weekdays and Weekends

Women hostel/women home. No variances in nutrient intake could be demonstrated between these two groups. This reflected an apparent similarity in their dietary habits.

Men home/men boarders. Variances of nutrient intake here, too, were found to be insignificant throughout, also suggesting that their dietary habits were similar.

Men hostel/men home. Variances of nutrient intake were found to be significant for all nutrients during the weekend, and for vitamin A and ascorbic acid on all the days of the week. Their daily intake and intake for the weekend, however, did not differ significantly. It has been pointed out earlier that the intake of men in hostel was found not to differ much from weekday to weekend. The significant differences which were found over weekends between these two groups, therefore, appear to be due to the home students' greater and more varied intake over weekends. Men in hostel had a significantly lower intake of ascorbic acid for the whole week and during weekends

TABLE VI. AVERAGE DAILY NUTRIENT INTAKE FOR A WEEK COMPARED WITH S.A. MINIMUM DAILY DIETARY ALLOWANCE STANDARDS

Group	Age (yrs)	Height (in.)	Weight (lb.)	Calories	Protein			Fat		Ca mg.	Fe mg.	Vit. A IU	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic acid mg.
					Animal G	Veg. G	Total G	G	% cals.							
Men																
Recom. allowances (for reference man)	20–25		136	2,650			65·0	73·6	25	700	9·0	4,000	1·00	1·60	1·50	40·0
A. Hostel																
Mean	19·5	67·4	127·6	2,659	36·0	37·3	73·3	101·5	34·4	791	12·7	3,892	1·02	1·44	13·8	44·1
SD	1·9	2·0	15·0	452			16·3	19·2		204	3·5	989	·25	·34	3·8	18·5
Sig. differences	—	—	—	—			—	More		—	More	—	—	—	—	—
B. Home																
Mean	21·3	68·1	129·9	2,517	37·6	34·7	72·3	90·1	32·2	665	14·1	4,474	1·07	1·38	15·4	62·8
SD	2·4	2·3	20·8	645			17·1	24·9		223	3·8	1,893	·29	·39	4·2	32·0
Sig. differences	Older	—	—	—			More	More		—	More	—	—	Less	—	More
C. Boarders																
Mean	19·9	68·0	131·4	2,553	38·6	36·7	75·3	92·2	32·5	670	14·1	4,016	1·06	1·38	15·8	53·9
SD	1·7	2·6	19·4	478			17·7	21·4		241	3·4	1,445	·26	·41	3·9	25·4
Sig. differences	—	—	—	—			More	More		—	More	—	—	Less	—	More
Women																
Recom. allowances (for ref. women)	20–25		115	2,150			55	59·7	25	600	12·0	4,000	·80	1·40	12·0	40·0
A. Hostel																
Mean	19·1	62·4	106·0	2,046	32·1	24·7	56·8	80·2	35·3	739	9·8	3,859	·89	1·31	10·6	48·3
SD	1·1	1·9	12·9	447			15·5	15·1		309	2·8	1,313	·23	·45	2·9	23·2
Sig. differences	—	—	—	—			—	More		—	Less	—	—	—	—	—
B. Home																
Mean	19·1	63·4	99·9	2,242	34·4	25·5	59·9	77·4	31·1	621	11·3	3,967	·87	1·24	12·6	55·2
SD	1·4	2·3	12·1	524			19·8	25·3		332	3·1	1,275	·24	·49	3·9	19·9
Sig. differences	—	—	—	—			—	More		—	—	—	—	—	—	More

TABLE VII. COMPARISON BETWEEN DAILY NUTRIENT INTAKE FOR EACH GROUP ON WEEKDAYS/WEEKENDS

		Calories	Proteins G	Fats G	Calcium mg.	Iron mg.	Vit. A IU	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic acid mg.
Men											
A. Hostel											
Weekdays:	Mean	2,686	75·0	103·5	803	12·9	3,870	1·03	1·47	14·2	43·2
	SD	465	18·2	19·2	203	3·9	1,059	·28	·35	4·4	19·8
Weekends:	Mean	2,571	69·1	96·5	769	12·2	3,926	·99	1·39	12·9	45·5
	SD	464	15·0	21·0	217	3·1	1,006	·24	·34	3·4	20·2
Significant difference		More	—	More	—	—	—	—	—	—	—
B. Home											
Weekdays:	Mean	2,449	67·8	86·6	644	13·1	4,099	1·00	1·29	14·0	55·4
	SD	621	16·4	24·2	220	3·6	1,795	·27	·37	4·1	31·0
Weekends:	Mean	2,662	83·9	98·1	709	16·8	5,291	1·23	1·59	19·0	79·7
	SD	810	27·4	34·0	334	5·4	2,533	·40	·60	6·4	43·4
Significant difference		Less	Less	Less	—	Less	Less	Less	Less	Less	Less
C. Boarders											
Weekdays:	Mean	2,509	27·3	90·3	653	13·7	3,854	1·03	1·34	15·3	51·0
	SD	498	20·0	22·1	218	3·8	1,412	·29	·42	4·5	25·4
Weekends:	Mean	2,638	79·2	94·5	673	15·2	4,346	1·13	1·45	17·2	61·0
	SD	664	26·7	30·2	437	4·3	1,837	·33	·64	5·5	33·1
Significant difference		—	—	—	—	—	—	—	—	—	—
Women											
A. Hostel											
Weekdays:	Mean	2,025	56·6	79·7	744	9·7	3,845	·87	1·36	10·5	48·0
	SD	480	14·8	14·7	324	2·5	1,383	·22	·46	2·4	23·4
Weekends:	Mean	2,095	57·5	81·7	729	10·0	3,890	·81	1·31	10·9	48·9
	SD	512	17·8	17·0	293	3·9	1,537	·26	·44	4·4	30·3
Significant difference		—	—	—	—	—	—	—	—	—	—
B. Home											
Weekdays:	Mean	2,205	56·5	74·9	611	10·6	3,761	·83	1·18	11·6	51·0
	SD	551	18·3	25·5	356	2·6	1,192	·21	·49	3·4	18·0
Weekends:	Mean	2,357	68·5	85·2	649	13·3	4,582	·99	1·39	15·3	67·3
	SD	564	26·3	30·0	336	4·6	1,836	·33	·56	5·8	33·1
Significant difference		—	Less	—	—	Less	—	Less	—	Less	—

than that of men living at home. Men in hostel also had a higher mean intake of calcium than that of men living at home. This was especially evident during weekends. This difference could probably be accounted for by the former group's higher intake of milk.

Men hostel/men boarders. In comparing men in hostel with men boarders, the differences were found to be less significant than those with men living at home, and were again found to be most prominent during the weekends. Significant variances were found between the intakes of protein, calcium, vitamin A, riboflavin, niacin and ascorbic acid. The hostel students had a greater intake of calcium than the boarders. The relatively low intake of milk by the latter group could again account for this difference. Men in hostel had a significantly lower iron intake over weekends when compared with men boarders. All three groups, however, had a significantly higher intake of iron than the value given in standard recommended allowances.

Comparison of Age, Height and Weight between Various Student Groups

From Table VI it can be seen that only men living at home were significantly older than the other two groups, but they still fell in the under-25-years age-group. This difference, therefore, did not affect the applicable values used in assessing their recommended nutrient requirements.

On the average the students were lighter than the recommended weights for their heights. The mean weight for the men students was 129 lb. and for the women students 102 lb. The mean height was found to be 67·8 in. for men and 62·9 in. for women. Even when it was taken into consideration that the students were generally of a light frame, the expected weight for men was 136 lb. and that for women 115 lb., according to applicable height-weight standards.[15]

Sleep and Activity

On average the students were found to sleep 7·21 hrs/night. Some form of physical recreation was participated in by 72% of men, with an average of 3·04 hrs weekly, and by 50% of the women, with an average of 2·29 hrs weekly.

Smoking and the Consumption of Alcohol

None of the women drank alcoholic beverages or smoked, whereas 46% of the 85 men smoked; 32% smoked 1 - 10 cigarettes daily, 9% 11 - 20 cigarettes daily, and 5% more than 20 cigarettes daily. Of the 85 men 21% drank alcoholic beverages; 15% occasionally or monthly and only 6% weekly.

Haemoglobin Levels

Table VIII shows the average daily intake of iron and the average haemoglobin levels for the different student groups. In all instances men had an intake of iron in excess of the recommended daily intake and their haemoglobin levels were above 14 G/100 ml. However, the average intake of iron by women students was below the recommended level of 12 mg./day and their haemoglobin levels averaged below 12 G/100 ml.

TABLE VIII. AVERAGE HAEMOGLOBIN LEVELS OF VARIOUS STUDENT GROUPS

Group	*Iron intake (mg./day)*	*SD*	*Haemoglobin values (G/100 ml.)*	*SD*
Men at home	13·80	3·47	15·21	1·06
Men boarders	13·97	3·44	14·93	1·25
Men in hostel	12·72	3·45	14·51	1·32
Women at home	11·50	3·10	11·19	1·81
Women in hostel	9·79	2·80	11·83	1·92

DISCUSSION

In considering the results of this investigation, certain trends were found in the nutritional habits of Indian university students: They appeared to enjoy a fairly adequate nutrition, although, on the average, they tended to be underweight for age and height. The standard values of weight for age and height which were used to assess those of the group studied are, however, applicable to the White section of the South African population. It has recently been shown that somatometric differences do exist between White and Indian schoolchildren in Pretoria, where it was found that the growth attainment of White children exceeded that of Bantu, Indian and Coloured children.[19] Whether or not these differences in growth potential have a nutritional basis has not yet been established and a further investigation of this aspect seems to be indicated.

The diets were found to be varied and the different food groups well represented therein. No single food group in particular was found to be neglected. The milk intake for the home and boarder students, though low, was not sufficiently low to incur a deficiency of calcium. The low intake of milk could, however, account for the significantly low riboflavin intakes. The women's diets in general reflected a low intake of iron (significant for the women living in hostel), which could have accounted for their relatively low haemoglobin levels. The low intake of iron could be traced to a low intake of protein-rich foods. This was especially evident for hostel women, despite an *ad lib.* access daily to a variety of well-prepared meat dishes. Their tendency, therefore, to show a preference for non-protein foods should also be further investigated.

The dietary fat intakes were found to be high for all the groups studied. This, however, was to be expected since it is customary for Indians to use oil and ghee in cooking.

In comparing the intake of food on weekdays with that of weekends, students living at home, especially the men, had a significantly higher intake of nutrients during weekends. Their diet was also of different composition, i.e. it contained less cereal but more protein-rich foods, vegetables and fruit. This could be expected as the students rely on a hurried breakfast, and on sandwiches and cafeteria snacks during weekdays for their lunch. Therefore, a study of food intake during weekdays or weekends only would not give representative results. Should a detailed study of a student body or school group be envisaged, however, the laborious 7-day weighing method could be avoided by conducting a preliminary pilot survey on a sub-sample, as suggested by Potgieter and Fellingham.[17] This would enable the selection of the three most representative days of the week for detailed study.

In comparing the different student groups, significant differences were found in nutrient intake between the men in hostel and home/boarder students. The dietary pattern

of the last two groups and all the women student groups were, however, found to be similar. The significant differences which were found occurred mainly over weekends and could be due to the higher nutrient intake of home/boarder students over weekends. However, the averages for the whole week were found to be comparable for all the groups studied.

SUMMARY

A pilot investigation was undertaken to study the effects of Indian students' way of life on their dietary habits and nutritional pattern during the university term. A random sample of 109 students was used and divided on the basis of their residence into hostel, home and boarder groups.

The students compiled a 24-hour food intake record for a weekday, and a general questionnaire concerning their dietary and living habits was completed for each student. Their heights and weights were recorded and haemoglobin levels were determined. Nutrient intake for weekdays, weekends and the whole week was calculated from a third questionnaire which was completed at an interview conducted by one of 12 trained interviewers.

Nutrient intakes were calculated and the results for the different student groups were compared statistically with recommended international nutrient allowances both for weekdays and weekends. Although the results indicated a fair to adequate nutrient intake, the students tended to be underweight even when taking into account their generally light frame. They ate a varied, somewhat westernized diet, were moderately active, indulged in no excesses and did not exhibit extreme deficiencies.

The home and boarder students relied mainly on sandwiches for breakfast and lunch but had some protein (mainly as fillings for their sandwiches) during the day. On the average about 40% of the recommended allowances for protein were met by their combined breakfast and lunch intakes.

The women showed a deficiency in iron intake which was reflected by low haemoglobin levels. The home students had a higher intake of nutrients over weekends as well as a diet of different composition, i.e they consumed less cereal but more protein-rich foods, vegetables and fruit. The diets of women living at home and hostel students did not differ significantly, nor were the diets of men living at home and boarder students found to differ. The men living in hostel, however, had a food intake that was found to differ from both the other groups, especially during the weekend.

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