A Study of Methods Used in a Reducing Program for Excessively Overweight Women

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LIFE insurance statistics and clinical studies have demonstrated that obesity is one of the chief threats to longevity and to continued good health in later years.[1]

The need for weight control programs is evident.[2] The literature contains many reports dealing with various attempts at weight reduction and maintenance. For example, Williams *et al.*,[3] in a study on overweight nurses, used diets of 400 to 1200 calories and administered anorexigenic compounds of the amphetamine type. They concluded that there are no "magic" drugs that can satisfactorily bring about weight loss in the face of continued ingestion of excessive amounts of food. Sapoznik,[4] by treating patients suffering from different degrees of hypertension with several anorexigenic drugs, concluded that Obolip° was the most effective. (This product consists of a mixture of certain lipotropic factors, amphetamine, phenobarbital, and methyl cellulose.) He was able to cause a considerable weight loss during a period of six weeks. Mayer[5] has shown that an increased energy output was effective in controlling weight gains in animal experiments, and he postulated that exercise would be effective in human weight reduction.

In view of these typical reports, a study was designed to evaluate several existing methods of treatment as practiced by the medical profession, public health personnel, and nutritionists. Since it was not feasible to confine the subjects in this study to a hospital or to provide a controlled feeding program, they were asked to cooperate in a project in which a suggested meal pattern was provided. The success of such a plan would depend on educational procedures which could develop in the subjects an awareness of sound nutritional principles.

MATERIAL AND METHODS

Subjects for the study were selected by the staff of the Woman's College Hospital. All were women and most of them were patients referred to this project by their private physicians. The majority were in the middle-income bracket and had some high-school education. Some held office positions; others looked after their families at home. All were extremely overweight. Preliminary extensive histories and medical examinations were made to rule out complicating disease, such as endocrine disorders. The laboratory tests[6,7] which were done at the commencement of the program and again after a six-month interval included the following: basal metabolic rate; fasting blood sugar; liver-function tests (thymol turbidity, mercuric chloride, cephalin-cholesterol flocculation), serum proteins, total serum cholesterol, hemoglobin, and routine urinalysis. To help us understand more fully the special problems and home situation of each person, we visited the subjects to obtain a personal history

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TABLE I
Plan of Medication

Period	Group I	Group II	Group III	Group IV
1	Obolip[a]	—	Placebo	—
2	Obolip	—	Placebo	—
3	Lipocap[b] and B_{12}[c]	Lipocap and B_{12}	Lipocap and B_{12}	—
4	Obolip	—	Obolip	—

[a] Obolip: phenobarbital, 16 mg; *d*-amphetamine sulfate, 5 mg; choline bitartrate, 400 mg; *dl*-methionine, 150 mg; vitamin B_{12} 4 μg; methyl cellulose, 160 mg.
[b] Lipocap: choline bitartrate, 450 mg; *dl*-methionine, 150 mg; inositol, 100 mg.
[c] Vitamin B_{12} (4 μg) supplied by Merck & Co., Montreal, Quebec.

in order to supplement the information previously recorded. The subjects kept a one-week dietary record, for which the approximate nutritive value was calculated for comparison with the Canadian Dietary Standards.

Procedures followed throughout the program included dietary education and evaluation, routine medical supervision, and, where advisable, instruction in physical exercise.

In January, 1956, 24 women, ranging in weight from 148 to 300 pounds and in age from 15 to 61 years, were divided in two equal groups (I and II), and enrolled in a six months' program. The study was divided into four periods of six weeks each, during which all subjects, in addition to nutritional education, received medication as indicated in Table I. In October, 1956, two more groups of 12 women each, III and IV, were started. These subjects varied from 25 to 60 years in age and from 179 to 254 pounds in weight. The plan for medication for these two groups is indicated in Table I. All weight losses were recorded weekly.* Data were tabulated at the end of each six-week period.

As the program proceeded, some of the subjects dropped out of their own accord. Of the 48 members, 4 moved away from the city, 2 became pregnant, 2 developed chronic illnesses, and 15 lost interest. Of those who lost interest, one-third showed lack of cooperation and irregular attendance before the third week. As a result, there were only 8, 5, 6, and 6, who finished the study in groups I, II, III, and IV, respectively. It is significant that the combination of a medical recommendation to lose weight plus a planned educational program failed to maintain interest and cooperation in about one-third of the subjects.[8]

* Neohydrin (Lakeside Laboratories), an oral mercurial diuretic, was prescribed for some of the subjects who showed edema.

TABLE II
A Comparison of Methods to Determine Ideal Weight in Obesity Using Four Different Procedures

	Group I	II	III	IV
Number of subjects	8	5	6	6
Average age (yr)	28.5	51	35	42
Average height (in.)	65.4	63.0	63.7	65.0
Average weight (lb)	247	188	230	210
Ideal weight (lb) as determined by:				
Lean body mass[12]	131	126	127	130
Wrist measurement	135	123	132	132
Life insurance tables[10]	141	128	132	135
Nomograph[11]	145	135	137	143

Groups I and II were continued for a second series of four six-week periods, using the same medication as in the first series.

At the beginning of the study it was explained that the 1,100 to 1,200 calorie pattern to be followed by the group was designed to supply all the food nutrients in amounts recommended for good health. The dietary plan supplied approximately 75 to 80 g of protein, 130 g of carbohydrate, and 30 g of fat. Each subject kept a daily food intake record which was checked each week. The women were taught to plan menus which fitted into their family pattern but met their own dietary requirements. In some cases, it was necessary to assist them with their weeklp shopping lists. The educational procedures included formal lectures and demonstrations, group discussions, and individual consultation. There was no

attempt at coercion during any phase of the program.

When the height and weight of each person had been determined, the daily caloric requirement was estimated by means of the Boothby and Berkson Food Nomogram.[9,11] The type of frame was determined by means of the wrist measurement and from this, the ideal weight for each person was estimated.* Ideal weights were also obtained from the standard height-weight tables[10] and the per cent above ideal weight was determined on a nomograph.[11] Overweight was also calculated in percentages above the lean body mass[12] which was taken as a standard of 2 pounds per inch of height. The expected loss of weight and the actual weight loss for each subject was charted on a graph for purposes of comparison. The ideal weights for those subjects who participated throughout the project were calculated from the height, weight, and wrist measurement using four different methods. Data are presented in Table II. It is apparent that the four methods give reasonably comparable results. The differences would not appear to be significant in terms of substantially altering the estimated caloric requirements. The discrepancy in average weight between groups I and II became more apparent after some members ceased to participate. As the project progressed, several of the lighter members of group I and some of the heavier members of group II lost interest. The same factors affected the average weights of the remaining subjects in groups III and IV.

Each week supervised exercise was available and those participating were instructed in a course of prescribed exercises, to be done at home each day. The women were encouraged to increase their general activity and to take part in sports when possible.

* Measurements and calculations are as follows:

	Type of frame acc. to wrist measurement	
	Small-boned	Large-boned
Height		
Under 5′3″	5½″ or under	Over 5¾″
5′3″–5′4″	6″ or under	Over 6½″
Over 5′4″	6½″ or under	Over 6½″
Ideal weight	100 lb for 5′ ht plus 5 lb for each addl. inch	110 lb for 5′ ht plus 5 lb for each addl. inch

RESULTS AND DISCUSSION

From the personal history of these subjects it is apparent that 41 of the 48 (85 per cent) had been inclined to overweight since childhood. The remaining 7 attributed their excess weight gain to long recuperative periods following operative procedures or chronic illnesses. Pregnancy seemed to be the most important factor adding to an already obese condition. Many of the women had experience with various kinds of reducing programs, all of which ended in failure. From a study of the dietary records which the subjects kept before the commencement of the project, it was apparent that there was a lack of meal planning, resulting in an inadequate intake of proteins, vitamins, and minerals. In no case did they partake of an adequate breakfast. In some instances, the daily caloric intake was well below 1,200 calories. Since this record was made the week prior to the onset of the project, the subjects may have curtailed their food consumption. As other studies of obese people[13] have indicated, however, they are frequently inaccurate in recording food intake.

It became evident from comments that the subjects thought they were eating more when following this dietary pattern then when they had been maintaining or gaining weight. Possibly essential foods providing 1,200 calories have greater satiety value than greater quantities of the less essential foods. Probably due to liberal measurement of food, the actual caloric intake of many of the subjects may have exceeded 1,200 calories.

The results of the laboratory tests showed that the basal metabolic rate of the subjects varied from −13 (87 per cent) to +17 (117 per cent). The fasting blood sugar was in a range of 79 to 112 mg per 100 ml. Three arbitrary liver-function tests were used and showed the greatest variation of any of the laboratory determinations, with abnormal levels in two-thirds of the subjects. The individual ranges were 0.25 to 7.25 units in the thymol turbidity, 0 to 90 units for mercuric chloride, and 0 to 4 plus

TABLE III
Weight Loss Record for Series I

Subject	Age	Initial weight (lb)	% above ideal weight	Weight loss (lb)					% of required loss	
				Per. 1	Per. 2	Per. 3	Per. 4	Total	Per. 1–4[b]	Per. 1–2[c]
Group I										
O.P.	17	215	59.3	18	5.5	1	−0.5[a]	24	30.0	29.1
G.G.	22	268	123.3	13	10	2	5	30	20.3	15.5
B.N.	25	208	48.6	18	9.5	0.5	5	33	48.5	40.4
P.S.	28	271	86.9	4	10	5	2	21	16.7	11.1
S.S.	29	236	62.8	15	6.5	−5.5	3	19	20.9	23.6
C.P.	30	226	73.8	14	3	1	2.5	20.5	21.4	17.7
D.C.	32	272	117.6	28	20.5	2	1.5	52	35.4	33.0
L.K.	45	278	105.9	8	3	0	3	14	9.8	7.7
Group II										
E.G.	43	176	30.4	14.5	6.5	9	2.5	32.5	79.3	51.2
F.M.	47	148	34.5	12	3	2	2	19	50.0	39.5
H.R.	51	182	51.7	8	0	2	−2	8	12.9	12.9
D.G.	53	211	75.8	10	−1	3	2	14	15.4	9.9
R.M.	61	220	63.0	12	5	4.5	1.5	23	27.1	20.0
Group III										
C.G.	25	204	56.9	14	8	10	0	32	43.2	29.7
L.B.	33	251	100.8	10.5	8.5	4	−2	21	16.7	15.1
V.B.	33	204	56.9	13	4	7	6	30	40.5	23.0
M.M.	34	230	91.7	12	−3.5	0.5	0	9	8.2	7.7
E.G.	37	240	84.6	10	1.5	4.5	0	16	14.5	10.5
M.B.	49	254	88.1	11	1	−9	2	5	4.2	10.1
Group IV										
B.B.	27	196	50.8	7	7	−1	−0.5	12.5	18.9	21.2
A.P.	32	179	49.2	4.5	2.5	−1	1.5	7.5	12.7	11.9
J.C.	36	208	43.4	9	8	1	5	23.0	36.5	27.0
H.M.	42	207	47.9	12.5	−2.5	2	4.5	16.5	24.6	14.9
F.R.	56	246	89.2	16	21	8	7	52	44.8	31.9
J.A.	60	221	70.0	5	5	2	0	12	13.2	11.0

[a] A negative value indicates a gain in weight.

[b] $\frac{\text{Total loss (lb)}}{\text{Loss required (lb)}} \times 100.$

[c] $\frac{\text{Loss for periods 1 \& 2 (lb)}}{\text{loss required (lb)}} \times 100.$

in the cephalin-cholesterol flocculation tests. The total serum proteins were essentially normal in all but two subjects, whose levels were low—4.8 and 5.5 g per 100 ml. Total serum cholesterol values varied from 174 to 293 mg per 100 ml., and exhibited the expected inverse relationship to the individual basal metabolic rates.

There was an increase in the pulse rate and blood pressure in 80 per cent of the women after two weeks' therapy with Obolip. The blood pressure rise was more marked in those subjects who had some elevation before starting the capsules. No significant change in pulse or blood pressure was found when another lipotropic preparation (Lipocaps), containing no amphetamine, was used. The hemoglobin level dropped in the less cooperative subjects who were not adhering to the diet. The routine urinalysis did not show any change with medication or diet.

The weight loss data for Series I are presented in Table III. None of the subjects attained their calculated ideal weight. Those subjects with the least amount of excess weight had the greatest degree of success. When weight reduction is expressed as percentage of the required weight loss, groups I, II, III, and IV lost an average of 25.5, 37, 21, and 25 per cent, respectively.

TABLE IV
Weight Loss Record for Series I and II

Subject	Initial weight (lb)	Loss (lb) in Series I	Loss (lb) in summer vacation	Loss (lb) in Series II					Net loss (lb)
				Period 1	Period 2	Period 3	Period 4	Total	
Group I									
O.P.	215	24	−10.5[a]	1	−4.5	−3.5	−1.5	−8.5	5
G.G.	268	30	−9	−4	−8	−6	4	−14	7
B.N.	208	33	−1	0	6	−1.5	−0.5	4	36
P.S.	271	21	3	1	4.5	−1.5	0	4	28
S.S.	236	19	−5	−5	2	−3	4	−2	12
C.P.	226	20.5	−2	−2.5	0	4	−6	−4.5	14
D.C.	272	52	−3	7	−1.5	−7.5	8	6	55
L.K.	278	14	6	−3	−1	2	−4	−6	14
Group II									
E.G.	176	32.5	3.5	1.5	−1.5	1	1	2	38
F.M.	148	19	−1	1	0.5	−1.5	1	1	19
H.R.	182	8	0	−2	2	−5	0	−5	3
D.G.	211	14	−2	2.5	−3.5	5.5	−1.5	3	15
R.M.	220	23	−4.5	−2	−0.5	−2	2	−2.5	16

[a] A negative value indicates a gain in weight.

Eighty-one per cent of all weight lost by all subjects in Series I was lost in periods 1 and 2 (twelve weeks). When the weight loss is considered for each group, it is seen that in the first twelve weeks groups I, II, III, and IV lost respectively 87, 72.5, 80, and 77 yer cent of all the weight that was lost in Series I. Enthusiasm, a factor common to all groups in the early stages of the program, contributed to the large initial weight loss.

As has been said, 87 per cent of the total weight lost by the subjects in group I was lost in the first two periods. This percentage is greater for this group than for any other group, possibly due to the effect of the anorexigenic drug, Obolip. It will be noted from the data that there was a decreased weight loss in the second six-week period. In the same period, the subjects frequently commented that the effectiveness of the appetite inhibitor seemed to be decreasing. The observation concerning the short-term efficiency of appetite inhibitors has been made by Williams[3] and Sapoznik.[4] In the third period, groups I, II, and III received Lipocaps and vitamin B_{12}. The losses attained were insignificant, and the medication appeared to be ineffective in stimulating weight loss. Group IV, which received no medication in this period, also had insignificant losses. During the fourth period, group I had an increased weight loss almost three times that of the previous period. This may be related to the renewed physical and psychologic effect of Obolip. Group III received Obolip for the first time in period 4. For this group, the medication seemed to be ineffective, indicating that the appetite inhibitor may be more effective when introduced in early stages of treatment. Groups II and IV, receiving placebos and no medication, respectively, had insignificant losses during this period. Two of the subjects, D. C. and F. R., lost a substantial amount of weight—52 pounds—but they were not successful in losing the remainder necessary to attain ideal weight.

During the summer months, members of groups I and II were encouraged to continue their weekly visits to the clinic, but vacations and week-end trips disturbed their dietary regimen. In September, 1956, these two groups were reassembled and the same experimental plan was repeated. The data regarding their weight losses in the second series are presented in Table IV. The large weight losses experienced at the beginning of the experiment were not attained by any member of group I or II. Only six members lost an additional amount. The other subjects gained significant amounts to substantially reduce their net loss for the two series.

The effect of the physical education program was difficult to assess because the program was limited. Due to excess overweight of the subjects and the resulting inactivity, muscular stiffness was a great deterrent to continuous participation. The difficulty in obtaining clothing suitable for such exercise was another factor which made the subjects less enthusiastic. Again, there was no coercion used in this aspect of the program.

From these studies, it appears that subjects who are moderately overweight are more likely to be successful in attaining a more normal weight than those who are excessively overweight. When the history of the past several years was checked for each subject, a pattern of 10 to 20 pounds weight gain per year was typical. During the course of the experiment, each subject in groups I and II ended the second series with a net loss, which indicates that their gaining pattern was arrested.

When subjects are only 10–25 per cent overweight, a program such as described here would be satisfactory because the initial weight losses are sufficient to bring the subjects near the so-called ideal weight within a period of less than three months. When subjects need to lose up to 100 pounds, the factors which have been considered here are not adequate for such a great weight loss, because of an apparent inability to permanently change long-established eating habits. From these observations, it becomes readily apparent that the need for preventive education during childhood, adolescence, and pregnancy is great.

SUMMARY

Forty-eight women were enrolled in a weight-reduction program of six months' duration. Of these, 25 attended regularly. These 25 women ranged in age from 17 to 61 years, and their initial weight varied from 148 to 278 pounds. The subjects were divided into four groups for ease of dietary education and evaluation of medical treatments. Two of these groups were followed for a second series of six months. Eighty-five per cent of the 48 subjects initially enrolled in the program had had a tendency to be overweight since childhood.

Seventy-nine per cent of the total weight loss of all subjects in Series I occurred in the first twelve weeks. Obolip may have been an effective adjunct in the early stage of the program but none of the subjects attained her estimated ideal weight during the study.

A dietary survey carried out prior to the commencement of the program revealed that the subjects had a very limited knowledge of meal planning or sound nutritional principles. Even after an intensive educational program, there seemed to be an inability on the part of many of the subjects to continue such a dietary regimen over a prolonged period. This was a contributing factor in the unsuccessful attempts of the majority to attain their ideal weight.

A weight-reduction program for individuals under normal living conditions was found to be only partially successful. The need for good nutrition education for the prevention of overweight is indicated.

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From the day on which she weighs 140, the chief excitement of a woman's life consists of spotting women who are fatter than she is.—HELEN ROWLAND