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Nutritional and Health Quality of a Group of Popular Weight-Reducing Diets in Jordan

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Abstract: This study aims at assessing nutritional and health quality aspects of a group of popular weight-reducing diets in Jordan. Twenty two popular weight-reducing diets were collected from dieters and their essential nutrients were analyzed using Food Processor SQL software (2008). Dietary reference intakes were used as reference values for nutritional assessment. Characteristics of the diets were compared with the criteria of healthy weight-reducing diets. The results showed that the daily energy contents of the diets ranged between 352-1632 Kcal/day, with an average value of 985±77.6 Kcal/day. The percentages of diets provided the AMDR of carbohydrate, protein and fat, were 36, 82 and 73%, respectively; none of the diets did meet all the AMDR values collectively. Fourteen percent of the diets contained the AMDR of dietary fibers, while 50% contained cholesterol more than 300 mg/day. The diet coverages of DRIs ranged from 5-50% and from 5-77% for minerals and vitamins, respectively. Half of the diets contained one or more of the criteria of unhealthy faulty weight-reducing diets. Furthermore, only 3 diets encouraged dieters to practice physical activity, whereas only two instructed the adoption of healthy eating behaviors. In conclusion, that most of the tested popular diets in Jordan were imbalanced with respect to macronutrient contribution in daily energy intake, insufficient in one or more of the essential micronutrients and contradicted with the criteria of healthy weight-reducing diets.

Key words: Popular weight-reducing diets, Jordan, health

INTRODUCTION

Recently, obesity and overweight are becoming among the most common health-related problems. They pose a major risk for many chronic diseases, such as type 2 diabetes, cardiovascular diseases, including hypertension and coronary heart diseases and certain cancers (WHO, 2010). Obesity has reached epidemic proportions globally, reflecting the large social and behavioral changes; it is a complex condition, with serious social and psychological consequences, affecting almost all ages and socioeconomic groups (Ajlouni *et al*., 1998).

Increased consumption of more energy-dense, nutrient-poor foods with high levels of sugar, total and saturated fats, combined with reduced physical activity, have led to high obesity rates. Such rates have raised three-fold or more since 1980 in some parts of the world, including the Middle East (Hussein, 2001; Al-Nuaim *et al*., 1996). As a developing country, the incidence of obesity and overweight in Jordan has been increasing at an escalating rate during the last decades (Al-Kloub and Froelicher, 2009; Khader *et al*., 2008; Zindah *et al*., 2008).

Surveys consistently show that most adults try to lose or maintain their body weights. Most people who are trying to lose weight are not using the recommended combination of reducing caloric intake and increasing physical activity (Serdula *et al*., 1999). Overweight individuals are willing to try any new diet that promises quick and dramatic results more in line with their desired goals and expectations than with what good science supports (Freedman *et al*., 2001). Many of these individuals do so with the assistance of diets from popular books, magazines, websites or commercial weight loss groups.

There is significant academic and public interest in the effectiveness of popular diets, particularly low-carbohydrate diets, but there is little information on the quality of nutrition information contained in these diets (Goff *et al*., 2006). Recently, several studies revealed that many health problems result from the use of such popular diets (Sumithran and Proietto, 2008; Yancy *et al*., 2004; Goyal and Goyal, 1998; Wing *et al*., 1995).

As a result of the increased awareness about obesity and its deleterious consequences, which come in part from the information revolution, people have become enthusiastic for following weight-reducing diets. Because there is scarcity of information about the nutritional quality of common popular weight-reducing diets followed by Jordanian dieters, the current study aims at evaluating the nutritional and health quality of those diets and elaborating their commitment with the health criteria and nutritional recommendations of healthy weight-reducing diets.

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MATERIALS AND METHODS

Twenty-two weight-reducing diets frequently followed by Jordanian dieters were collected by interviewing people between September and October, 2009. These diets were exposed to study, analysis and evaluation. The criteria adopted for selecting these diets were based on the potential to be quantified and analyzed. They contained either a frequent one-day regimen or multiple days' regimen. For one-day regimens, the whole day diet was analyzed and evaluated, whereas for multiple days' regimens, three representative days were randomly selected for analysis and evaluation and the average was calculated for each of them.

The studied diets were analyzed for their nutrient contents by using the computerized dietary analysis system Food Processor SQL (2008) (Version.10.0.4, 2008; ESHA Research, Salem, Oregon, USA) (Food Processor SQL, 2008). In addition, if any of the diets did not give precise portion sizes of foods, the regular food serving sizes were used to quantify those foods. Thereafter, nutrient contents of the tested diets were statistically analyzed using Microsoft Office Excel (2007) program and the data were presented as mean±standard error of the mean (mean±SEM). The results are expressed on daily basis unless otherwise mentioned.

The diets were divided into five groups according to their daily energy levels: >1500 Kcal; 1200-1499 Kcal; 900-1199 Kcal; 600-899 Kcal and <600 Kcal. The diet was classified as low in any of the three macronutrients: carbohydrate, protein and fat if their contents were less than the lower limit of the Acceptable Macronutrient Distribution Range (AMDR) and high if their contents were greater than the upper limit. According to the AMDR (Institute of Medicine (IOM), 2002/2005), the diet was classified as low in carbohydrate, protein or fat if their corresponding values were less than 45%, 10% or 25% of the total energy, respectively and classified as high if their corresponding values were higher than 65%, 35% or 35% of the total energy, respectively. Another criterion was added for evaluating carbohydrate; the diet should not contain less than the RDA value (130 g/day) (IOM, 2002/2005). For micronutrients, the diet was considered adequate if provided not less than 80% of either the RDA of iron, phosphorus, vitamin A, thiamin, riboflavin, niacin and vitamin C, or the AI of calcium, potassium, sodium and dietary fibers (IOM, 2002/2005; Dazzi and Dwyer, 1984).

For the purpose of evaluation, the nutrient contents of the studied diets were compared with the nutrient recommendations of the two age groups of 19-30 year and 31-50 year, because they are the groups mostly adhering to such slimming diets. In case of differences between the nutrient recommendations of males and females, the recommendations of females were used for comparison, as they represent the sex group mostly following those diets.

RESULTS

Table 1 shows the energy, carbohydrates, total fats, n-3 and n-6 fatty acids, proteins, dietary fibers and cholesterol contents of the studied diets. The energy contents (Kcal) ranged from 352 to 1632, while the average energy content of all diets was 985±77.6. The energy content levels (Kcal) were >1500, 1200-1499, 900-1199, 600-899 and <600 in 9%, 18%, 32%, 23% and 18% of the diets, respectively.

As shown in Table 1, Fig. 1 and Fig. 2, only 23% of the diets provided the RDA of carbohydrate (130 g) and 45% provided less than 100 g. Thirty-six percent of the diets provided the AMDR of carbohydrate, while 14% and 50% of the diets provide less than and higher than the AMDR, respectively. Only 14% of the diets provided the recommendations of both the RDA and AMDR of carbohydrate.

Concerning fats, 73%, 14% and 5% of the diets provided the AMDR of total fats, n-6 and n-3 fatty acids, respectively. All the diets contained less than the recommended values of both n-3 and n-6 fatty acids, while only 14% provided higher amounts than the AMDR of total fats. Proportion of n-6 to n-3 was higher than the recommended 11:1 ratio in half of the diets, with an average value of 10.6±0.91:1.

As shown in Table 1, 27% of the diets did not provide the daily recommended amounts of protein for adult females (0.8 g/kg = 46 g/day for reference woman of 57 kg body weight), while 18% of the diets provided more than twice the recommended grams. Fig. 1 shows that 82% of the diets lies within the AMDR of protein. It is clear that none of the studied diets satisfied the collective criteria of the AMDR of carbohydrates, proteins, total fats and n-3 and n-6 fatty acids.

For adult females of 19-30 years, the degree of coverage of dietary fiber recommendations was 32%, when requirements are expressed as g/day and 77%, when expressed as g/1000 kcal, with average values of 13.9±1.4 g/day and 14.1 g±0.88/1000 kcal. The range values for all diets were from 4-29 g/day and from 6.5-22.9 g/1000 kcal. The cholesterol content (mg/day) of the diets ranged from 0-931 and the average was 341±52 mg for all diets. Half of the diets provided more than 300 mg of cholesterol; whereas one diet was free of cholesterol.

Table 2 shows that 41% of the diets provided more than the recommended values of saturated fatty acids (i.e., <10% of the total calories), 64% provided less than recommended amounts for monounsaturated fatty acids (i.e.,10-15% of total calories) while all the diets provided the recommended amounts of polyunsaturated fatty acids (i.e., ≤10% of total calories).

Table 3 shows that the percentages of diets that provided adequate amounts of calcium, potassium phosphorus, sodium, iron, iodine and zinc were 14, 5, 50, 36, 55, 14 and 23, respectively. The average contents of the diets were only sufficient for phosphorus

Table 1: The diets content of energy, carbohydrates, lipids, proteins, dietary fibers and cholesterol

Diet	Energy (kcal)	CHO* (g)	Lipids (g) Total	n-3	n-6	n-6:n-3	Proteins (g)	DF** g (g/1000 kcal)	Chol. (mg)
1	467	47	15	0.14	2.02	14.4	35	5 (10.7)	144
2	795	95	26	0.27	3.59	13.3	49	11 (13.8)	446
3	1632	227	41	0.35	1.62	4.6	96	29 (17.8)	158
4	352	42	8	0.10	0.63	6.3	29	5 (14.2)	57
5	943	81	28	0.43	5.24	12.2	91	10 (10.6)	292
6	1201	110	46	0.49	6.51	13.3	91	18 (15.0)	931
7	1040	106	40	0.38	4.35	11.4	70	12 (11.5)	241
8	1250	221	17	0.23	1.59	6.9	52	17 (13.6)	43
9	430	33	18	0.28	2.56	9.1	33	4 (9.3)	280
10	789	92	31	0.26	4.17	16.0	43	11 (13.9)	622
11	1135	140	43	0.29	2.69	9.6	56	26 (22.9)	810
12	930	115	34	0.29	1.81	6.2	47	13 (14.0)	227
13	1377	113	53	0.49	8.90	18.2	111	9 (6.5)	403
14	673	84	16	0.23	1.65	7.2	48	8 (11.9)	225
15	1617	86	90	0.76	4.87	6.4	116	11 (6.8)	497
16	890	113	20	0.12	1.95	16.3	67	14 (15.7)	334
17	1159	96	36	0.43	5.86	13.6	113	16 (13.8)	394
18	1430	213	42	0.61	3.20	5.2	62	23 (16.1)	364
19	1059	203	12	0.24	1.38	5.8	44	20 (18.9)	32
20	853	84	21	0.08	1.32	16.5	89	14 (16.4)	433
21	509	118	2	0.07	0.52	7.4	12	11 (21.6)	0
22	1142	102	61	0.13	1.61	12.4	51	18 (15.8)	576
Average	985.1	114.6	31.8	0.30	3.09	10.6	63.9	13.9 (14.1)	341.3
±SEM	77.6	11.8	4.3	0.04	0.46	0.9	6.3	1.4 (0.9)	52.0

*Carbohydrates, **Dietary fibers, Chol. = Cholesterol

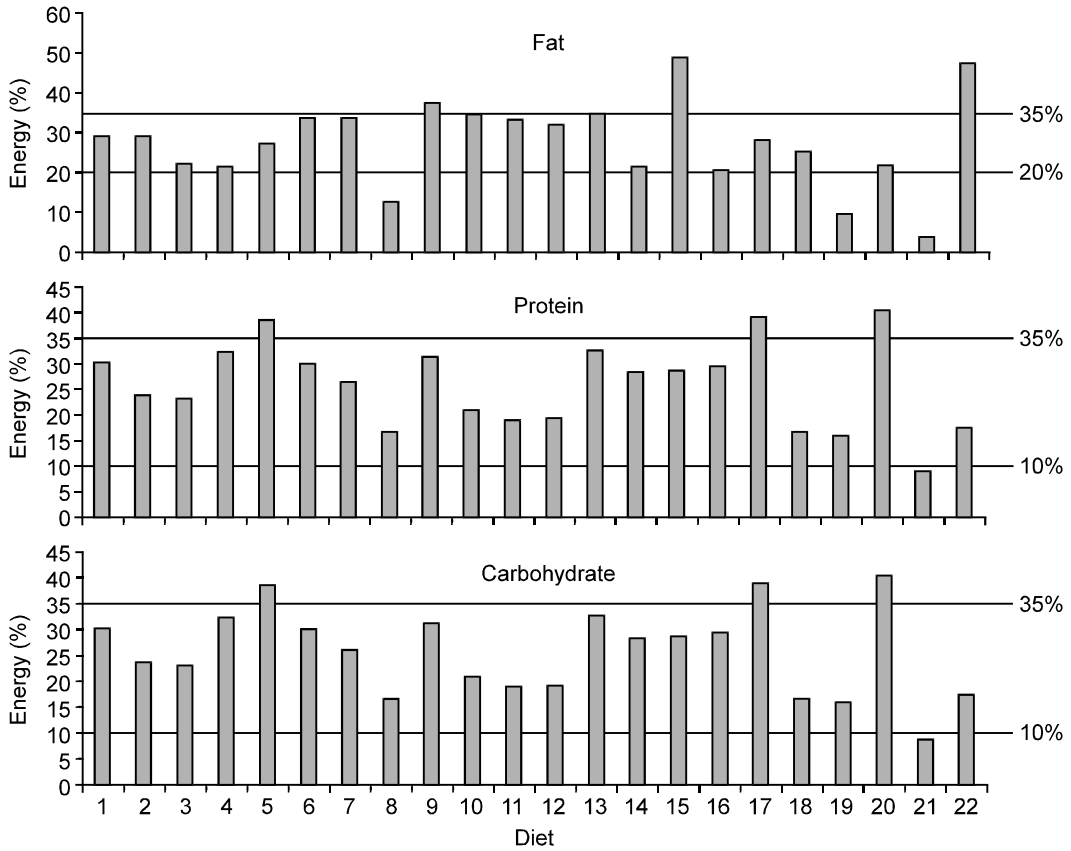

Fig. 1: Comparison of the calculated macronutrient profiles of various tested diets with the IOM's AMDR. Solid horizontal lines represent the upper and lower limits of the AMDR for the macronutrient

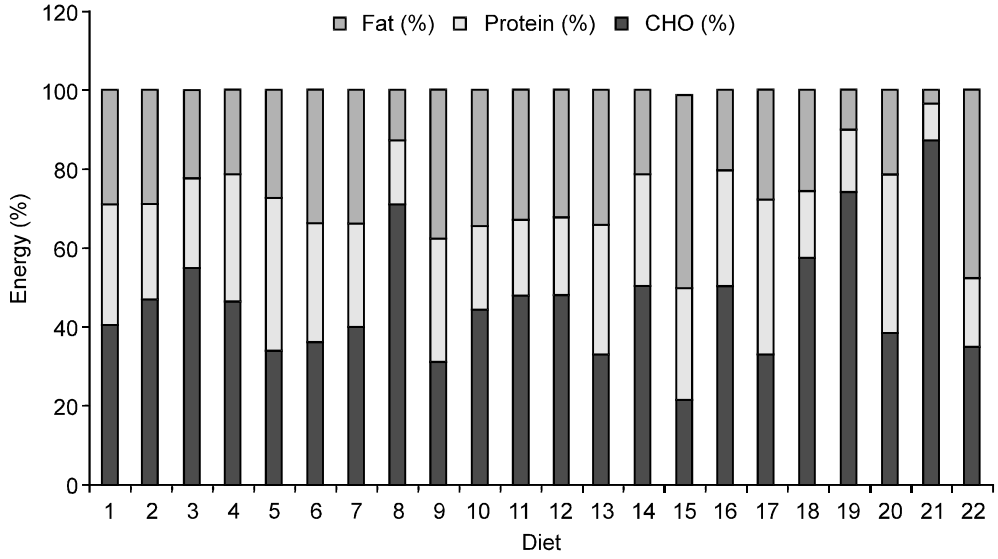

Fig. 2: Macronutrient profiles of tested diets. Percentages may not add up to 100% because of rounding

Table 2: Percentages of share of fats from total energy

	Types of fat/fatty acids*				
Diet	SAT	MUFA	PUFA	Trans	Others
1	9.8	9.3	4.2	0.3	5.5
2	10.4	9.3	4.4	0.1	4.8
3	9.3	4.2	1.1	0.5	7.1
4	9.5	4.4	1.9	0.0	5.4
5	4.2	6.5	5.4	0.0	11.0
6	10.1	12.7	5.3	0.2	5.5
7	12.1	9.9	4.0	0.1	7.8
8	3.4	1.7	1.3	0.0	6.0
9	11.2	14.3	6.2	0.3	5.6
10	10.0	13.0	4.8	0.0	6.5
11	9.7	5.9	2.2	0.0	15.2
12	11.1	10.7	7.0	0.2	3.0
13	8.8	11.9	6.2	0.0	7.8
14	8.0	7.0	2.5	0.2	3.6
15	17.4	19.0	3.2	0.2	10.2
16	6.7	8.1	2.1	0.4	3.2
17	7.9	11.0	4.9	0.4	3.7
18	10.3	6.9	2.3	0.3	5.6
19	4.9	2.3	1.4	0.0	1.2
20	6.8	8.7	1.9	0.4	3.8
21	0.6	0.6	1.0	0.0	1.4
22	18.2	19.9	2.9	4.6	1.8
Average	9.1	9.0	3.5	0.4	5.7
±SEM	0.9	1.1	0.4	0.2	0.7

*The total types of fatty acids may not sum to the total fat because of approximation

(681.7 mg±67.1); whereas they were insufficient for calcium (409.3 mg±55.2), potassium (1857.3 mg±206.9), iron (7.5 mg±0.79), sodium (1018.7 mg±124.2), iodine (68.5 µg±10) and zinc (6.3 mg±0.8). Table 3 also shows that the percentages of diets that provided adequate amounts of vitamin A, vitamin C, thiamine, riboflavin, niacin, folic acid and vitamin B_{12} were 27, 77, 23, 59, 68, 5 and 77, respectively. The average contents of the diets were sufficient for vitamin C (144.9mg ± 23.8), riboflavin (1.2mg ± 0.18), niacin (21.2 mg NE ± 2.8) and vitamin B_{12} (4.05µg ± 0.69); whereas they were insufficient for vitamin A (481.8µg RAE ± 60.0), thiamin (0.57mg±0.07) and folic acid (150.4µg DFE ± 19.0).

Table 4 and 5 summarize some of the criteria of fad reducing diets and description of the studied diets, respectively. Table 4 shows that half of the diets contained at least one of the criteria of fad reducing diets; the most frequent criterion (46% of the diets) was the ability of the diet to reduce a great deal of the body weight in a short time. Table 5 shows that 14%, 9% and 9% of the diets recommended the use of physical activity, behavioral change and use of herbals, respectively. Table 5 also shows that 32% of the diets did not precise the period of commitment to these diets; whereas 45% and 5% of the diets promised a weight reduction of more than 1 kg/week and between 0.5-1 kg/week, respectively.

A general overview of the studied diets reveals that none of those diets considered the personal food preferences, cultural and socioeconomic differences; the graduation in reducing the energy intake, as well as undergoing nutritional assessment prior to prescribing the diet.

DISCUSSION

Although most of popular weight-loss diets are effective for weight reduction in a short term, their dietary quality and long-term health impact are unknown (Ma *et al*., 2007). It is known that the intake of more than the AMDR value increases the risk for chronic diseases, while the intake of lesser values may cause nutrient deficiencies (IOM, 2002/2005). Depending on the results in Table 1,

Table 3: The diet contents of some vitamins and minerals

	Vitamins							Minerals						
Diet	A, (RAE) (µg)	C (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin, NE (mg)	Folate, DFE (µg)	B_{12} (µg)	Ca (mg)	K (mg)	P (mg)	Na (mg)	Fe (mg)	I (µg)	Zn (mg)
1	943.4	7.4	0.3	0.5	9.9	64.5	2.4	184.5	648.4	320.4	684.2	4.1	25.5	3.4
2	304.8	171.2	0.3	0.8	15.6	89.5	2.5	191.7	1712.6	425.4	796.9	7.0	45.5	5.2
3	417.6	267.1	1.2	1.7	21.6	358.9	4.2	962.2	2832.6	1023.1	2118.7	12.6	145.3	7.8
4	88.5	77.8	0.2	0.5	4.5	55.8	0.6	293.5	866.3	240.9	628.0	3.2	60.4	1.5
5	379.1	276.7	0.6	0.9	32.1	155.9	3.9	263.9	1910.3	772.2	1534.3	7.5	41.8	2.6
6	566.6	225.9	0.5	1.7	29.7	135.7	6.8	298.6	2001.2	866.4	541.0	9.5	95.2	11.3
7	303.7	35.5	0.3	0.7	29.8	71.0	5.2	297.4	1199.3	654.1	1355.6	6.0	21.2	5.0
8	210.6	281.9	0.9	0.9	10.9	245.1	0.7	534.4	1925.1	512.0	1236.6	9.3	57.6	2.8
9	785.8	27.9	0.3	0.5	9.3	70.5	2.9	134.7	787.6	409.4	584.2	3.7	43.3	3.1
10	445.5	249.0	0.5	1.0	17.6	127.7	2.7	237.1	1944.5	553.7	721.3	5.8	76.2	4.1
11	1192.6	96.6	0.5	1.5	9.8	261.0	2.0	499.8	2149.9	549.3	1512.1	7.3	108.6	2.9
12	517.2	209.6	0.5	1.0	9.6	113.2	2.5	639.5	1755.9	570.6	956.5	5.2	106.0	4.9
13	325.3	105.9	0.8	1.0	43.2	109.5	5.2	583.2	1659.5	1020.1	2115.9	7.5	50.7	6.7
14	508.5	11.7	0.3	0.6	17.6	153.5	2.7	379.0	1072.3	473.6	900.1	5.6	22.1	4.9
15	965.5	86.9	1.1	2.4	35.1	298.6	12.0	928.7	2410.4	1194.9	2175.4	19.9	140.1	14.9
16	445.1	86.1	0.6	1.1	23.6	124.8	7.2	370.4	1774.6	823.4	718.8	8.7	88.3	10.2
17	385.8	184.1	0.5	1.1	51.4	102.9	11.4	202.3	2334.9	1125.6	944.5	11.6	28.5	12.2
18	501.3	71.9	1.0	1.6	18.8	231.2	3.2	831.6	2418.6	972.4	1337.1	7.8	188.9	5.8
19	626.2	449.8	1.3	4.3	42.1	292.3	1.7	651.3	5345.3	1291.6	609.2	6.4	76.8	10.7
20	263.8	49.4	0.2	0.7	17.1	76.4	7.8	113.8	1585.0	474.0	366.1	5.9	27.0	8.5
21	47.0	114.6	0.4	0.6	4.5	103.0	0.4	275.7	952.6	221.2	226.3	3.1	3.7	1.3
22	375.6	101.6	0.3	1.1	12.1	67.8	1.1	130.7	1573.4	504.0	349.4	6.2	54.7	8.5
Average	481.8	144.9	0.6	1.2	21.2	150.4	4.1	409.3	1857.3	681.7	1018.7	7.5	68.5	6.3
±SEM	60.0	23.8	0.07	0.18	2.8	19.0	0.7	55.2	206.9	67.1	124.2	0.8	10.0	0.8

Table 4: The criteria/claims of fad diets and their frequency in the studied diets

Criterion/claim	Frequency (out of the 22 diets)
Addressing diets by brilliant names such as famous medical centers, physicians, or herbalists	4
The use of attractive statements such as "adhere to this diet for only 14 days, after that you will lose weight and will not gain weight whatever you eat"	2
The use of special supplements or herbals as a secret of success	2
The claim that the diet is novel, unique or different from other common slimming diets	2
The use of misleading and fraud statements, i.e., "this diet changes the body metabolism"	3
Promotes the dieter to strictly adhere the diet without any change, otherwise the diet fails	2
The claim that the dieter will lose much weight in very short time, i.e., 4 kg/week	10
The use of some non day-to-day foods, such as instant coffee or steak in every meal	2

Table 5: Description of the studied weight-reducing diets

Diet	CT (week)	EWL (kg/wk)	RATOPE	RAEBC
1	2	3-4	No	No
2	ND*	9	No	No
3	ND	½-1	Yes	Yes
4	ND	4.5	No	No
5	ND	ND	No	No
6	4	5-7	Yes	No
7	3-7	5	No	No
8	1	ND	No	No
9	2	ND	No	No
10	2	ND	No	No
11	1	2-3	No	No
12	1	ND	No	No
13	4	ND	No	No
14	2	ND	No	No
15	1	2-4	Yes	No
16	ND	ND	No	No
17	1	ND	No	No
18	ND	ND	No	Yes
19	ND	3	No	No
20	1	ND	No	No
21	1	2	No	No
22	1	2	No	No

*Not determined. CT (week) = Commitment Time (week), EWL (kg/wk) = Expected Weight Loss (kg/wk), RATOPE = Recommends a Type of Physical Exercise, RAEBC = Recommends an Eating Behavioral Change

it is clear that the studied diets depended mainly on dramatically decreasing energy intake, thus forcing the body to catabolize its own energy stores. It is well documented that any calorie-restricted diet will result in weight loss (Freedman *et al*., 2001). In other words, weight loss has to be associated with energy restriction and not merely with carbohydrate restriction (Bravata *et al*., 2003). Furthermore, in the absence of physical activity, a diet that contains 1400-1500 kcal/day, regardless of macronutrient composition, will result in a certain degree of weight loss (Gill and Wu, 2006; Freedman *et al*., 2001).

The American College of Sports Medicine recommends that the reducing diet should not use less than 1000 or 1200 kcal/day for adult females and males, respectively (Rolfes *et al*., 2009). It is obvious that 50% and 73% of the studied diets provided less than 1000 and 1200 kcal, respectively. This low energy intake forces the body to oxidize its adipose tissue stores to compensate for energy shortage. It is well known that the lower the calories, the more difficult to achieve adequacy of nutrients because nutrient intakes tend to parallel energy intakes. Iron, calcium, magnesium, zinc, copper, vitamin B_6 and folate are problematic even on many moderately low calorie diets, particularly among physiological groups such as reproductive women and adolescents who have relatively high and critical nutritional needs (Gardner *et al*., 2010; Dazzi and Dwyer, 1984).

One of the criteria of sound reducing diets is the gradual reduction in energy content to adapt the dieter for the change in food quantities, quality and lifestyle modifications (Hill, 2009). All the studied diets did not take into consideration this important criterion and prescribed fixed energy contents. In addition, all the studied diets ignored the individual behavioral and biological differences, food preferences, cultural and socioeconomic factors of the dieters, which are other limitations of such weight-reducing diets. Large proportion of overweight and obese persons need some type of nutritional assessment before commitment to diets (Rolfes *et al*., 2009; Dazzi and Dwyer, 1984); this crucial point was also ignored in the studied diets.

As shown in Table 1 and 2, the carbohydrate contents (>130 g/day) and their contributions in total calories were both low in 23% of the diets. Commonly, "low-carbohydrate diet" is considered to be the diet that contains less than 100 g/day, while the term ''ketogenic diet'' is often limited to diets containing less than 50 g/day carbohydrate; therefore, not all low-carbohydrate diets are ketogenic (Sumithran and Proietto, 2008). Hence, 45% and 14% of the studied diets can be defined as low-carbohydrate diets and ketogenic diets, respectively. Although there is currently no consensus on the amount of carbohydrate restriction required to induce ketosis, elevated serum or urinary ketones have also been reported in subjects on diets with average daily carbohydrate intakes between 58 and 192 g/day (Sumithran and Proietto, 2008). It is worth mentioning that none of the studied diets could be described as high carbohydrate diet, especially when taking into consideration both AMDR and RDA values. Therefore, most of the studied diets can be generally described as low carbohydrate diets.

Despite controversy, the use of high-fat, low-carbohydrate diets are getting more popular today (Freedman *et al*., 2001). No scientific evidence suggests that ketogenic diets have a metabolic advantage over conventional weight-reducing diets (Johnston *et al*., 2006). Studies consistently show that under conditions of negative energy balance, weight loss is a function of caloric intake, not diet composition (Bravata *et al*., 2003). In the short term, however, high-fat, low-carbohydrate ketogenic diets cause a greater loss of body water than body fat and when these diets are terminated, the lost body water is regained. However, in the long term, all reduced calorie diets result in loss of body fat. Additionally, high fat low carbohydrate diets are nutritionally inadequate; they are low in vitamins E, A, thiamin, B_6 and folate and the minerals calcium, magnesium, iron and potassium, as well as dietary fiber, rendering the dieter in bad need for supplementation (Freedman *et al*., 2001). Furthermore, these diets are commonly high in saturated fat and cholesterol and were associated with increase in some risk factors for coronary heart diseases (Foster *et al*., 2003).

Carbohydrate restriction leads to ketosis resulting in weight loss and decreases blood glucose, insulin and triglyceride levels (Adam-Perrot *et al*., 2006). Advocates for such diets believe they have a high satiety level, because of the proportional increase in proteins and fats to compensate for the carbohydrate restriction. This matter makes such diets easier to adhere to; thus overriding one of the main challenges that dieters face (Gill and Wu, 2006).

It is indicated from Table 2 that the diet contents of n-3 and n-6 fatty acids were low and thus incompatible with the healthy diet recommendations. These fatty acids play critical physiological roles in the body such as body metabolism, normal heart action and tissue integrity. It is inferred from these results that the long commitment to such diets may lead to deficiency of these essential fatty acids in the body (Gallagher, 2008). Table 3 shows that the saturated fatty acids content of the studied diets, mostly from animal origin, were more than unsaturated ones and having high cholesterol content; imposing a hazard on human health.

Table 1 shows that approximately one third of the diets were only adequate in dietary fibers (g/day). This indicates that most dieters may suffer from their diets as they are deprived from the adequate dietary fiber. The high content of cholesterol (Table 1), coming mainly from animal foods and the low dietary fiber content of these diets may predispose dieters to the risk of cardiovascular disease on the long run. An overall look to Fig. 2 shows that none of the diets satisfies all the five recommendations of AMDR; this indicates that all these diets are imbalanced, inadequate and therefore unhealthy. This finding is in agreement with that of Dazzi and Dwyer (1984) that most weight-reducing diets in USA at that time were found to be imbalanced.

Regarding calcium, only 13% of the diets contained adequate amount of calcium, whereas the average content of all diets was about half the adequate amount. The long-term use of these diets may cause the deficiency symptoms of calcium and, consequently, osteoporosis. Many clinical, laboratory and epidemiological studies indicated that calcium plays a role in reducing body weight and adipose tissue content (Teegarden, 2003; Zemel, 2003; Zemel, 2002); this is another shortcoming of these diets. Table 3 also shows that about half of the diets were inadequate in phosphorus. Calcium and phosphorus play a vital physiological role in building and strengthening bones and teeth; this means that the long adherence to these diets increases the chance of exposure to osteoporosis. Another disadvantage of these diets is the imbalance between calcium and phosphorus; the calcium to phosphorus ratio was low (1:1.7) which is not in agreement with nutritional recommendations stating that it should be at least 1.4:1 (Rolfes *et al*., 2009).

Almost all the evaluated diets were deficient in potassium. It is well known that potassium deficiency is very rare, as it is abundant in many types of foods. The low amounts of potassium in these diets reflect the small quantity of eaten foods and/or the lacking of variety in the different food groups. The symptoms of potassium deficiency include a general muscle weakness which causes disturbances in the function of the heart, lungs and gut. Furthermore, most of the diets were deficient in sodium which increases the risk of hypovolemia and hypotention and adversely affects the nerve function and conductivity and muscle contraction over the long run of using these diets (Rolfes *et al*., 2009).

To summarize, the low content of many of the major minerals such as calcium, potassium and sodium in these diets, in addition to the imbalance of sodium and potassium can cause many health risks on many physiological functions of the body as a whole and its organs (Rolfes *et al*., 2009). Regarding the trace elements status, most of the diets were low in the trace minerals iron, iodine and zinc. Some physiological age groups such as adolescence and adult females, which are the main followers of these diets, are more likely to be exposed to the adverse effects of these deficiencies. Such age groups may be particularly susceptible to different degrees of iron deficiency anemia in addition to disorders of iodine and zinc deficiencies. Some vitamins which were reported to be deficient in Jordan, such as vitamins A, B_1 and folic acid (MOH, 2006; Khatib, 2002), are inadequate in most of these diets.

Goff *et al*. (2006) reported that most of popular weight-reducing diets depend on unscientific books and are based on scientific inaccuracies and misinformation. Table 4 shows some known claims of the unhealthy

diets that are implied in the studied diets. These claims include the inclusion of different methods of attracting dieters to these diets; the ability of these diets to positively change the metabolism of the body toward weight loss is an example of these claims. The power of these diets to reduce large amounts of extra body weight in short time and with minimal effort is one of its most frequent claims. Besides that these weight-reducing diets are nutritionally inadequate, one third of them did not determine the period of commitment which may make dieters to stick to these diets long time that leads to the probability of the appearance of some deficiency symptoms (Rolfes *et al*., 2009). More than one third of these diets promise a weight loss of more than 1 kg/week, such amount of weight loss implies some health risks. Another negative criterion of unhealthy fad diets is focusing on consumption/restriction of certain food(s) which leads to a decrease in energy intake because it alters usual patterns of eating. The weight loss in this type of diets is not because of metabolic changes, as claimed, but as a result of the sudden unusual alteration of food preferences and habits and the use of these unbalanced and unvaried diets (Anderson *et al*., 2000; Dazzi and Dwyer, 1984).

A crucial property of healthy weight-reducing diets is increasing physical activity and decreasing energy intake on one side and insertion of positive dietary and lifestyle changes on the other side (Hill, 2009). In this study, most diets (>85%) did not take into consideration this positive aspect which may explain the failure of these diets to maintain weight loss on the long run (Table 5). This result is in agreement with that of Serdula *et al*. (1999) who found that about 20% of the study population reported using the recommended combination of eating fewer calories and engaging in at least 150 min of leisure-time physical activity per week.

The popularity of these diets seems to come from the following: (1) its ability to reduce weight in short time as a result of the (very) low energy content, water loss not adipose tissue loss and the sharp changes in eating patterns, (2) the determination of the commitment time in some diets by few weeks do not permit the deficiency symptoms to appear which makes them useful and increases their followers.

Conclusion: It is concluded that the evaluated diets in this study seem to be unhealthy and that they did not take into consideration the criteria of sound reducing diets. Consequently, following such slimming diets for long periods of time would encompass harmful consequences on human health. Therefore, it is advised for the public to avoid following such diets. Our recommendation is that weight-reducing diets should be prescribed by qualified dietitians after complete client's assessment. Also, application of such diets needs follow up to obtain and maintain the desired body weight. Further research is required to elucidate the health impact of the long-term adhesion to such popular weight-reducing diets. Further, extension and education for publics is necessary to increase the awareness regarding the role of registered and certified dietitians in the provision of popular diets.

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