Nutrient Intake and Diet Quality in Patients with Systemic Lupus Erythematosus on a Culturally Sensitive Cholesterol Lowering Dietary Program

MEENA SHAH, BEVERLEY ADAMS-HUET, ARTHUR KAVANAUGH, YVONNE COYLE, and PETER LIPSKY

ABSTRACT. ***Objective.*** To evaluate the effect of a culturally sensitive cholesterol lowering dietary program on energy, protein, fiber, vitamin and mineral intake, diet quality, and hemoglobin levels in patients with systemic lupus erythematosus (SLE).

Methods. Seventeen patients with SLE were randomized to a Step II diet intervention group or a control group for 12 weeks. The diet intervention was made up of weekly group sessions during the first 6 weeks followed by telephone counseling every 2 weeks for the last 6 weeks. Food intake was assessed by 3-day food record at baseline, 6, and 12 weeks. Diet quality was assessed by expressing the nutrients as a percentage of the Dietary Reference Intakes of the US National Academy of Sciences, or as a percentage of the nutrient guidelines by the National Cholesterol Education Program, Adult Treatment Panel III. Between- and within-group changes in nutrient intakes were assessed by repeated measures ANOVA.

Results. The changes in nutrient intakes were not significantly different between the groups for any of the nonfat nutrients except vitamin B12 ($p = 0.05$), which decreased in the diet group and increased in the control group. Within-group analysis showed a significant reduction ($p = 0.0003$ to 0.02) in the diet group in energy and sodium intake at 6 and 12 weeks and B12 intake at 12 weeks compared to the respective baseline values (28–32%, 37–41%, and 43%, respectively). Sodium intake decreased to 66–71% of the total sodium allowance (< 2400 mg per day) in the diet group. The intervention was successful in maintaining adequate intakes or even increasing intakes of most nutrients except B12, dietary fiber, folate, calcium, and iron, which were slightly higher or below 67% of the Dietary Reference Intakes or other dietary guidelines. Anemia, as assessed by hemoglobin levels, was present throughout the study and did not correlate with iron intake.

Conclusion. This culturally sensitive cholesterol reducing diet program was successful in decreasing sodium intake and maintaining adequate intakes of most nutrients except B12, dietary fiber, iron, calcium, and folate. Future intervention studies in patients with SLE need to pay special attention to these nutrients and the presence of anemia. (J Rheumatol 2004;31:71–5)

Key Indexing Terms:
CHOLESTEROL LOWERING DIET SYSTEMIC LUPUS ERYTHEMATOSUS

Systemic lupus erythematosus (SLE) affects mostly women, particularly minorities[1]. Patients with SLE have a high prevalence of dyslipidemia and atherosclerotic cardiovascular disease[2-4].

From the Division of Rheumatic Diseases, Department of Internal Medicine, University of Texas at Southwestern Medical Center, Dallas, Texas, USA.

Supported in part by the University of Southwestern Medical Center General Clinical Research Center (GCRC) grant No. M01-RR-00633.

M. Shah, PhD, Assistant Professor, Department of Kinesiology, Texas Christian University, Forth Worth, TX; B. Adams-Huet, MS, Faculty Associate, Department of Internal Medicine, University of Texas Southwestern Medical Center; A. Kavanaugh, MD, Professor, Division of Rheumatology, Allergy and Immunology, Center for Innovative Therapy, University of California in San Diego; Y. Coyle, MD, Associate Professor, Department of Internal Medicine, University of Texas Southwestern Medical Center; P. Lipsky, MD, Scientific Director, National Institute of Arthritis and Musculoskeletal and Skin Diseases, Bethesda, MD.

Address reprint requests to Dr. M. Shah, Department of Kinesiology, Texas Christian University, TCU Box 297730, Fort Worth, TX 76129, USA.

Submitted December 19, 2002; revision accepted June 23, 2003.

We investigated the effect of a culturally sensitive cholesterol lowering diet program in mostly minority SLE patients for 12 weeks and found a significant decrease in reported dietary cholesterol and percentage calories from fat and saturated fat in the diet group (–32% to –49%) compared to the control group (–8% to +22%)[5]. The culturally sensitive cholesterol lowering diet was also rated highly acceptable[6], and was associated with a significant improvement in serum total cholesterol and quality of life at 6 and 12 weeks, low density lipoprotein (LDL) cholesterol at 6 weeks, and body weight at 12 weeks[5].

Although the diet group in this study reported making impressive changes in the target nutrients (total fat, saturated fat, and dietary cholesterol), it is not known how the other nutrient intakes changed over time and whether they were consumed in adequate amounts in this minority SLE population. Investigating diet quality in subjects with SLE is important since these patients, in addition to having a high risk for cardiovascular disease, are also at high risk for low bone mineral density[7], high blood homocysteine levels[8], and anemia[9], all of which are influenced by diet. Few studies have examined the effect that lowering dietary fat has on nutrient adequacy[10-15], and all of them have been conducted on non-SLE subjects. Moreover, the subject population, when reported, was either mostly white or generally well-educated[10-13], in contrast to our study population, which was largely composed of minorities and which had a low level of education.

Our purpose was to investigate the effect of the culturally sensitive cholesterol lowering diet intervention on nonfat nutrient intakes (energy, protein, fiber, vitamins, and minerals), diet quality (by comparing against dietary reference intakes or other nutrient guidelines[16-20]), and hemoglobin levels in mostly minority patients with SLE. We also suggest ways to improve the nutrient quality of the diet.

MATERIALS AND METHODS

Patients. Seventeen women with SLE were recruited from Parkland Health and Hospital System outpatient arthritis clinic and randomized to a diet intervention group or a control group. To be eligible for the study, the patients had to be diagnosed with SLE for at least 6 months, have an LDL cholesterol level > 100 mg/dl, and be able to read at least at the 5th grade level[5,6]. Patients were not eligible for the study if they were pregnant (assessed by blood test), lactating, taking ≥ 20 mg of prednisone per day, actively abusing alcohol (≥ 20 drinks/week by self-report), or if they had inadequate cognitive ability[5,6]. The study was approved by the University of Texas Southwestern Medical Center Institutional Review Board.

Diet intervention. The diet intervention was made up of weekly group sessions during the first 6 weeks, followed by telephone consultation every 2 weeks during the last 6 weeks. The diet group was counseled by one of the authors, a nutritionist, and a bilingual research assistant. The control group was not given any dietary advice. Both the groups were asked to maintain their usual level of physical activity.

The patients in the diet group were counseled to follow the National Cholesterol Education Program (NCEP) Step II diet: < 30% of energy as fat and < 7% as saturated fat, and < 200 mg of cholesterol per day[21]. They were also counseled to limit their intake of sodium (< 2400 mg/day) and refined and added sugars, and consume 2–3 servings of skim/low fat dairy foods and ≥ 5 servings of fruits and vegetables per day.

The patients in the diet group also learned techniques on how to maintain their diet while eating out, and how to read food labels and prepare grocery shopping lists. They recorded everything that they ate and drank daily in a food and exercise diary and converted it to nutrients using the fat and cholesterol counter provided. This information was used to provide individual counseling whenever necessary.

Data collection. Food intake was assessed by 3-day food record (2 weekdays and 1 weekend day), a valid and reliable method[22]. The measure was taken at baseline, 6 weeks, and 12 weeks. The patients were instructed on how to record in detail all the foods and drink consumed in the 3-day food record provided. Any questionable input in the food records was addressed promptly when the patients brought in their food records. Nutrient intakes were calculated from the food records using the Compnutrition computerized database of the National Research Council's nutrient content of foods (Compnutrition Inc., Chatsworth, CA, USA). Complete blood count was also assessed at each of the 3 time points.

Data analyses. Two of the 17 patients recruited were excluded from the analyses because they did not complete the food records at weeks 6 and 12. Analyses were conducted using the SAS statistical package, version 8.0.

The treatment by time interaction effect on energy, protein, dietary fiber, vitamin and mineral intake, and hemoglobin level was assessed by repeated measures analysis of variance (ANOVA). Physical activity, prednisone dose, and cholesterol drug dose were not included as covariates because they did not change over time in either group. Repeated measures ANOVA was also used to assess within-group nutrient and hemoglobin changes over time. Spearman correlations were computed to evaluate the association between iron intake and hemoglobin levels.

The diet quality of the SLE patients was examined by expressing the nutrient intakes as a percentage of the Dietary Reference Intakes (DRI) recommended by the US National Academy of Sciences[16-19] or as a percentage of the NCEP Adult Treatment Panel III (ATP III) guidelines[20]. As has been commonly used[13], a mean value of less than 67% of the reference intake was used as an index of at-risk intake.

RESULTS

There was no significant difference in age, ethnicity, education, SLE duration, SLE disease activity, prednisone intake, and usage of cholesterol lowering drugs of participants in the diet and control groups at baseline. Mean age was 44.1 ± 9.3 years in the diet group and 45.1 ± 12.7 years in the control group. There were 5 African Americans and 3 Hispanics in the diet group, and 4 African Americans, 2 Hispanics, and 1 Caucasian in the control group. Eleven of the 15 women had a high school or lower level of education. Only 3 women in the diet group and 1 woman in the control group had some college education.

The presentation of results (Table 1) is limited to nutrients that changed significantly over time or nutrients that were below 67% of the respective DRI or other guidelines at any of the 3 time points. At baseline, there was no significant difference in any nutrient between the 2 groups. The treatment by time interaction effect was significant for only B12 ($p = 0.05$). Repeated measures ANOVA within the diet group showed a significant reduction in energy intake and sodium intake at 6 and 12 weeks ($p = 0.0003$ to 0.02) and in B12 at 12 weeks ($p = 0.02$) compared to the respective baseline values. These results were reflected in the confidence intervals. A similar analysis in the control group showed no significant change in any of these nutrients.

In the diet group, the nutrients that were close to or below 67% of the respective reference values or other guidelines were dietary fiber, calcium and folate at all time points, iron at 6 and 12 weeks, and B12 at 12 weeks. Sodium intake in the diet group decreased by about 1001–1108 mg from baseline and was about 2/3 the 2400 mg daily allowance at both 6 and 12 weeks. The other nutrients assessed remained above 2/3 the reference intakes (77–181%) in the diet group (data not shown). In the control group the nutrient intakes that were 67% or below the reference values at one or more of the 3 time points were dietary fiber, calcium, and folate.

Hemoglobin levels changed from 12.4 ± 1.1 g/dl at baseline to 11.9 ± 1.3 g/dl at 6 weeks and 12.0 ± 1.1 g/dl at 12 weeks in the diet group, and from 11.3 ± 1.8 g/dl at baseline to 11.4 ± 1.5 g/dl at 6 weeks and 10.9 ± 1.7 g/dl at 12 weeks in the control group. The treatment by time interaction effect

Table 1. Energy, dietary fiber, and selected vitamin and mineral intake at baseline, 6 weeks, and 12 weeks in the diet group and the control group. Values are expressed as mean ± standard deviation. P values reflect overall treatment by time interaction effect assessed by repeated measures ANOVA.

Nutrient	Time	Diet Group, n = 8		Control Group, n = 7		p
		Intake	Reference Intake, %*	Intake	Reference Intake, %*	
Energy, kcal	Baseline	1693 ± 320		1386 ± 509		0.1
	6 weeks	1214 ± 306		1186 ± 325		
	12 weeks	1145 ± 310		1339 ± 465		
Dietary fiber, g	Baseline	8.7 ± 4.6	44 ± 23	9.0 ± 4.5	45 ± 23	0.07
	6 weeks	11.9 ± 5.8	59 ± 29	6.7 ± 4.0	34 ± 20	
	12 weeks	10.9 ± 6.2	54 ± 31	6.9 ± 2.9	35 ± 14	
Iron, mg	Baseline	10.5 ± 4.0	74 ± 27	9.0 ± 1.9	77 ± 25	0.5
	6 weeks	9.2 ± 4.1	62 ± 21	9.7 ± 4.8	84 ± 68	
	12 weeks	8.5 ± 2.0	64 ± 35	9.7 ± 2.7	78 ± 26	
Sodium, mg	Baseline	2697 ± 1158	112 ± 48	1877 ± 566	78 ± 24	0.08
	6 weeks	1589 ± 640	66 ± 27	2000 ± 959	83 ± 40	
	12 weeks	1696 ± 710	71 ± 30	1919 ± 757	80 ± 32	
Calcium, mg	Baseline	496 ± 215	47 ± 19	637 ± 351	61 ± 38	0.8
	6 weeks	469 ± 182	45 ± 19	563 ± 312	51 ± 26	
	12 weeks	434 ± 147	41 ± 13	627 ± 363	58 ± 36	
B12, µg	Baseline	2.8 ± 0.8	118 ± 34	2.3 ± 0.9	94 ± 37	0.05**
	6 weeks	2.3 ± 2.0	97 ± 84	2.6 ± 1.0	107 ± 42	
	12 weeks	1.6 ± 1.1	68 ± 46	2.6 ± 0.7	109 ± 29	
Folate, µg	Baseline	188 ± 71	47 ± 18	160 ± 53	40 ± 13	0.4**
	6 weeks	210 ± 86	52 ± 22	166 ± 125	42 ± 31	
	12 weeks	224 ± 126	56 ± 32	156 ± 116	39 ± 29	

* References 16, 17, 19, 20. ** After log transformation. One subject in each group is missing baseline analysis.

was not significant (p = 0.08), but repeated measures ANOVA by group showed a significant reduction in hemoglobin level in the diet group from baseline to 6 weeks (p = 0.01). The hemoglobin levels, however, were not significantly correlated to iron intake in either group (baseline r = 0.38, p = 0.2).

DISCUSSION

Diet assessment methods are often associated with overcompliance on the measurement day[23]. Our earlier analysis showed that the change in LDL and total cholesterol did not completely reflect the reported food intake at 12 weeks, indicating that there was overcompliance on the days that the food intake was assessed[5]. It is within this constraint that the present results should be evaluated.

Energy intake, although not a target variable, decreased significantly in the diet group (479–548 kcal) compared to the control group (47–200 kcal). The substantial decrease in the diet group may be related to the 32% to 49% reduction in calories from fat[5].

The strategies to reduce sodium intake to less than 2400 mg/day were highly successful, leading to a 37–41% statistically significant decrease in sodium intake in the diet group and an absolute intake that was only about two-thirds of the total allowance of 2400 mg/day. The decrease in sodium intake in the diet group was 1000–1100 mg/day compared to the 500–900 mg/day decrease reported by other similar studies in non-SLE subjects[11,14]. By contrast, sodium intake increased in the control group.

B12 intake declined statistically in the diet group from 118% of RDA (2.4 µg) to 68% or borderline value at 12 weeks, and increased in the control group from 94% to 107–109%. The decrease in B12 in the diet group was probably related to decreased consumption of animal foods, the only food source for B12. Similar findings have also been noted by some low fat intervention studies in non-SLE subjects[11,15]. A low B12 intake is of concern, since low serum B12 levels are associated with increased amounts of plasma homocysteine in SLE patients[24], and homocysteine is a risk factor for cardiovascular disease in this population[3,24]. These results suggest that it might be prudent for SLE patients on a cholesterol lowering diet to consume fortified cereals or take B12 supplements.

Folate intake was less than 50% of RDA (400 µg) at baseline, and increased nonsignificantly to 50–60% of RDA in the diet group and did not change much in the control group. The low folate intakes reported in our study are similar to the folate intakes reported by African American and Hispanic women in the National Health and Nutrition Examination Survey III (NHANES III), Phase 1[25], and by non-SLE subjects on cholesterol and weight lowering diet interventions[10,12-14]. A low folate intake is of concern since low plasma folate levels are associated with increased amounts of plasma homocysteine in SLE patients[24]. These results indicate a need to aggressively promote the regular consumption of folate-rich foods, such as orange juice, green leafy vegetables, and fortified cereals, in subjects with SLE.

Fiber intake at baseline was less than 50% of the NCEP ATP III minimum goal of 20 g/day[20], and increased nonsignificantly to about 55–60% of RDA in the diet group and decreased in the control group. Low fiber intakes have also been observed nationally among African American and Hispanic women, especially the former[25]. The difficulty in achieving the minimum dietary fiber goal when the baseline fiber intake is low (< 10 g/day) has also been corroborated by other similar diet intervention studies in non-SLE subjects[13,15]. Future cholesterol lowering interventions need to further emphasize the importance of fiber-rich foods, especially soluble fiber sources such as oats, peas, beans, and certain fruits that have a beneficial effect on serum cholesterol[20].

The recommendation to consume 2 to 3 servings of milk or milk products did not increase calcium intake. Calcium intake, indeed, decreased slightly and was less than 50% of the Adequate Intake (19–50 yrs: 1000 mg; > 50 yrs: 1200 mg) at all time points. Inadequate calcium intakes were also observed in the Hispanic and African American women in the NHANES III[25]. The decrease in calcium intake seen in our diet subjects is similar to the changes observed by other cholesterol and weight lowering diet intervention studies in non-SLE subjects[10,11,13-15]. Consuming enough calcium is of particular importance for SLE patients, many of whom have decreased bone mineral density associated with corticosteroids[7]. Also, women with SLE are 5 times more likely to have a fracture compared with similar-aged women from the US population sample, and the fractures are more likely to occur under the age of 50 or before menopause in the SLE population than in the US population sample[26]. Because of these health issues, SLE patients who have difficulty meeting their calcium needs should be recommended to take calcium supplements.

Iron intake decreased in the diet group from 74% of RDA (19–50 yrs: 18 mg; > 50 yrs: 8 mg) to 62–64% of RDA and increased in the control group (77% to 78–84%), albeit nonsignificantly. The NHANES III also found generally low levels of iron intake in African American and Hispanic women[25]. The decrease in iron levels in this study is probably linked to a decreased consumption of meat. A similar decrease in iron intake was also noted by other studies that focused on substantially reducing the intake of meat from the diet of their subjects[10,11,14]. Many SLE patients have anemia[9]. Hemoglobin levels in our study decreased significantly in the diet group at 6 weeks, and according to the American College of Rheumatology definition for anemia (hemoglobin level of 12 g/dl or less for women)[27], our subjects were in an anemic state throughout the study. The hemoglobin levels, however, were not significantly correlated to iron intake in either group, possibly due to the small sample size and because anemia in this population is multifactorial, including anemia of chronic disease, iron deficiency anemia, autoimmune hemolytic anemia, and other causes[9]. Nevertheless, given the low iron intakes and low hemoglobin levels, SLE patients should be encouraged to consume iron-rich foods such as green leafy vegetables, whole grains, legumes, and fortified cereals or use iron supplements.

In summary, the culturally sensitive cholesterol lowering diet intervention program, in addition to significantly reducing percentage of energy intake from fat and saturated fat, dietary cholesterol, and sodium in minority patients with SLE, was also effective in maintaining adequate intakes or increasing intakes of many nutrients except B12, dietary fiber, folate, calcium, and iron, which were close to or below 67% of the reference values. Future intervention studies in SLE patients need to pay special attention to these nutrients, especially since SLE patients are at high risk for high blood cholesterol, osteoporosis, high blood homocysteine, and anemia. Anemia was present throughout the study. Increasing the intake of these nutrients, except B12, may not be an impossible task, since including just 1 glass of calcium fortified orange juice, half a cup of cooked spinach, and half a cup of all-bran cereal per day in the diet will raise these nutrient intakes to the desired levels without affecting the dietary goals. Adding foods to the diet, however, would have to be done at the expense of less nutrient-dense foods in order to maintain energy balance.

ACKNOWLEDGMENT

We thank Katia Palek, Dr. Virat Pinyopornpanit, Dr. Mellisa McIlraith, Valerie Branch, and the GCRC staff for assistance with the study.

REFERENCES

1. McCarty DJ, Manzi S, Medsger TA Jr, Ramsey-Goldman R, LaPorte RE, Kwoh CK. Incidence of systemic lupus erythematosus: race and gender differences. Arthritis Rheum 1995;38:1260-70.
2. Jonnson H, Nived O, Sturfelt G. Outcome in systemic lupus erythematosus: a prospective study of patients from a defined population. Medicine (Baltimore) 1989;68:141-50.
3. Petri M. Detection of coronary artery disease and the role of traditional risk factors in the Hopkins Lupus Cohort. Lupus 2000;9:170-5.
4. Ettinger WH, Goldberg AP, Applebaum-Bowden D, Hazzard WR. Dyslipoproteinemia in systemic lupus erythematosus: effect of corticosteroids. Am J Med 1987;83:503-8.
5. Shah M, Kavanaugh A, Coyle Y, Adams-Huet B, Lipsky PE. The effect of a culturally sensitive cholesterol lowering diet program on lipid and lipoproteins, body weight, nutrient intakes, and quality of life in patients with systemic lupus erythematosus. J Rheumatol 2002;29:2122-8.
6. Shah M, Coyle Y, Kavanaugh A, Adams-Huet B, Lipsky PE. Development and initial evaluation of a culturally sensitive cholesterol-lowering diet program for Mexican and African American patients with systemic lupus erythematosus. Arthritis Care Res 2000;13:205-12.
7. Gilboe IM, Kvien TK, Haugeberg G, Husby G. Bone mineral density in systemic lupus erythematosus: comparison with rheumatoid arthritis and healthy controls. Ann Rheum Dis 2000;59:110-5.
8. Svenungsson E, Jensen-Urstad K, Heimburger M, et al. Risk factors for cardiovascular disease in systemic lupus erythematosus.

Circulation 2001;104:1887-93.
9. Voulgarelis M, Kokori SI, Ioannidis JP, Tzioufas AG, Kyriaki D, Moutsopoulos HM. Anemia in systemic lupus erythematosus: aetiological profile and the role of erythropoietin. Ann Rheum Dis 2000;59:217-22.
10. Shah M, Baxter JE, McGovern PG, Garg A. Nutrient and food intake in obese women on a low-fat or low-calorie diet. Am J Health Promot 1996;10:179-82.
11. Swinburn BA, Woollard GA, Chang EC, Wilson MR. Effects of reduced-fat diets consumed ad-libitum on intake of nutrients, particularly antioxidant vitamins. J Am Diet Assoc 1999;99:1400-5.
12. Retzlaff BM, Dowdy AA, Walden CE, et al. Changes in vitamin and mineral intakes and serum concentrations among free-living men on cholesterol-lowering diets: the Dietary Alternatives Study. Am J Clin Nutr 1991;53:890-8.
13. Retzlaff BM, Walden C, McNeney WB, Buck BL, McCann BS, Knopp RH. Nutritional intake of women and men on the NCEP Step I and II diets. J Am Coll Nutr 1997;16:52-61.
14. Benezra LM, Nieman DC, Nieman CM, et al. Intakes of most nutrients remain at acceptable levels during a weight management program using the food exchange system. J Am Diet Assoc 2001;101:554-8, 561.
15. Sasaki S, Ishikawa T, Yanagibori R, Amano K. Change and 1-year maintenance of nutrient and food group intakes at a 12-week worksite dietary intervention trial for men at high risk of coronary heart disease. J Nutr Sci Vitaminol 2000;46:15-22.
16. Food and Nutrition Board. Institute of Medicine. Dietary Reference Intakes for calcium, phosphorus, magnesium, vitamin D, and fluoride. Washington, DC: National Academy Press; 1997.
17. Food and Nutrition Board. Institute of Medicine. Dietary Reference Intakes for thiamine, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline. Washington, DC: National Academy Press; 1998.
18. Food and Nutrition Board. Institute of Medicine. Dietary Reference Intakes for vitamin C, vitamin E, selenium, and carotenoids. Washington, DC: National Academy Press; 2000.
19. Food and Nutrition Board. Institute of Medicine. Dietary Reference Intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. Washington, DC: National Academy Press; 2001.
20. Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA 2001;285:2486-97.
21. The Expert Panel. Summary of the second report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel II). JAMA 1993;269:3015-23.
22. Block G. A review of validations of dietary assessment methods. Am J Epidemiol 1982;115:492-505.
23. Forster JL, Jeffery RW, Sugars C, Kurth C, Pirie P. Hypertension Prevention Trial: Do 24-hour food records capture usual eating behavior in intervention study participants? Am J Clin Nutr 1990;51:253-7.
24. Refai TMK, Al-Salem IH, Nkansa-Dwamena D, Al-Salem MH. Hyperhomocysteinaemia and risk of thrombosis in systemic lupus erythematosus patients. Clin Rheumatol 2002;21:457-61.
25. Alaimo K, McDowell MA, Briefel RR, et al. Dietary intake of vitamins, minerals, and fiber of persons ages 2 months and over in the United States: Third National Health and Nutrition Examination Survey, Phase I, 1988-91. Adv Data 1994;258:1-28.
26. Ramsey-Goldman R, Dunn JE, Huang CF, et al. Frequency of fractures in women with systemic lupus erythematosus. Arthritis Rheum 1999;42:882-90.
27. Dacie JV, Lewis SM. Reference ranges and normal values. In: Dacie JV, Lewis SM, editors. Practical haematology. New York: Churchill Livingstone; 1991:9-17.