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# Food Pattern of Non-Anemic Nomadic Women Living in Fars Province, Southern Iran as a Vegetarian Recipe

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ABSTRACT

**Background:** The Qashqa'i form approximately 500000 Turkish-speaking ethnic nomadic pastoralist tribal people, living in Fars province, southern Iran. People choosing macrobiotic diets are frequently identified as following a vegetarian diet. Despite that plant foods contain only non-heme iron, which is more sensitive than heme iron to both inhibitors and enhancers of iron absorption, surprisingly, we noted that the mean values of hemoglobin and serum ferritin in the group under investigation were significantly higher than the same population living in the south of Iran. So we aimed to investigate the food basket of Qashqa'I people in an attempt to find out the reason behind this observation.

**Methods:** Dietary information was collected using the mean of 3-day recall and food frequency methods. Dieticians, with long experience in nutrition surveillance explained the purpose of the dietary information and instructed the girls on how to report quantities using food basket. Iranian food processor was used to enter and analyze nutrient intakes. Weig hts and heights were measured using established equipment and techniques and body mass index (BMI) values were calculated.

**Results:** Mean value of hemoglobin was 12.31±1.51 gr/dL, ferritin 23.59±4.2 µg/L, albumin 4.27±1.1 gr/dL, and total protein 7.72±1.3 gr/dL. BMI of 81% of the women was between 18.5 and 25 kg/m$^2$.

**Conclusion:** The mean serum albumin, total protein, hemoglobin, and serum ferritin of this population show that vegetarian diet can meet protein and Iron requirements by using the variety of plant foods.

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## Introduction

People choosing macrobiotic diets are frequently identified as vegetarians. Macrobiotic diet is based largely on grains, legumes, and vegetables. Fruits, nuts, and seeds are used to a lesser extent (1). Some people following a macrobiotic diet are not truly vegetarian because they use limited amounts of fish. Some other people describe themselves as vegetarians while they eat fish, chicken, or even meat (2, 3). Some studies have identified these "self-described" vegetarians as semi-vegetarians and have defined them as occasional meat eaters who predominately practice a vegetarian diet (4).

About 4% of Canadian adults are vegetarians, which represents an estimated 900,000 people (5). 20-25% of adults in the United States eat four or more meatless meals weekly or "usually

or sometimes maintain a vegetarian diet," suggesting an interest in vegetarianism (6).

Vegetarian diets offer a number of advantages, including lower levels of saturated fat, cholesterol, and animal protein and higher levels of carbohydrates, fiber, magnesium, boron, folate, antioxidants such as vitamins C and E, carotenoids, and phytochemicals (7-9). Some vegans may have lower intakes of vitamin B12, vitamin D, calcium, zinc, and occasionally riboflavin than what recommended (7, 10). Plant protein can meet requirements when a variety of plant foods is consumed and energy needs are met. Research indicates that an assortment of plant foods eaten over the course of a day can provide all essential aminoacids and ensure adequate nitrogen retention and use in healthy adults, thus complementary proteins do not need to be consumed with the same meal (11). A recent meta-analysis of nitrogen balance studies found no significant difference in protein needs due to the source of dietary protein (12). Based primarily on the lower digestibility of plant proteins, other researchers have suggested that protein requirements of vegans may be increased by 30-35% for infants up to the age of 2 years, 20-30% for 2-6 year-old children, and 15-20% for those 6 years and older, in comparison with those of non-vegetarians (13). Athletes can also meet their protein needs on plant-based diets (14).

Plant foods contain only non-heme iron, which is more sensitive than heme iron to both inhibitors and enhancers of iron absorption. Inhibitors of iron absorption include phytate, calcium, teas including some herb teas, coffee, cocoa, some spices, and fiber (15). Vitamin C and other organic acids found in fruits and vegetables can enhance iron absorption and can help to reduce the effects of phytate (16-18). Studies show that iron absorption would be significantly reduced if a diet were to be high in inhibitors and low in enhancers. The main inhibitor of iron absorption in vegetarian diets is phytate. Because iron intake increases as phytate intake increases, effects on iron status are somewhat less than might be expected (19).

Fiber appears to have a minor effect on iron absorption (20, 21). Vitamin C, consumed at the same time as the iron source, can help to reduce the inhibitory effects of phytate (17, 18). Some research links high vitamin C intake to improved iron status (22, 23). The same is true for organic acids in fruits and vegetables (16). The higher intakes of vitamin C and of vegetables and fruits by vegetarians can favorably affect iron absorption (3). Some food preparation techniques such as soaking and sprouting beans, grains, and seeds can hydrolyze phytate (24) and may improve iron absorption (17, 24, 25). Leavening of breads hydrolyzes phytate and enhances iron absorption (24, 26, 27). Other fermentation processes, such as those used to make soy foods like miso and tempeh may also make iron more available (28), although not all research supports this. Whereas many studies of iron absorption have been short term, there is evidence that adaptation to low intakes takes place over a longer duration and involves both increased absorption and decreased losses (29, 30).

Because phytate binds zinc, and animal protein is believed to enhance zinc absorption, total zinc bioavailability appears to be lower in vegetarian diets (31). Also, some vegetarians have diets that are significantly below recommended intakes for zinc (7, 32, 33). Although overt zinc deficiency has not been seen in Western vegetarians, the effects of marginal intakes are poorly understood (34).

Calcium is present in many plant and fortified foods. Low-oxalate greens (bok choy, broccoli, Chinese/Napa cabbage, collards, kale, okra, turnip greens) provide calcium with high bioavailability (49-61%), in comparison with calcium-set tofu, fortified fruit juices, and cow's milk (bioavailability in the range of 31-32%) and also with fortified soymilk, sesame seeds, almonds, and red and white beans (bioavailability of 21-24%) (35-37). Figs and soy foods such as cooked soybeans, soy nuts, and tempeh provide additional calcium. Calcium-fortified foods include fruit juices, tomato juice, and breakfast cereals. Thus, various food groups contribute dietary calcium (38, 39). Oxalates present in some foods can greatly reduce calcium absorption, so vegetables that are very high in these compounds, such as spinach, beet greens, and Swiss chard, are not good sources of usable calcium despite their high calcium content. Phytate may also inhibit calcium absorption. However, some foods with high contents of both phytate and oxalate, such as soy foods, still provide well-absorbed calcium (37). Factors that enhance calcium absorption include adequate

vitamin D and protein. Calcium intakes of lacto-vegetarians are comparable with or even higher than those of no vegetarians (40), whereas intakes of vegans tend to be lower than both groups and often below recommended intakes (7, 10, 37, 40). Diets high in sulfur-containing aminoacids may increase losses of calcium from bone. Foods with a relatively high ratio of sulfur-containing aminoacids to protein include eggs, meat, fish, poultry, dairy products, nuts, and many grains. There is some evidence that the impact of sulfur-containing aminoacids is only important with low calcium intakes. Excessive sodium intake may also promote calcium losses. In addition, some studies show that the ratio of dietary calcium to protein is more predictive of bone health than calcium intake alone. Typically, this ratio is high in lacto-ovo-vegetarian diets and favors bone health, whereas vegans have a calcium to protein ratio that is similar to or lower than that of no vegetarians (37). This can be accomplished, in non-pregnant, non-lactating adults, by consuming at least 8 servings per day of foods that provide 10-15% of the adequate intake (AI) for calcium, as indicated in the Vegetarian Food Guide Pyramid and Vegetarian Food Guide Rainbow (38, 39). Adjustments for other stages of the life cycle are available (38, 39). Many vegans may find that it is easier to meet needs if fortified foods or supplements are included (35, 37, 41).

The aim of this study was to introduce a natural vegetarian recipe among the people who have limited information about vegans or lacto-ovo-vegetarians.

## Materials and Methods

The test group consisted of 335 randomly selected women from some sub-tribes of Qashqa'i, living in the Fars province, southern Iran. Surprisingly, the authors noted that these groups were significantly different in their mean values of the hemoglobin (Hb) and serum ferritin to same population living in the south of Iran. As they were identical as far as the significant demographic and socioeconomic parameters are concerned this peculiar finding prompted the authors to investigate the food basket of them in an attempt to find out the reason behind this observation

Dietary information was collected using the mean of 3-day (24 h) recall and food frequency methods. Dieticians, with long experience in nutrition surveillance explained the purpose of the dietary information and instructed the girls on how to report quantities using a food basket. Iranian food processor was used to enter and analyze the nutrient intakes. Weights and heights were measured using established equipment and techniques and body mass index (BMI) values were calculated as weight (in Kg) divided by height (in meters$^2$). Cut of point for BMI was chosen as 18.5-25 (Garrow 2000).

Capillary blood was collected from the fingers of the participants. Hb was measured in g/L by the HemoCue hemoglobinometer . Calibration of the photometer was checked daily by a control cuvette supplied with the hemoglobinometer. The authors used serum ferritin (SF) concentration<15 µg/L and Hb<120 g/L for non-pregnant women to characterize iron deficiency anemia (Hallberg L. 1992).

## Results

The food basket of the non-anemic women contained, chamomile, coriander, parsley, leek, watercress, rice, barley, pea, kidney bean, lentil, chikling vetch, millet, sesame, grape juice, plum, onion, date, yoghurt, and dried whey as described in table 1. Nutrient value of the women's food basket is described in table 2. The mean±SD age of the non-anemic women was 36.34±21.47 years (table 3). Table 4 displays the number of women's children. As shown in the table, about 26% of the women had less than four children and 56.7% had more than 4 children and less than 9 children. BMI values of the women are displayed in table 5.

The results of biochemical tests among the non-anemic women revealed that mean value of hemoglobin was 12.31±1.51 gr/dL, ferritin 23.59±4.2 µg/L, albumin 4.27±1.1 gr/dL, and total protein 7.72±1.3 gr/dL (table 6).

## Discussion

Vegetarian adolescents also consume more fruits and vegetables and fewer sweets, fast foods, and salty snacks compared with non-vegetarian adolescents (3, 42). In this population there is no acceptability of fast food at all.

An analysis of five prospective studies involving more than 76,000 subjects showed that death from ischemic heart disease was 31%, which was lower among vegetarian men compared

**Table 1:** Components of the food basket of the studied women

| Food name | Food components | | | | | |
|---|---|---|---|---|---|---|
| **Polo Babooneh** | **Chamomile (25)** | **Rice (70)** | **Oil (5)** | | | |
| Ash Jow | Barley (11) | Pea (8) | Dried whey (72) | Lentil (8) | | |
| Ash konjed | Sesame (14) | Rice (41) | Lentil (12) | Grape juice (22) | Oil (11) | |
| Polool Babooneh | chamomile (14) | Onion (16) | Wheat flour (42) | Oil (8) | Rice (20) | |
| Halva konjed | Sesame (38) | Date (46) | Yoghurt (8) | Oil (8) | | |
| Dam Pokht Alum | Millet (45) | Lentil (15) | Vegetables* (22) | Onion (9) | Oil (9) | |
| Sehen | Barley (15) | Wheat (60) | Beans (25) | | | |
| Kask Piyaz | Dried whey (44) | Onion (20) | Vegetables* (22) | Walnut (14) | | |
| Lalak | Wheat (30) | Beans (25) | Vegetables* (12) | Onion (5) | Oil (5) | Rice (23) |
| Yarmayeh | Wheat (20) | Lentil (50) | Vegetables* (15) | Oil (5) | Plum (10) | |

*Vegetables mean coriander, parsley, watercress, and leek.

**Table 2:** Nutrient values of the food basket of the studied women

| Nutrients Food name | Energy KC | Protein gram | Fat gram | Fiber gram | Iron mg | Calcium mg |
|---|---|---|---|---|---|---|
| Polo Babooneh | 311 | 8 | 1.5 | 0.8 | 0.5 | 52 |
| Ash Jow | 371 | 17.5 | 6 | 0.8 | 3.2 | 350 |
| Ash konjed | 426 | 8 | 18 | 1.6 | 5.7 | 230 |
| Polool Babooneh | 405 | 1.1 | 28.1 | 0.7 | 1 | 48 |
| Halva Conjed | 413 | 7.9 | 27.1 | 3.1 | 5.8 | 461 |
| Dam Pokht Alum | 354 | 11.1 | 10.9 | 2.7 | 15.2 | 339 |
| Sehen | 341 | 14.4 | 1.6 | 2 | 8.9 | 132 |
| Kask Piyaz | 234 | 32.7 | 8.1 | 0.5 | 1.1 | 207 |
| Lalak | 137 | 6.3 | 1 | 1.5 | 18.3 | 409 |
| Yarmayeh | 160 | 18.5 | 12.3 | 4.1 | 19 | 439 |

**Table 3:** Age frequency distribution of women

| Age (year) | The women N=135 | |
|---|---|---|
| | **No** | **Percent** |
| Less than 20 | 18 | 5.3 |
| 20–29 | 88 | 26.3 |
| 30–39 | 105 | 31.3 |
| 40–49 | 68 | 20.3 |
| More than 49 | 56 | 16.8 |
| Sum | 335 | 100 |

with non-vegetarian men and 20% lower among vegetarian women compared with non-vegetarian women (43). The lower rates of heart disease among vegetarians are explained in part by their lower blood cholesterol levels. A review of nine studies found that, in comparison with non-vegetarians, lacto-ovo-vegetarians and vegans had mean blood cholesterol levels that were 14% and 35% lower, respectively (44). Although the lower mean BMI of vegetarians may help to

**Table 4:** Frequency distribution of the women with regard to number of children

| Number of children | The women N=335 | |
|---|---|---|
| | No | Percent |
| Less than 4 | 87 | 26 |
| 4-8 | 190 | 56.7 |
| More than 8 | 58 | 17.3 |
| Sum | 335 | 100 |

**Table 5:** Frequency distribution of women with regard to BMI

| BMI | The women N=335 | |
|---|---|---|
| | No | Percent |
| Less than 18.5 | 33 | 9.9 |
| 18.5–25 | 272 | 81.2 |
| More than 25 | 30 | 8.9 |
| Sum | 335 | 100 |

**Table 6:** Mean biochemical parameters of the non-anemic women

| Group | Hemoglobin gr/dL | Ferritin µg/L | Albumin g/dL | Total protein g/dL |
|---|---|---|---|---|
| Women N=335 | 12.31±1.51 | 23.59±4.2 | 4.27±1.1 | 7.72±1.3 |

explain this finding, Sacks and colleagues found that, even when vegetarian subjects were heavier than non-vegetarian subjects, the vegetarians had markedly lower plasma lipoprotein values (45). We found that BMI of 81% of our studied population was between 18.5-25 kg/m$^2$ (table 5).

Research suggests that some factors in vegetarian diets may impact cancer risk. Vegetarian diets come closer to matching the dietary guidelines issued by the National Cancer Institute than do non-vegetarian diets, particularly in regard to fat and fiber intakes (46). In this population there is a low rate of breast cancer (47). This might be due to some factors including higher intakes of fruits and vegetables, which contain high amounts of vitamin C and organic acid. These factors help improve non-heme iron availability in vegetarian diets (13, 16, 22, 23). Considering that fiber has minor effect on iron absorption, and because iron intake increases as phytate intake increases and thus the effect of phytate on iron status is less than might be expected (20, 21), it seems that these two inhibitory factors do not strongly affect iron absorption and therefore its availability.

Plant protein can meet macro and micro nutrient requirements when a variety of plant foods is consumed and energy needs are met. Research indicates that an assortment of plant foods eaten over the course of a day can provide all essential aminoacids and ensure adequate nitrogen retention and use in healthy adults, thus complementary proteins do not need to be consumed at the same meal (11).

As has been presented in (table 4), 74% of the women had more than four children. Despite the fact that the families in this population were low income and high size, the mean serum albumin and total protein of this population show that vegetarian diet can meet protein requirements by using a variety of plant foods.

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## Conflict of Interest

None declared.

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