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Diet Quality in Elderly Nursing Home Residents Evaluated by Diet Quality Index Revised (DQI-R)

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ABSTRACT

*The objective of this research was to evaluate diet quality in elderly nursing home residents and to point out the critical dietary components. The participants (277 females and 62 males) were recruited from all elderly nursing homes in Zagreb and each of elderly nursing homes was equally represented in this study. The age of subjects was ranging from 61 to 93 years; most of the females (53.4%) and males (53.2%) were between 70 and 80 years old. The dietary data from the multi pass 24-hour recall were used to compute the Diet Quality Index Revised (DQI-R). DQI-R is an instrument that provides a summary assessment of a diet's overall healthfulness and is based on ten different aspects, including recommendations for both nutrient and food types. Pearson correlation analysis was used to compare the total DQI-R score with dietetic parameters and *t*-test was calculated between mean values of all the components of DQI-R as well as for total DQI-R score for men and women. The mean DQI-R score for the 339 sample was 62.1±11.7. The biggest number of participants satisfied recommendations about dietary cholesterol intake (88.5 % of participants) and dietary moderation score (71.1% of participants) but nobody satisfied recommendation about dietary diversity score. Only 3.2% of subjects had an adequate calcium intake (6.5% of male participants and only 2.5% of female participants). Recommended servings of fruit intake were satisfied by 19.8% of population, 30.4% satisfied vegetables recommendations and 38.6% recommendations for grains. According to DQI-R, beside positive dietary habits regarding dietary moderation and dietary cholesterol intake the population of elderly nursing home residents in the capital of Croatia needs improvement in other dietary habits in order to enhance successful aging.*

Key words: dietary assessment, Diet Quality Index Revised (DQI-R), elderly

Introduction

There are estimated 605 million older persons, i.e. age 60 and over, in the world today, nearly 400 million of whom live in low-income countries. Within the next 25 years Europe is projected to retain its title as the world's oldest region. Older persons currently represent around 20% of the total population and the proportion is expected to increase to 29% by 2025¹.

Croatian population is very old. In June 2004 Croatia approximately counted 4 439 400 inhabitants, whereof the number of older than 65 years was 738 500 (16.64%) which represents a very significant and warning share. Demographic projections for the for the year 2025 show an increase in the percentage of elderly people up to 27.4%².

Nutrition is one of the major determinants of successful aging, defined as the ability to maintain three key behaviours: low risk of disease and disease-related disability, high mental and physical function, and active engagement of life³. Because elderly people are growing segment of the population, increasing attention is being paid to the foods they eat. An unbalanced diet is a main risk factor for several chronic diseases, among which are obesity, stroke, cancer and type 2 diabetes mellitus⁴⁻⁷. These diseases contribute to premature deaths, restrict life quality and lead to enormous costs for health systems.

Not only are foods consumed interrelated, but also are the nutrients. Consuming more of some foods usually has consequence of consuming less of other foods, so

monitoring of single parameter such as single nutrient or single food could lead to wrong conclusions. In vivo nutrient use and metabolism are also interdependent and correlated^{8,9}. Almost 3 decades ago, it was suggested that diet quality indicators based on nutrient intakes, foods and food groupings, or combination of nutrients and foods¹⁰ could be used to quickly evaluate survey results and the efficacy of dietary programs^{11,12}. It has been stated that by describing global dietary quality these indices communicate more about dietary adequacy and disease risk than the intake of single nutrients or foods^{10,13,14}. The Diet Quality Index is an instrument used to assess the overall diet quality of groups and to evaluate risk for chronic disease related to dietary pattern^{15,16}. It was originally published in 1994 and was based on 8 dietary recommendations from the National Academy of Sciences publication *Diet and Health: Implication for Reducing Chronic Disease Risk*¹⁷. It was revised in 1999 to reflect the development of the Food Guide Pyramid, revisions in the Dietary Guidelines for Americans, and the creation of the Dietary Reference Intakes. The Diet Quality Index scores diet on the basis of 10 indicators of diet quality. The first 3 indicators reflect macronutrient intake, the next 3 reflect the Food Guide Pyramid's recommendations for fruit, vegetable and grain consumption, and the 2 recommendations reflect relative intakes of calcium and iron. The last 2 indicators address the importance of consuming foods from a variety of food groups and having a moderate intake of sugar, discretionary fat, sodium and alcoholic beverages. Each of 10 components contributes a maximum of 10 points to the total DQI score, which has a maximum of 100 points. The higher is the score, the higher is the diet quality. The objective of this research was to evaluate diet quality in elderly nursing

home residents and to point out the critical dietary components.

Subjects and Methods

The dietary data from 339 elderly nursing home residents (277 females and 62 males) were used to compute the DQI-R. The participants were recruited from the public elderly nursing homes in Zagreb during 2004 and each of elderly nursing homes was equally represented in this study. There are eleven elderly nursing homes in Zagreb with 1828 mobile residents (a total of 3498 residents). Medical staff employed in nursing homes provided us list of participants willing to participate in our study. By random sampling from each nursing home were selected participants to proceed the trial. We decided to select 20% of total mobile nursing home residents (Table 1).

All participants provided informed consent before data were collected. Twenty seven participants were excluded because of difficulties while recording diet which means that participants included in this research represented about 19% of mobile elderly nursing home residents in the capital of the Croatia. The age of subjects was ranging from 61 to 93 years; most of the females (53.4%) and males (53.2%) were between 70 and 80 years old. All the nursing home residents had the same daily menu (3 full meals). The snacks were not organized in nursing homes so that could slightly differentiate diet of nursing home residents. The dietary assessment method used was a multi pass 24-hour recall^{18,19}. The multi pass 24-hour recall consists of three different passes to provide the respondents opportunities to report their in-

TABLE 1
NUMBER OF RANDOMLY SELECTED PARTICIPANTS WHO ENTERED THE STUDY COMPARED TO TOTAL NUMBER OF MOBILE RESIDENTS OF ELDERLY NURSING HOMES IN CITY OF ZAGREB

| Elderly nursing home | Number of mobile residents | Number of participants enter the study (% of mobile residents) |
|----------------------|----------------------------|---|
| Nursing home No. 1 | 181 | 36 (19.9) |
| Nursing home No. 2 | 64 | 13 (20.3) |
| Nursing home No. 3 | 126 | 25 (19.8) |
| Nursing home No. 4 | 190 | 38 (20.0) |
| Nursing home No. 5 | 189 | 38 (20.1) |
| Nursing home No. 6 | 82 | 16 (19.5) |
| Nursing home No. 7 | 139 | 28 (20.1) |
| Nursing home No. 8 | 141 | 28 (19.9) |
| Nursing home No. 9 | 181 | 36 (19.9) |
| Nursing home No. 10 | 337 | 68 (20.2) |
| Nursing home No. 11 | 198 | 40 (20.2) |
| Total | 1828 | 366 (20.0) |

take. This procedure includes a quick list, detailed description, and review of intake.

Trained interviewers who helped the participants to remember the amount of single foods and dishes consumed in the past 24 hours interviewed the participants. Quantity of consumed food and drinks was estimated using food photographs²⁰ (3 portion sizes – small, medium and large) and units of serving (piece, cup, glass, teaspoon, tablespoon, etc.). Mixed dishes were converted to recipes with food normative used in nursing homes to obtain food ingredient data. Conversion of food intake data into nutrient and food serving measures was accomplished through use of food composition tables²¹ and pyramid servings database.

According to method of Haines et al.¹⁵ the first 3 components of the DQI-R reflect macronutrient distribution recommendations: to restrict relative dietary fat to less than or equal to 30% of energy, to restrict saturated fat intake to less than or equal to 10% of daily energy and to consume less than 300 mg of cholesterol daily. For percentage of energy from total fat and saturated fat, and for milligrams of cholesterol scoring based on the 3 levels shown in the Table 2, so participants were categorically scored with 0, 5 or 10 points.

The next 3 DQI-R indicators measure relative difference in consumption of servings of fruit, vegetables and grains. The recommended number of servings from the Food Guide Pyramid depends on recommended energy intakes. Because in our study most participants reported energy intake with mean close to 6694 kJ/d (1600 kcal/d) and because 1600 kcal is an adequate energy intake to some older adults²², we used recommendations for this energy range. Scores for fruit, vegetables and grains were limited to range 0 to 10 points depending on percentage of recommended servings (e.g. if recommendation for fruit group is 2 servings, and the person consumes 1.7 servings which is 85% of recommendation, the score for fruit group is 8.5).

The next 2 DQI-R indicators reflect relative intakes of calcium and iron. The calcium is included instead of servings of dairy products to consider calcium intake for people who are not consuming dairy products for some reasons. Iron is measured directly because measurements of mineral status would contribute more in explaining variation in diet quality than would inclusion of meat or protein status factors. The percentage of the RDA for iron (10 mg)²³ and percentage of the AI value for calcium (1200 mg)²⁴ were scored as continuous variables ranging between 0 and 100%, or 0 to 10 points.

The final 2 components of DQI-R are 2 new scores designed to measure the constructs of diversity and moderation. A dietary diversity score was developed to reflect differences in consumption across 23 broad categories.

Six of groups reflect grain-based products: non-whole-grain bread, quick breads, pasta, whole-grain bread, cereals and rice; 6 categories of vegetable are included: potatoes, tomato products, starchy vegetables, dry beans, deep yellow or orange and other vegetables; 4 categories

of fruit and juices: citrus, berries, melons and other fruit; and 7 groups of animal based products: beef and pork, milk, poultry, cheese, eggs, fish and yogurt. Minor changes were made to the subgroups because of the specificity of food intake for population in this area. To be counted as a »consumer« for any of the food group categories, a respondent needed to consume one-half serving, as defined by Food Guide Pyramid quantity criteria, at any time during the 2-day survey period. We used the same cut off as Newby et al.²⁵ because 24-hour recall provided only data for one day. Participants received 1 point if they consumed $\geq 1/4$ serving/day of the foods within each subgroup (alone or in combination) and 0 points if they consumed $< 1/4$ serving/day. For each food group points were summed across the subgroups and divided by the total number of subgroups and then multiplied with 2.5 to receive a top score of 2.5 points *per* food group.

The dietary moderation component is comprised of 4 subgroups: added sugars, discretionary fat, sodium and alcohol. As defined by USDA the measure of discretionary fat represents »all excess fat from the major food groups beyond that which will be consumed if only the lowest fat forms (of a given food) were eaten. This measure includes fats added to food in preparation or at the table, including margarine, cheese, oil, meat drippings and chocolate«²⁶. Component of discretionary fat attempts to include an added dimension of dietary behaviour that it indirectly reflects consumer decision to consume products with lower *vs.* higher levels of natural and/or added fat.

The added sugar component is defined by the US department of Agriculture Food Surveys Research Group²⁶ to reflect »teaspoon of added sugar, where 1 teaspoon is the quantity of a sweetener that contains the same amount of carbohydrate as one teaspoon of table sugars«. Products include all sweeteners that are eaten separately or used as ingredients in processed or prepared food.

Alcohol was counted directly for 24-hour recall and dietary sodium intake is measured as milligrams of dietary sodium consumed as a natural part of food, sodium added to processed food, and salt added to prepared foods.

Each of 4 dietary moderation components contributes a maximum score of 2.5 points or 10 points in total for the moderation component across 4 groups. Participants were categorically scored with 0, 1, 1.5 or 2.5 points inside each component according to criteria shown in Table 4.

STATISTICA 7.1 was used for statistical analysis²⁷. To compare the total DQI-R score with dietetic parameters Pearson correlation analysis was used. t-test was calculated between mean values of all the components of DQI-R as well as for total DQI-R score for men and women.

Results

The mean DQI-R score for the 339 sample was 62.1 ± 11.7 (Table 3). Only 2.7% of participants had DQI-R

TABLE 2
COMPONENTS OF DIET QUALITY INDEX REVISED AND SCORES DISTRIBUTION. AI-ADEQUATE INTAKE VALUE, RDA-RECOMMENDED DIETARY ALLOWANCE

| Component | Score | Scoring criteria | Female | % Female | Male | % Male | Population | % Population |
|---|-------------|-----------------------|--------|----------|------|--------|------------|--------------|
| | | | | | | | | |
| Total fat \leq 30% energy intake | 0-10 points | \leq 30%=10 | 69 | 24.9 | 21 | 33.9 | 90 | 26.5 |
| | | >30 and \leq 40%=5 | 157 | 56.7 | 24 | 38.7 | 181 | 53.4 |
| | | >40%=0 | 51 | 18.4 | 17 | 27.4 | 68 | 20.1 |
| Saturated fat \leq 10% energy intake | 0-10 points | \leq 10%=10 | 92 | 33.2 | 22 | 35.5 | 114 | 33.6 |
| | | >10 and \leq 13%=5 | 106 | 38.3 | 23 | 37.1 | 129 | 38.1 |
| | | >13%=0 | 79 | 28.5 | 17 | 27.4 | 96 | 28.3 |
| Dietary cholesterol <300 mg/d | 0-10 points | \leq 300=10 | 246 | 88.8 | 54 | 87.1 | 300 | 88.5 |
| | | >300 and \leq 400=5 | 18 | 6.5 | 5 | 8.1 | 23 | 6.8 |
| | | >400=0 | 13 | 4.7 | 3 | 4.8 | 16 | 4.7 |
| 2-4 servings fruit <i>per day</i> , % recommended servings (based on the 1600-kcal diet) | 0-10 points | \geq 100% | 52 | 18.8 | 15 | 24.2 | 67 | 19.8 |
| | | <100% and \geq 50% | 97 | 35.0 | 14 | 22.6 | 111 | 32.7 |
| | | <50% | 128 | 46.2 | 33 | 53.2 | 161 | 47.5 |
| 3-5 servings vegetables <i>per day</i> , % recommended servings (based on the 1600-kcal diet) | 0-10 points | \geq 100% | 85 | 30.7 | 18 | 29.0 | 103 | 30.4 |
| | | <100% and \geq 50% | 117 | 42.2 | 22 | 35.5 | 139 | 41.0 |
| | | <50% | 75 | 27.1 | 22 | 35.5 | 97 | 28.6 |
| 6-11 servings grains <i>per day</i> , % recommended servings (based on the 1600-kcal diet) | 0-10 points | \geq 100% | 97 | 35.1 | 34 | 54.9 | 131 | 38.6 |
| | | <100% and \geq 50% | 127 | 45.8 | 18 | 29.0 | 145 | 42.8 |
| | | <50% | 53 | 19.1 | 10 | 16.1 | 63 | 18.6 |
| Calcium intake as AI for age, % recommended servings | 0-10 points | \geq 100% | 7 | 2.5 | 4 | 6.5 | 11 | 3.2 |
| | | <100% and \geq 50% | 121 | 43.7 | 25 | 40.3 | 146 | 43.1 |
| | | <50% | 149 | 53.8 | 33 | 53.2 | 182 | 53.7 |
| Iron intake, % 1989 RDA for age | 0-10 points | \geq 100% | 66 | 23.8 | 25 | 40.3 | 91 | 26.9 |
| | | <100% and \geq 50% | 179 | 64.6 | 35 | 56.5 | 214 | 63.1 |
| | | <50% | 32 | 11.6 | 2 | 3.2 | 34 | 10.0 |
| Dietary diversity score | 0-10 points | \geq 6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| | | <6 and \geq 3 | 116 | 41.9 | 18 | 29.0 | 134 | 39.5 |
| | | <3 | 161 | 58.1 | 44 | 71.0 | 205 | 60.5 |
| Dietary moderation score | 0-10 points | \geq 7 | 200 | 72.2 | 41 | 66.1 | 241 | 71.1 |
| | | <7 and \geq 4 | 74 | 26.7 | 19 | 30.7 | 93 | 27.4 |
| | | <4 | 3 | 1.1 | 2 | 3.2 | 5 | 1.5 |

scores below 40, 13% of participants had scores between 41 and 50, 26% of participants between 51 and 60, 33% of subjects between 61 and 70, 18% had scores ranging from 71-80 and scores of 6.8% participants exceed 80 (Table

6). The highest correlation observed was between total DQI-R the energy percent from saturated fat ($r=0.68$), energy percent from total fat ($r=0.65$) and for servings grains ($r=0.57$) and fruit ($r=0.51$) *per day* (Table 5). Dietary

TABLE 3
SCORE AND DAILY INTAKES FOR THE DIET QUALITY INDEX REVISED AND FOR INDIVIDUAL INDEX COMPONENTS (X±SD). AI-ADE-
QUATE INTAKE VALUE, RDA-RECOMMENDED DIETARY ALLOWANCE.

| Component | Score total (n=339) | Intake/d total | Score female (n=277) | Intake/d female | Score male (n=62) | Intake/d male |
|--|------------------------|---------------------|-------------------------|---------------------|----------------------|---------------------|
| Total DQI-R (the highest possible score – 100) | 62.1±11.7 | – | 62.1±11.4 | – | 62.2±13.5 | – |
| Total fat, ≤30% energy intake | 5.3±3.4 | 34.6±7.7% of energy | 5.3±3.3 | 34.6±7.4% of energy | 5.3±3.9 | 34.4±8.9% of energy |
| Saturated fat, ≤10% energy intake | 5.3±2.9 | 11.6±3.6% of energy | 5.2±3.9 | 11.5±3.3% of energy | 5.4±4.0 | 11.8±4.5% of energy |
| Dietary cholesterol, <300 mg/d | 9.2±2.4 | 179.7±118.6 mg | 9.2±2.4 | 179.3±121.4 mg | 9.1±2.5 | 181.7±106.2 mg |
| 2 servings fruit per day (for a 1600 kcal/d diet) | 4.8±3.7 | 1.2±1.2 servings | 4.9±3.6 | .1±1.1 servings | 4.5±4.2 | 1.3±1.5 servings |
| % recommended servings | – | 58.2±58.5% | – | 57.2±53.5% | – | 63.0±77.4% |
| 3 servings vegetables per day (for a 1600 kcal/d diet) | 6.7±3.2 | 2.4±1.5 servings | 6.8±3.2 | 2.4±1.5 servings | 6.6±3.2 | 2.4±0.4 servings |
| % recommended servings | – | 80.0±50.9% | – | 79.7±49.5% | – | 81.2±56.9% |
| 6 servings grains per day (for a 1600 kcal/d diet) | 7.5±2.8 | 5.5±3.0 servings | 7.5±2.7 | 5.3±2.8 servings | 7.9±3.0 | 6.5±3.6 servings |
| % recommended servings | – | 91.4±50.6% | – | 87.5±47.3% | – | 108.7±60.7% |
| Calcium intake | 5.0±2.0 | 600.7±265.4 mg | 4.9±2.0 | 599.1±259.9 mg | 5.0±2.1 | 607.6±291.1 mg |
| % AI | – | 50.1±22.1% | – | 49.9±21.7% | – | 50.6±24.3% |
| Iron intake | 7.8±2.1 | 8.5±3.1 mg | 7.7±2.1 | 8.2±3.0 mg | 8.3±2.1 | 9.4±3.4 mg |
| % RDA | – | 84.6±31.4% | – | 82.5±30.3% | – | 94.2±34.5% |
| Dietary diversity score | 2.8±0.7 | – | 2.8±0.7 | – | 2.6±0.7 | – |
| Dietary moderation score | 7.7±1.6 | – | 7.7±1.5 | – | 7.5±1.8 | – |

moderation component had the lowest and inverse correlation of all the components of DQI-R ($r=-0.08$). Calcium intake was also poorly correlated to with DQI-R ($r=0.17$).

In addition, vitamin A and zinc were poorly correlated with DQI-R score and proteins and polyunsaturated fatty acids were poorly and inversely correlated with DQI-R score.

The biggest number of participants satisfied recommendations about dietary cholesterol intake (88.5% of participants) and dietary moderation score (71.1% of participants) but nobody satisfied recommendation about dietary diversity score (Table 2). Only 3.2% of subjects had an adequate calcium intake (6.5% of male participants and only 2.5% of female participants).

From the values in the Table 3 t-test was calculated and there were no significant differences between mean

values of all the components of DQI-R as well as for total DQI-R score for men and women.

Table 6 shows that there is a consistent qualitative and quantitative dietary improvement in the percentage of energy from fat, dietary cholesterol intake, intake of recommended servings of fruit, vegetables and grains, in the iron intake and in the dietary diversity component as one moves from the lowest grouping DQI-R scores to the highest.

The mean unadjusted dietary diversity score was 2.8 food groups. During observed day nobody have chosen more than 11 food groups of possible 23 in sufficient amount and one subject didn't choose ¼ serving or more of any of specified food groups.

The mean dietary moderation score was 7.7 (Table 3) but the most of the participants had problem with meet-

TABLE 4
ELEMENTS OF DIET MODERATION SCORE (COMPONENT 10) OF THE DOI-R AND DISTRIBUTION OF SCORES

| Moderation consumption and scoring criteria/d | Score | Female in subgroup (%) | Male in subgroup (%) | Population in subgroup (%) |
|---|-------|------------------------|----------------------|----------------------------|
| Teaspoons added sugar (tsp) | | | | |
| ≤ 100% of maximum | 2.5 | 68.6 | 72.6 | 69.3 |
| > 100% and ≤ 150% | 1.5 | 20.2 | 12.9 | 18.9 |
| > 150% and ≤ 200% | 1.0 | 5.8 | 9.7 | 6.5 |
| > 200 % | 0.0 | 5.4 | 4.8 | 5.3 |
| Discretionary fat (g) | | | | |
| ≤ 25 g | 2.5 | 82.0 | 79.0 | 81.4 |
| > 25 and ≤ 150g | 1.5 | 16.2 | 11.3 | 15.3 |
| > 150 and ≤ 200g | 1.0 | 1.8 | 6.5 | 2.7 |
| > 200 g | 0.0 | 0.0 | 3.2 | 0.6 |
| Sodium intake (mg) | | | | |
| ≤ 2400 mg | 2.5 | 19.1 | 19.3 | 19.2 |
| > 2400 and ≤ 3400 mg | 1.5 | 25.3 | 21.0 | 24.5 |
| > 3400 mg | 0.0 | 55.6 | 59.7 | 56.3 |
| Alcohol intake (drinks) | | | | |
| ≤ 100% of maximum | 2.5 | 97.8 | 93.6 | 97.1 |
| > 100% and ≤ 150% | 1.5 | 1.8 | 1.6 | 1.7 |
| > 150% and ≤ 200% | 1.0 | 0.4 | 3.2 | 0.9 |
| > 200 % | 0.0 | 0.0 | 1.6 | 0.3 |

ing goals for sodium intake (more than 50% of participants consume more than 3400 mg of sodium/day) (Table 4). The average sodium intake was 3615.4 mg. The average value for discretionary fat intake was 16.7 g and for added sugar was 4.6 tsp. There were 97.1 % of alcohol non-consumers (Table 4), and average alcohol intake for consumers was 0.1 drinks.

Discussion and Conclusion

The main purpose of this manuscript was to evaluate diet according to recently developed index, which take in account certain foods and nutrients important for health status. Evaluation of diet according Dietary Reference Intakes for the same population was already observed and published elsewhere. Some of our preliminary results published elsewhere showed inadequate calcium intake, intake of fruit and vegetables below recommendation as well as dietary fibre, and advisable decrease in the energy fraction of fat and decrease in protein content^{28–30}.

The failure of single-nutrient supplementation to prevent disease in intervention studies underlines the necessity to develop a holistic view of food intake^{31–33}. The DQI-R consists of 10 components and provides overall picture of the type and quantity of foods people eat, their

compliance with specific dietary recommendation, and the variety and moderation in their diets.

Last 10–15 years information about diet quality of nursing home residents in Croatia were lacking. In review article published in Collegium Antropologicum few years ago³⁴ among nutritional studies in Croatia, the only mentioned study concerning older persons from pensioners' home was by Subotičanec et al.³⁵. Analysis of the daily menus showed great nutritive deficiencies, like lack of pyridoxine in 58% of persons, vitamin C from 21.4–45.2% and riboflavin from 11.1–19.4%.

The results of this study could help to identify and improve critical dietary parameters in elderly nursing home resident existing at the moment.

The mean DQI-R score for all participants was 62.1 out of 100, which meant that their diet needed improvement. Haines et al. found similar DQI-R score (63.4) in the sample of 3202 adults aged 18 and older participating in the 1994 Continuing Survey of Food Intakes by Individuals who had completed two 24-hour recalls¹⁵. Total DQI-R score found by Newby et al. was ranging from 62.0 to 69.5, although the participants were younger men, aged 45–75 and DQI-R was calculated based on the food frequency questionnaire²⁵. On the sample of older cancer survivors (aged ≥ 65 years) DQI score was ranging from 64.6 to 69.8 (the greatest score was achieved in the

intervention group, after implementation of dietary intake and physical activity guidelines)³⁶.

We found that only 6.8% of participants had DQI-R score higher than 80 that could be consider as indicator of »good« diet. Even the participants with total score above 80 appeared to be less successful in meeting recommendations for calcium intake and dietary diversity. Concerning was the fact that almost one quarter of all subjects had DQI-R score below 50. There were no significant gender differences in DQI-R scores probably because participants as nursing home residents usually consume the same or similar foods.

Most of the diet indices tend to relate positively to the intake of critical micronutrients but the association with energy and fat intake does not always go in the expected direction³⁷. In this study the total DQI-R correlated with energy and with total fat.

Consuming a wide variety of foods is considered the best way to ensure balance of nutrients and consumption of appropriate amounts of healthful food components. The recommendation to consume fruit and vegetables to lower risk for chronic disease has been and continues to be a key component of dietary guidance³⁸. According to this research 81.2% of female participants and 75.8% of male participants did not meet recommended intake of fruit, 69.3% of female and 71% of male did not meet recommended intake vegetables and 64.9% of female participants and 45.1% of male participants did not meet recommended intake of grains. Beside inadequate fruit, vegetable and grains intake, DQI-R score had shown very low dietary diversity score and it is obvious that diet diversity of nursing home residents should be improved. Partly possible explanation of low diversity score could be in dietetic method used (24-hour dietary recall for one day only). Other studies that showed greater scores mainly used 24-hour dietary recall for two days^{15,36,39,40}.

There are very few papers dealing with DQI-R but to our knowledge in specific population such as nursing home residents no papers were published, what could be considered one of the most important strengths of this study.

A limitation of our study was disability to reproduce the method used in DQI-R concerning added sugars and discretionary fat. Discretionary fat and added sugars were not recorded directly in the 24-hour recall so the selection of the foods containing added sugars and discretionary fat was performed on the basis of the definitions used in the food guide pyramid.

Another limitation was impossibility to include some ingredients from mixed dishes in the 23 food groups that might influence the diversity score and consequently total DQI-R score as well as calculating score from 24-hour dietary recall for one day. Twenty-four hour recalls were open-ended and thus collect information on specific food items, including ethnic food and serving size amounts variety component could be higher if two-day period was observed.

TABLE 5
PEARSON CORRELATION COEFFICIENTS OF DIETETIC PARAMETERS WITH THE TOTAL SCORE FOR THE DIET QUALITY INDEX REVISED, *p<0.05

| Parameter | Correlation coefficients |
|--|--------------------------|
| Total fat (score) | 0.65* |
| Saturated fat (score) | 0.68* |
| Dietary cholesterol (score) | 0.23* |
| Servings fruit <i>per</i> day (score) | 0.51* |
| Servings vegetables <i>per</i> day (score) | 0.41* |
| Servings grains <i>per</i> day (score) | 0.57* |
| Calcium intake (score) | 0.17* |
| Iron intake (score) | 0.45* |
| Dietary diversity (score) | 0.45* |
| Dietary moderation (score) | -0.08 |
| Energy(kJ) | 0.23* |
| Protein (% kJ) | -0.10 |
| Fat(%kJ) | -0.61* |
| Saturated fatty acids (% kJ) | -0.64* |
| Monounsaturated fatty acids (% kJ) | -0.54* |
| Polyunsaturated fatty acids (%kJ) | -0.07 |
| Carbohydrates (% kJ) | 0.55* |
| Dietary fiber (g) | 0.62* |
| Magnesium (%DRI) | 0.45* |
| Phosphorus (%DRI) | 0.17* |
| Potassium (mg) | 0.40* |
| Sodium (mg) | 0.21* |
| Zinc (%DRI) | 0.07 |
| Copper (%DRI) | 0.39* |
| Manganese (%DRI) | 0.37* |
| Selenium (%DRI) | 0.25* |
| Vitamin C (%DRI) | 0.39* |
| Thiamin (%DRI) | 0.35* |
| Riboflavin (%DRI) | 0.18* |
| Niacin (%DRI) | 0.20* |
| Pantothenic acid(%DRI) | 0.15* |
| Vitamin B6(%DRI) | 0.29* |
| Food Folate (%DRI) | 0.34* |
| Vitamin B12 (%DRI) | -0.11* |
| Vitamin A (%DRI) | 0.04 |
| Vitamin E (%DRI) | 0.21* |
| Vitamin K (%DRI) | 0.24* |

TABLE 6
MEAN VALUES OF DQI-R COMPONENTS BY DQI-R SCORE CATEGORY

| Variable | Sample±SD | DQI-R Score Category | | | | | | | | | |
|--|-------------|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 0-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 | 71-75 | 76-80 | >80 |
| Number of subjects | 339 | 9.0 | 15.0 | 29.0 | 35.0 | 53.0 | 59.0 | 53.0 | 32.0 | 31.0 | 23.0 |
| % energy from fat | 34.6±7.7% | 49.0 | 39.2 | 41.8 | 39.4 | 34.9 | 34.8 | 32.7 | 30.2 | 28.0 | 27.5 |
| % energy from saturated fat | 11.6±3.6% | 19.1 | 15.0 | 14.9 | 13.3 | 12.2 | 11.2 | 10.3 | 9.7 | 8.7 | 8.4 |
| Dietary cholesterol (mg) | 179.7±118.6 | 192.8 | 309.9 | 187.7 | 197.5 | 189.5 | 161.6 | 171.8 | 173.9 | 151.5 | 141.1 |
| % recommended servings of fruit per day | 58.2±58.5 | 6.5 | 25.8 | 25.5 | 39.3 | 46.0 | 50.5 | 61.6 | 82.4 | 109.0 | 108.2 |
| % recommended servings of vegetables per day | 80.0±50.9 | 34.8 | 44.1 | 56.6 | 71.5 | 69.4 | 81.1 | 88.0 | 99.3 | 98.2 | 115.1 |
| % recommended servings of grains per day | 91.4±50.6 | 20.6 | 46.4 | 58.3 | 70.3 | 86.1 | 94.4 | 107.8 | 107.4 | 118.2 | 130.7 |
| % AI calcium per day | 50.1±22.1 | 33.5 | 51.0 | 45.4 | 43.8 | 51.4 | 50.4 | 49.1 | 54.8 | 54.7 | 56.6 |
| % RDA iron per day | 84.6±31.4 | 47.4 | 71.4 | 73.0 | 77.9 | 77.8 | 82.5 | 92.3 | 91.3 | 99.2 | 107.0 |
| Dietary diversity | 2.8±0.7 | 1.6 | 2.5 | 2.5 | 2.5 | 2.7 | 2.7 | 2.8 | 3.1 | 3.1 | 3.6 |
| Dietary moderation | 7.7±1.6 | 8.3 | 7.9 | 8.0 | 7.4 | 7.8 | 7.8 | 7.4 | 7.8 | 7.4 | 7.6 |

In the conclusion, the population of elderly nursing home residents in the capital of Croatia according to DQI-R should improve calcium, fruit and vegetables intake as well as include in their actual diet variety of foods. Total fat and saturated fat intake should also be observed. Positive dietary habits regarding dietary moderation and dietary cholesterol intake should be sustained.

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KVALITETA PREHRANE U OSOBA SMJEŠTENIH U DOMOVIMA ZA STARIJE I NEMOĆNE OSOBE PROCIJENJENA INDEKSOM KAKVOĆE PREHRANE (DQI-R)

SAŽETAK

Cilj ovog rada bio je procjena prehrane starijih osoba smještenih u Domovima za starije i nemoćne osobe i utvrđivanje kritičnih nutrijenata u njihovoj prehrani. Ispitanici (277 žena i 62 muškarca) su probрани iz svih Domova za starije i nemoćne osobe na području grada Zagreba pri čemu su svi domovi bili su jednako zastupljeni. Dob ispitanika bila je u rasponu od 61–93 godine; većina žena (53,4%) i muškaraca (53,2%) bili su u dobnoj skupini od 70–80 godina. Podaci o prehrani prikupljeni su 24-satnim prisjećanjem i korišteni su za izračunavanje revidiranog indeksa kakvoće prehrane (DQI-R). Korišten je Pearsonov koeficijent korelacije kako bi se usporedili dijetetički parametri s ukupnim indeksom kakvoće prehrane i t-test za usporedbu komponenti DQI-R i DQI-R vrijednosti među muškarcima i ženama. Srednja vrijednost DQI-R sume za 339 ispitanika iznosila je 62,1±11,7. Najveći broj ispitanika zadovoljio je preporuke za prehrambeni unos kolesterola (88,5% ispitanika) i za umjerenost (71,1% ispitanika), međutim nitko od ispitanika nije zadovoljio preporuke za raznolikost u prehrani. Samo 3,2% ispitanika imalo je unos kalcija u skladu s preporukama, i to 6,5% muškaraca i 2,5% žena. Preporuke za unos voća zadovoljilo je 19,8% ispitanika, za unos povrća 30,4%, a unos proizvoda iz skupine žitarica bio je u skladu s preporukama u 38,6% ispitanika. Procjenom prehrane prema kategorijama DQI-R, osim prihvatljivih vrijednosti za unos kolesterola i umjerenost, može se zaključiti da je potrebno poboljšati kvalitetu prehrane kako bi se doprinijelo boljoj kvaliteti života.