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THE EVALUATION OF TOTAL DIETARY FIBRE CONTENT IN STANDARD HOSPITAL DIETS DURING THE WINTER AND SUMMER SEASONS

OCENA ZAWARTOŚCI BŁONNIKA POKARMOWEGO W STANDARDOWYCH DIETACH SZPITALNYCH W OKRESIE ZIMOWYM I LETNIM

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The main aim of the study was to determine the total dietary fiber in standard diets for hospitalized patients in winter and summer. In the randomized trial performed in the winter of 1995/1996 and summer 1997, we assessed the dietary fiber content in 12 standard diets with AOAC method. We also made a simulation, where white bread, present in every diet, was replaced by dark bread. The change induced statistically significant differences between diets containing white bread and dark bread ($p < 0.001$).

INTRODUCTION

Regular supplementation in energy, nutritive elements and dietary fiber in food, especially in the diets of patients in public hospitals, may sometimes be problematical. It mainly depends on the amount of money allotted daily for each patient. According to The World Health Organization the diet should provide 27-40 g of dietary fiber per day [7]. This is considered as an optimal amount to prevent some gastrointestinal diseases, atherosclerosis, coronary heart disease and diabetes [2, 3, 4, 5, 6]. The composition of the meals in public boarding institutions is established by dietiticians according to the national index of composition and nutritive values of food products.

The goal of our study was to estimate the total dietary fiber in standard diets prepared in winter and summer for patients in a certain teaching hospital. Because grain products were provided in every hospital diet, we also simulated a change in total dietary fiber induced by replacement of white bread for dark bread. This let us determine the degree to which the alternative food product influences the diet's composition.

MATERIAL AND METHODS

Food samples were collected from one of the major hospitals in the city of Białystok: 6 samples in the winter – the time period from December 1995 to January 1996 and 6 samples in summer – from June to July 1997. Tested material consisted of normal hospital diets for adults which were composed of breakfast, dinner, afternoon meal and supper taken from the “patient’s plate”. Products were divided into three main sources of fiber: grains, vegetables and fruits. Diets were homogenized and oven-dried at a temp. 700°C.

Six samples of commercially baked dark bread, which were prepared from wholemeal rye flour were sliced into slices of 7 x 8 x 0.7 cm. Six samples of white bread (made from fine wheat and rye flours), available in the shops, were cut into slices of size 8 x 12 x 0.7 cm. Both kinds of bread samples were oven-dried at temperature 105°C.

Dried products were ground with a commercial mill and stored in a desiccator. Subsequently, the material was defatted with petroleum ether. The loss of weight was recorded for final correction of total dietary fiber content. The samples were examined with Association of Official Analytical Chemists method [1] in duplicate.

All statistical calculations were based on the software statistical program Statistica v.5.0. and *Student’s* T-test was performed for dependent and independent samples to estimate the p value.

RESULTS AND DISCUSSION

Table I shows the results of total dietary fiber determination in white bread and dark bread.

Table I. Mean total dietary fibre content (g/100 g) in white bread and dark bread

	N	Mean	St. Dev.	Significance
White bread	6	4.58	0.45	p < 0.001
Dark bread	6	9.53	0.59	

This part of material allowed us to estimate total dietary fiber contents in white bread, which was an everyday component of the tested hospital diets, and total dietary fiber content in dark bread, which substituted the white bread in simulated changes of one kind of bread to another. Mean fiber content in white bread amounts 4.58g/100g, and 9.53g/100g in dark bread. *Student’s* T-test displayed significant distinction in dark bread in comparison to white bread (p < 0.001). These results demonstrated that dark bread is a very good fiber-rich product and can be used to increase the dietary fiber content in the normal diet, especially in the diet of hospitalized patients.

The determined mean dietary fiber contents (Fig. 1) in examined hospital daily diets ranged:

- in winter from 16.9 to 35.4 g/diet (mean value 27.5),
- in summer from 21.4 to 33.9 g/diet (mean 26.2).

After the replacement of white to dark bread, the results varied respectively:

- in winter from 25.4 to 47.9 g/diet,
- in summer from 33.3 to 47.4 g/diet.

We observed the presence of a statistically significant difference between the total dietary fiber in the analyzed daily diets and simulated change of white bread to dark bread (p < 0.001). The greater amount of fiber in dark bread than in white bread causes a significant increase of dietary fiber, what was shown by the simulation.

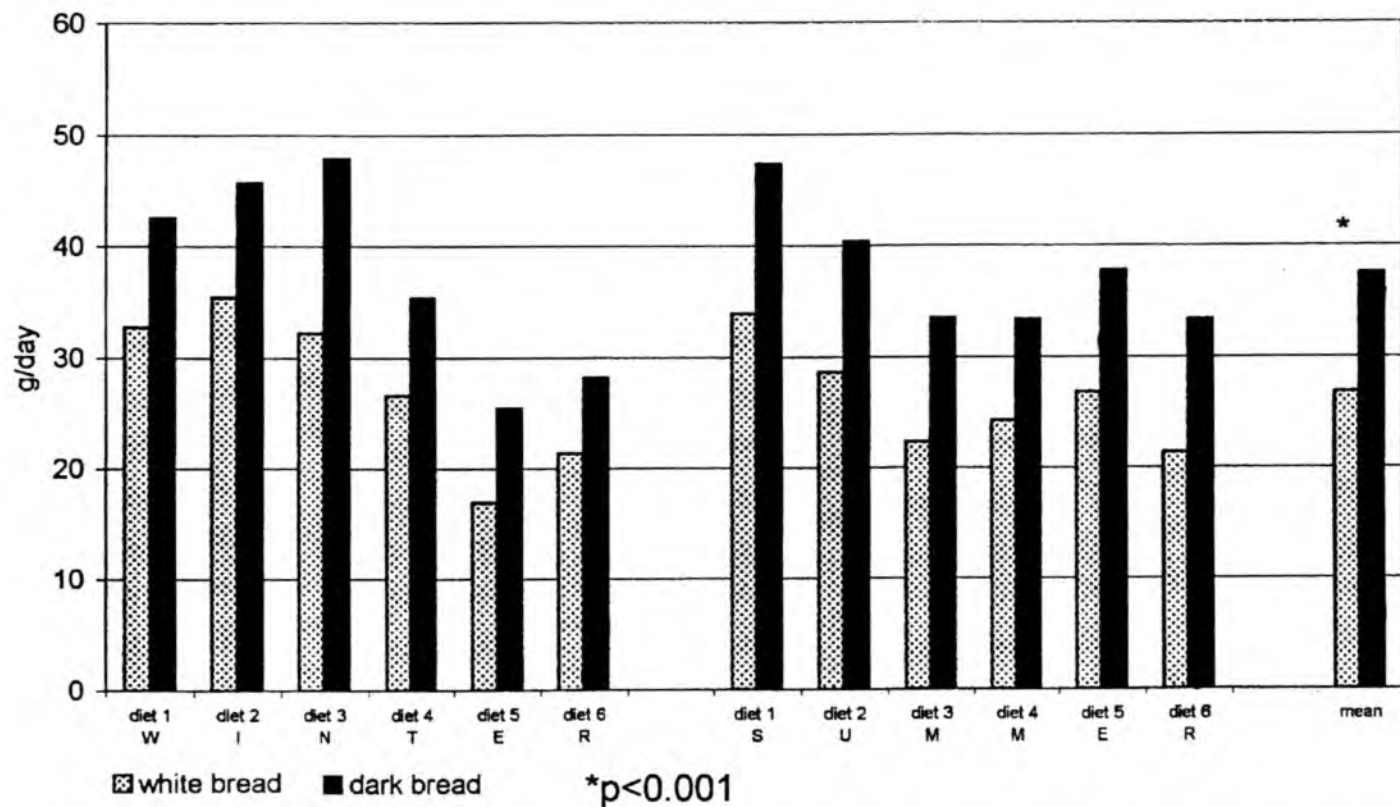


Fig. 1. Total dietary fibre contents (g/day) in the hospital diets in comparison to the diets with simulated change from white bread to dark bread

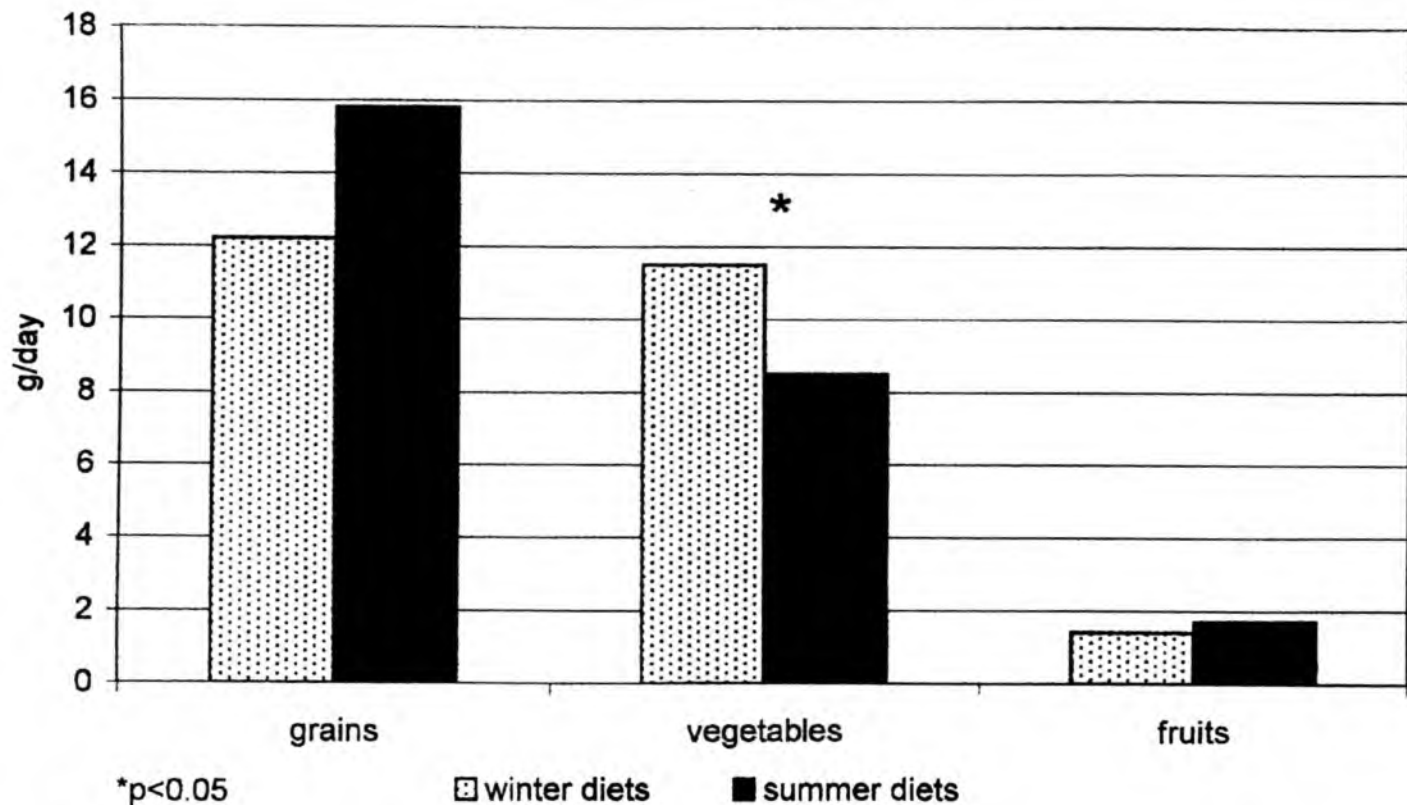


Fig. 2. Mean total dietary fibre (g/day) in the tested diets derived from grains, vegetables and fruits

The total dietary fiber contents in hospital diets (Fig. 2), were expressed in g/day for individual groups of products (grains, vegetables, fruits). The dietary fiber in the tested hospital diets was derived mainly from grains – average value 12.2 g/day in winter and 15.8 g/day in summer. The second group of plant products to supply fiber in the diet were vegetables. Food portions covered an average of 11.5 g dietary fiber per day in winter and 8.5 g in summer. In spite of the variety of cheap vegetables on sale, a significantly lower content of fiber was observed in summer ($p < 0.05$). Fruits and fruit products in hospital food contained 1.4 g/day of fiber in winter and 1.7g/day in summer respectively.

According to the list of products, delivered from the hospital stores for preparing meals, a greater mean weight of fiber-containing products (grains, vegetables and fruits) was found in the winter diet – on an average of 1040 g/day in contrast to summer – 890 g/day. Concerning the mean dietary fiber content and the mean weight of the diets, the dietary fiber was relatively decreased in winter – 2.6 g on 100 g than in summer – 2.9 g/100 g. In our study we observed that the tested hospital diets were unvaried in sources of dietary fiber independent of the season. Grain products were served at most of the meals, but vegetables only for dinner. Grains were represented mainly in bread, groats and noodles. Vegetables were the most varied group of food products, whereas potatoes were served frequently. Also beetroots, cabbage and carrots were served during both seasons, and seasonal vegetables (lettuce, tomatoes) only in summer. Fruits were mainly for breakfast in the form of jam, or in winter diets for dinner as congealed currants in drinks. Fresh apples were sometimes served for afternoon meals during both seasons.

Our testing also has shown that there was not a considerably great difference between the percentage proportion in dietary fiber content in individual foodstuffs. However summer diets contained less fiber from vegetables and fruits than winter diets. Furthermore, about 30% of grains supplied by the hospital stores may meet the dietary fiber requirement ranging from about 50 to 60%. This observation shows that grains are a large group of products which may influence to a great extent dietary fiber contents of daily food rations in hospitals.

CONCLUSIONS

The results demonstrate that the replacement everyday of eaten foodproducts may evoke significant changes in dietary fiber contents. It is only the replacement of the one component of the daily meals may influence the whole diet composition and enhance the advantageous influence of fiber-rich products to the health and well-being of the hospital patients. Obviously, we have shown only the example of possible changes in hospital nutrition. In some cases of simulation, the dietary fiber contents exceed recommended daily allowances. However, an easy way to increase the dietary fiber contents in the normal diet, in this case, is to enrich hospital meals in produce. As we found, the assessed daily contents of dietary fiber in the tested hospital diets were calculated correctly, however the composition of the meals should be improved. Vegetables and fruits ought to be served at a greater number of meals. Ultimately, the sources of the dietary fiber in the tested diets need to be more varied, in particular in foods containing soluble fiber, such as fruits and leguminous plants.

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Summary

The main aim of the study was to determine the total dietary fiber in standard diets for hospitalized patients in winter and summer. In the randomized trial performed in the winter of 1995/1996 and summer 1997, we assessed the dietary fiber content in 12 standard diets with AOAC method. The dietary fiber in the tested hospital diets was derived mainly from grains – average value 12.2g/day in winter and 15.8g/day in summer. The second group of plant products to supply fiber in the diet were vegetables. Food portions covered an average of 11.5g dietary fiber per day in winter and 8.5g in summer. In spite of the variety of cheap vegetables on sale, a significantly lower content of fiber was observed in summer ($p < 0.05$). Fruits and fruit products in hospital food contained 1.4g/day of fiber in winter and 1.7g/day in summer respectively.

We also made a simulation, where white bread, present in every diet, was replaced by dark bread. This let us determine the degree to which the alternative food product influences the diet's composition. The results demonstrate that the replacement everyday of eaten foodproducts may evoke significant changes in dietary fiber contents. The change induced statistically significant differences between diets containing white bread and dark bread ($p < 0.001$).

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Streszczenie

Celem badań było oznaczenie zawartości błonnika pokarmowego metodą AOAC w 12 standardowych dietach szpitalnych w okresie zimowym na przełomie roku 1995/1996 i w okresie letnim w roku 1997. Najwyższą średnią zawartość błonnika pokarmowego wykazano w produktach zbożowych – 12,2 g/dzień w dietach zimowych i 15,8 g/dzień w dietach w okresie letnim. Warzywa dostarczały 11,5 g/dzień błonnika pokarmowego zimą i 8,5 g/dzień latem. Owoce i ich przetwory dostarczały średnio 1,4 g błonnika dziennie w diecie zimą i 1,7 g/dzień w lecie. Pomimo większej dostępności w sprzedaży tanich warzyw, stwierdzono znamienne niższą zawartość błonnika pokarmowego w dietach letnich ($p < 0,05$).

Wykazano, że symulowana zamiana białego pieczywa na razowe powoduje znamienny wzrost zawartości błonnika pokarmowego w diecie ($p < 0,001$).

REFERENCES

1. AOAC Method 985.29. Total Dietary Fibre in Foods. Enzymatic-Gravimetric Method. Official Methods of Analysis, 15th Ed. AOAC, Arlington, VA, 1990, vol. II, sec. 985.29, 1105.
2. Durrington P.N., Manning A.P., Bolton C.H., Hartog M.: Effects of pectin on serum lipids and lipoproteins, whole gut transit time and stool weight. *Lancet* 1976, 2, 394-396.
3. Guevin N., Jacques H., Nadeau A., Galibois I.: Postprandial glucose, insulin, and lipid responses to four meals containing unpurified dietary fiber in non-insulin-dependent diabetes mellitus (NIDDM), hypertriglyceridemic subjects. *J. Am. Coll. Nutr.* 1996, 15, 389-396.

4. *Kritchevsky D., Tepper S.A.*: Influence of dietary fiber on establishment and progression of atherosclerosis in rabbits. *J. Nutr. Biochem.* 1995, 6, 509–512.
5. *Pietinen P., Rimm E.B., Korhonen P., Hartman A.M., Willett W.C., Albanes D., Virtamo J.*: Intake of dietary fiber and risk of coronary heart disease in a cohort of Finnish men. *Circulation* 1996, 94, 2720–2727.
6. *Roberts D.C., Truswell A.S., Bencke A., Dewar H.M., Farmakaidis E.*: The cholesterol-lowering effect of a breakfast cereal containing psyllium fibre. *Med. J. Aus.* 1994, 161, 660–664.
7. WHO Reports: Reports No 797, Geneva 1990.

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