Z Ernährungswiss 37: 315–318 (1998)

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Supplements as a source of micronutrient intake in middle-aged men in southern Germany: Results of the MONICA dietary survey 1994/95

Nahrungsergänzungspräparate als Quelle für die Zufuhr von Mikronährstoffen bei Männern mittleren Alters in Süddeutschland: Ergebnisse der MONICA Ernährungserhebung 1994/95

Summary Survey data on contemporary supplement intake in Germany are scarce, and the contribution of supplements to nutrient intake is especially unclear. In the MONICA Project Augsburg a dietary survey using 7-day weighed records was carried out in a subsample of 607 eligible men aged 45–64 years from the city of Augsburg (participation 430 men = 71 %) in 1994/95. Participants also reported their intake of supplements. The German national food data base BLS (version 2.1), which was used to code the records and calculate the nutrients, had to be complemented by nutrient data of supplements and fortified foods. On a group level the maximum mean percentage contribution of supplements to the intake of a micro nutrient was 4.0 % (vitamin C). On an individual level, however, up to 4.0 % of the men were found to receive more than 50 % of their intake of selected micronutrients from supplements. It is, therefore, recommended to ask for supplement intake in future dietary surveys within Germany.

Received: 14 April 1998
Accepted: 14 August 1998

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Zusammenfassung Bisher liegen kaum Daten über die derzeitige Einnahme von Nahrungsergänzungspräparaten vor. Vor allem ist unklar, welchen Anteil Supplemente an der Nährstoffzufuhr ausmachen. Im MONICA Project Augsburg wurde 1994/95 an einer Substichprobe von netto 607 Männern im Alter von 45 bis 64 Jahren aus der Stadt Augsburg eine Ernährungserhebung mit 7-Tage-Wiege-Protokollen durchgeführt (430 Teilnehmer = 71 % Beteiligung). Die Teilnehmer protokollierten auch Supplemente. Zur Kodierung und Berechnung der Nährstoffe wurde der Bundeslebensmittelschüssel BLS (Version 2.1) verwendet, der um Supplementdaten ergänzt wurde. Auf Gruppenebene lag der maximale mittlere prozentuale Beitrag von Supplementen zur Zufuhr eines Mikronährstoffs bei 4,0 % (Vitamin C). Auf Individualebene allerdings zeigte sich, daß bis zu 4,0 % der Männer über 50 % der Aufnahme einzelner Mikronährstoffe aus Supplementen bezogen. Es wird deshalb dringend empfohlen, Supplemente bei allen zukünftigen Ernährungserhebungen in Deutschland mitzuerheben.

Key words: Dietary survey – records – supplements – vitamins – minerals

Schlüsselwörter: Ernährungserhebung – Ernährungstagebücher, Nahrungsergänzungspräparate – Vitamine – Mineralstoffe

Introduction

Survey data on contemporary supplement intake in Germany are scarce, though increases during recent years are suspected. To our knowledge, only the 3rd survey of the MONICA Project Augsburg and the „Brandenburger Ernährungs- und Krebsstudie“ focused on the actual situation in adults in the mid 1990s (5, 7).
Especially the contribution of supplements as a source of micronutrient intake in relation to usual food sources is unclear and a topic of discussion. The present paper aims to analyze the contribution of supplements to the intake of selected micronutrients on a group and individual level.

Methods

Sample and dietary assessment method

Methodology and results on food and nutrient intake from the dietary survey 1994/95 of the MONICA[1)] Project Augsburg have been previously described (2, 3), so only a brief summary of methods is given in Table 1.

Assessment and definition of supplement intake

Trained nutritionists instructed each participant individually on how to keep the record and stressed the importance to report all supplements. Additionally, the written instructions in the records reminded the participants to note all supplements, e.g., vitamin and mineral tablets, fishoil capsules. The completed records were checked together with the participant and the nutritionists asked again, whether supplements were taken and reported.

The German national database BLS[2)] (version 2.1), which was used for food coding and for the transformation into nutrients, does not contain supplements. Therefore, nutrient data of supplements and new fortified foods had to be obtained from the producers and internally added to the database (6). One specific group contained all supplements; fortified foods became part of their relevent food group; for supplement a new group was created.

The definition of supplements and supplemented foods is, therefore, based on the variety of items the participants reported in their records, from which each was taken into account. As the only supplemented foods occuring in the records were drinks, candies, formula diet drinks, and milk products which could unambiguously be grouped into their appropriate food group, the distiction between supplements and supplemented foods was also obvious.

Statistical analysis

The following measures are reported:

- Mean daily intakes of selected micronutrients from all sources for all 430 participants (age-standardized according to the population of Germany of 1980),
- mean contribution to the total intake of a nutrient originating from supplements in percent for all 430 participants,
- percentage of supplement "users", and
- the number of participants receiving a percentage contribution of ≥ 25 % and ≥ 50 % of their intake of selected vitamins and ≥ 10 % and ≥ 25 % of their intake of selected minerals from supplements.

The three latter measures refer to supplements only and do not include fortified foods.

Users are defined as men reporting an intake of a supplement at least once in their records.

To calculate the contribution of foods and supplements, all items reported were combined into a non-overlapping food grouping system[3)]. The contribution of supplements, in percent, toward individual nutrient intake was at first calculated using the following formula:

*Percentage of total intake of nutrient x contributed by supplements = (total nutrient x in all supplements reported over the 7 days / total nutrient x in all foods consumed) * 100 %.*

Thereafter, descriptive statistics for the percentage contribution of food items for all participants were carried out using the Statistical Analysis Software (SAS), version 6.09.

Table 1 Sample and dietary assessment method of the MONICA Augsburg dietary survey 1994/95

Sample	
Framework of the study	3rd survey of the MONICA project Augsburg
Study area	City of Augsburg
Year	1994/95
Study population	men, aged 45–64 years (German nationality)
Sampling	Sex-age-stratified simple random sampling
Sample size	622
No. Eligible	607
Participants (response)	430 (71 %)
Dietary assessment method	
Method	7-day weighed records, open-ended
Assessment of food amounts	weighing by dietary scales *(Soehnle classic plus)* and use of household measures
Time of the year	October–June
Food table	German national food database BLS (version 2.1)

1) MONICA = Monitoring trends and determinants in cardiovascular disease
2) Bundeslebensmittelschlüssel (= German Federal Food Key)
3) Food grouping system according to the regular German household budget survey „Einkommens- und Verbrauchsstichprobe" (EVS).

Results

Generally, 16.3 % of the 430 participants reported an intake of supplements during the 7-day period. The two types of products consumed most often were products containing either a single mineral (35 men, respectively 8.1 %) or products containing a single vitamin (25 men, 5.8 %). This was closely followed by multivitamin products (18 men, 4.2 %), products with combinations of vitamins and minerals (5 men, 1.2 %), and multimineral products (3 men, 0.7 %). Eighteen men (4.2 %) reported the use of other supplements, such as garlic and silica products. Fortified foods were used by 10.7 % (46 men) of the 430 participants, with fortified drinks as the preferred group. Fortified fruit juices and nectars were used by 30 men (7.0 %), sport mineral drinks by 12 men (2.8 %), and other fortified soft drinks by 3 men (0.7 %). Fortified candies (2 men, 0.5 %), formula diet drinks (2 men, 0.5 %), and fortified milk products (1 man, 0.2 %) were reported less frequently.

Supplement contribution on the group level

The mean percentage contribution of supplements to the total intake of selected vitamins and minerals on the group level is shown in Table 2. Generally, supplements seem to have a stronger impact on vitamin as compared to mineral intake. The mean contribution to vitamin intakes ranges between 4.0 % (vitamin C) and 0.3 % (carotene). Concerning minerals, only the mean intakes of calcium and magnesium are influenced considerably by supplements.

Supplement contribution on the individual level

In a limited number of individuals, however, the contribution of supplements to vitamin and mineral intake is considerably high (see Table 2). The number of men with more than 25 % of their vitamin intake originating from supplements varies between 3 men (0.7 %) for carotene and 23 men (5.3 %) for vitamin C. Some men even receive distinctly more than 50 % of their vitamin intake from supplements. The number of men with a comparably high contribution of supplements to their mineral intake is markedly smaller: Only 3 respectively 2 men (0.7 % respectively 0.5 %) receive more than 25 % of their calcium and magnesium intake from supplements.

Discussion

To our knowledge, detailed data on the contemporary use of supplements in random German population samples are scarce. In the 3rd survey of the MONICA Project Augsburg in 1994/95, supplement intake was asked in the standardized interview with 4 856 men and women aged

Table 2 Supplements as a source of selected vitamin and mineral intake in 430 men aged 45–64 years: Daily intake from all sources, percentage contribution of supplements, percentage of users, and number of men with a percentage contribution of ≥ 25 % and ≥ 50 %, respectively, ≥ 10 % and ≥ 25 % from supplements. MONICA Augsburg dietary survey 1994/95

Nutrient	Daily intake from all sources[1] (n = 430 men)		% contribution of supplements (n = 430 men)		Users of supplements	Number of men with percentage contribution of supplements ≥ 25 %	≥ 50 %
	$\bar{x}$	SD	$\bar{x}$	SD	%	n	n
Vitamin A	1.7 mg	2.4	1.1	7.8	5.6	8	2
Carotene	3.5 mg	3.5	0.3	2.9	1.6	3	0
Vitamin C	140.8 mg	323.6	4.0	16.0	12.1	23	17
Vitamin E	12.7 mg	10.4	2.4	11.1	9.8	17	9
Thiamin	1.5 mg	0.8	1.5	8.5	8.1	9	4
Riboflavin	1.9 mg	0.7	1.6	8.2	8.1	12	5
Niacin	24.4 mg	8.2	1.0	5.7	7.4	5	1
Pyridoxin	2.1 mg	0.9	1.3	7.2	5.3	9	2
Pantothenic acid	6.7 mg	2.3	1.1	6.5	6.7	10	3
Cobalamin	8.9 ug	6.2	0.9	5.8	4.4	6	2
						≥ 10 %	≥ 25 %
Potassium	3.3 g	0.9	0.0	0.1	4.4	0	0
Calcium	812 mg	352	0.6	3.7	7.2	9	3
Magnesium	369 mg	108	0.7	3.5	8.6	10	2
Iron	16.1 mg	4.7	0.0	0.05	3.7	0	0
Zinc	12.7 mg	3.3	0.0	0.7	3.5	1	0

[1] Only the daily intake from all sources is age-standardized according to the population of Germany 31/12/1980

25–74 years and was part of the additional dietary survey carried out in the subsample of 45–64 year old men from the city of Augsburg. The present analysis is based on the dietary survey using *prospective* 7-day records and amplifies the results of the interviews, which recalled the *previous* week (7).

The percentage of men reporting the use of supplements in the records is smaller than the percentage of men in the comparable age group recalling a supplement use in the interview (16.3 % vs. 19.1 %) (7, 8). The known tendency toward underestimation by records as compared to questionnaires (9) might be one reasonable explanation. It might also be suspected that – contrary to supplements which are bought by personal drive – supplements which are recommended or even prescribed by physicians tend to be regarded as medicine and are not reported in the food record. Generally, however, the difference indicates that the contribution of supplements is estimated conservatively in the present analysis.

Concerning methodology, results from the Swedish "Malmö Diet and Cancer Study" (4) seem to be best comparable. In this study, 29 % of a total of 2 667 men and 43 % of a total of 3 878 women aged 45–64 years reported an intake of supplements in an 8-day menu record in the early 1990s.

On the group level, contributions of supplements markedly below 5.0 % to the mean intakes of the selected micronutrients were found in the male population from South Germany under investigation. In individual cases, however, distinctly more than 50 % of the intake of a selected vitamin or mineral originated from supplements. Schellhorn et al. (7) and Klipstein-Grobusch et al. (5) found the prevalence of supplement use to be significantly higher in women than in men. Therefore, the impact of supplements to women's micronutrient intake has to be estimated even higher both on the group level and probably also on an individual level.

Conclusion

Our results recommend that the intake of supplements should be taken into account in every future dietary survey within a German population, just as it is already recommended for studies in the United States (1). Failure to include these sources may produce errors in nutrient estimates and notable misclassifications of individuals with regard to their total intake. Furthermore, we strongly believe it is high time that more detailed official recommendations on the proper use of supplements for the general population be formulated, since a considerable number of individuals already receive enormous proportions of their vitamin intake from supplements.

Acknowledgment We gratefully acknowledge the contribution of the participants and the support of all who were engaged in data collection and coding. We are especially indebted to Reinhold Kammerlohr for computational work and to Kerstin Honig-Blum for managing and analyzing the data.

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