Dietary habits and intake of nutritional supplements in patients of outpatient cancer clinics

Christina Holzapfel, Alexandra Kocsis, Benjamin Jaeckel, Marc Martignoni, Dagmar Hauner, Hans Hauner

Abstract

Background: Nutrition and nutritional status are of crucial importance in the context of cancer. There is almost no data available on dietary habits and use of nutritional supplements in patients with cancer in Germany. Therefore, the aim of this survey was to record dietary habits and use of nutritional supplements in patients of outpatient cancer clinics.

Method: Patients at 17 outpatient cancer clinics in southern Bavaria were surveyed using a standardized questionnaire. The patients were asked about their dietary habits, nutrition-related medical care and use of nutritional supplements in addition to their diagnoses, treatment and health status. The statistical evaluation was carried out using a descriptive approach.

Results: Data from a total of 765 people (60.9% women) was evaluated. The average age of the participants was 63 ± 13 years, and the average Body Mass Index (BMI) was 25.2 ± 5.1 kg/m^2. Most of the participants (91.9%) reported that they followed a normal diet, but 9.2% reported that they placed some restrictions on the range of foods they consumed (e.g. no raw foods). Three people reported that they followed a classic cancer patient diet. About half of those surveyed (48.6%) reported taking nutritional supplements. The products most frequently used by these people were minerals (56.7%), vitamin preparations (52.4%) and "other" nutritional supplements (35.5%), for instance herbal remedies or homeopathic remedies such as globules. The use of nutritional supplements was most common in those with breast cancer (59.8%).

Conclusions: Only a few of the patients with cancer surveyed had any notable features in their dietary habits, but half of those surveyed took nutritional supplements. The results of this survey highlight the need for medical nutritional counseling as part of routine care for patients with oncological diseases.

Keywords: Dietary behavior, nutritional supplements, supplements, tumors, cancer

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Introduction

Diet and nutritional status can have a significant effect on the development and disease course of cancer [1, 2]. Conversely, cancers can themselves cause changes in nutritional status, for example due to mechanical obstruction and cancer-related metabolic changes (e.g. inflammation, catabolic metabolic state) [2]. Patients with cancer often suffer from side effects caused by cancer treatment. These may include changes in the sense of taste, nausea, vomiting and diarrhea [2, 3].
A reduced nutritional status not only has a negative effect on the tolerability of cancer treatments and on survival time, but also impairs

Questions about nutrition		
Are you receiving enteral nutrition (tube feeding)?		
☐ Yes	☐ No	☐ Prefer not to say
Are you receiving parenteral nutrition (feeding with infusion solutions)?		
☐ Yes	☐ No	☐ Prefer not to say
Do you use liquid nutrition?		
☐ Yes	☐ No	☐ Prefer not to say
Do you receive home care (tube feeding and / or liquid feeding at home)?		
☐ Yes	☐ No	☐ Prefer not to say
Are you following any specific type of diet at the moment?		
☐ Yes	☐ No	☐ Prefer not to say
What type of diet are you following at the moment?[a]		
☐ Normal diet / balanced, mixed diet	☐ Vegetarian / vegan	☐ Ketogenic
☐ Low-carbohydrate	☐ Mediterranean diet	☐ Other
I am currently following the following diet that is not listed above:		
What type of diet did you follow during your illness?[a]		
☐ Normal diet / balanced, mixed diet	☐ Vegetarian / vegan	☐ Ketogenic
☐ Low-carbohydrate	☐ Mediterranean diet	☐ Other
Questions about nutritional supplements		
What nutritional supplements are you currently taking?[a]		
☐ Vitamin preparations	☐ Trace elements and / or minerals	☐ Combined preparations
☐ Omega-3 fatty acids	☐ Curcumin	☐ Antioxidant preparations
☐ Other	☐ None	
What nutritional supplements are you currently taking (please state all of them)[a]?		
Have you taken nutritional supplements in the past?		
☐ Yes	☐ No	☐ Prefer not to say

Fig. 1: **Questions about types of diet and about use of nutritional supplements from the structured questionnaire**
[a] Multiple answers possible

quality of life and the patient's general capabilities [4, 5]. Therefore, adequate nutritional care is essential for patients with cancer and is a relevant factor in prognosis. In the guidelines of the German Society for Nutritional Medicine, the authors recommend a balanced, energy-rich and nutrient-rich diet for clinical nutrition in the oncological context [2]. In addition, specific recommendations regarding nutrition in the context of cancer have been developed by the *World Cancer Research Fund (WCRF)* in cooperation with the *American Institute for Cancer Research (AICR)* and these have also been recently updated [1]. Even though the nutrition recommendations for patients with cancer hardly differ from the recommendations for healthy adults, they are frequently confused about correct nutrition [6, 7]. In particular, special diets and nutritional supplements for patients with cancer are often advertised as having health benefits for these patients, even though this has not been scientifically proven. Special diets for patients with cancer are mainly based on the principle of "starving" cancer cells of specific nutritional components, thus inhibiting their growth [8]. Here, there is a risk of unbalanced diets making malnutrition more likely or making existing malnutrition worse [9]. When used at high doses and without the supervision of the treating physician, nutritional supplements also have the potential to cause harm to health, as has been shown for high doses of beta-carotine, for example [10, 11]. In light of these considerations, the aim of this survey was to record nutrition habits and intake of nutritional supplements in patients of outpatient cancer clinics.

Parameter	Total (N = 765)		Women (N = 466)		Men (N = 299)	
	n	%	n	%	n	%
Age [years]						
18–39	44	5.8	22	4,7	22	7.4
40–59	238	31.1	149	32.0	89	29.8
≥ 60	483	63.1	295	63.3	188	62.9
BMI [kg/m²]						
< 18.5	47	6.2	42	9.0	5	1.7
18.5–24.9	372	48.8	233	50.0	139	46.5
25.0–29.9	288	29.9	117	25.1	111	37.1
≥ 30	116	15.2	73	15.7	43	14.4
Tumor location (initial diagnosis)[a]						
Breast	219	28.6	213	45.7	6	2.0
Digestive system	184	24.1	95	20.4	89	29.8
Lymphatic / hematopoietic tissue	173	22.6	87	18.7	86	28.8
Urogenital system	122	15.9	42	9.0	80	26.8
Other[b]	89	11.6	42	9.0	47	15.7
Reason for medical appointment						
Ongoing chemotherapy / radiotherapy	363	47.5	255	54.7	138	46.2
Follow-up	80	10.5	37	7.9	43	14.4
Other[c]	329	43.0	206	44.2	116	38.8

Table 1: **Description of the participants**
BMI = Body Mass Index; N = number
[a] multiple answers possible, e.g. more than one cancer diagnosis (according to patient's self-reporting)
[b] e.g.: glioblastoma, malignant melanoma, sarcoma
[c] e.g.: follow-up appointment, blood draw, antibiotic therapy or bisphosphonate therapy

Methodology

Sample

This was a multicenter, cross-sectional study in oncology clinics in the region of southern Bavaria. The study was authorized by the Ethics Committee of the School of Medicine of the Technical University of Munich (Ethikkommission der Fakultät für Medizin der Technischen Universität München) (Number: 89/17 S). A total of 44 outpatient cancer clinics (including 20 belonging to Tumorzentrum München [TZM—Munich Tumour Centre]) were invited to take part. A total of 17 outpatient cancer clinics (including 12 registered TZM clinics) took part, with surveys taking place from June 2017 to May 2018. A total of 1,083 people were invited to participate and 793 of those actually completed the survey. This evaluation was able to include the complete data sets of 765 people. 28 people were excluded from the analysis due to the presence of a precursor stage of cancer, an incomplete data set, or pregnancy.

Data collection

The survey of the patients was carried out by employees of the Institute for Nutritional Medicine in the form of standardized interviews, which took place on site at the clinics. The structured questionnaire was divided up into five content categories and it was composed of a total of 58 questions. The nutrition-related questions that were taken into account in the present analysis are listed in ◆ Figure 1.

In the open questions, comments regarding allergies, impairments of the sense of taste due to chemotherapy, and special food- or nutrient-related dietary features were recorded along with the pre-defined responses.
In addition, the two validated questionnaires *Malnutrition Universal Screening Tool (MUST)* and *Nutritional Risk Screening-2002 (NRS-2002)* were integrated into the survey in order to determine the prevalence of a risk of malnutrition [12, 13]. The detailed results of the screening for malnutrition were published separately [14].

Categorization of tumor types

The participants' tumor diagnoses were divided into the following categories: breast cancer, cancer of the lymphatic or hematopoietic tissues (e.g. leukemia, lymphoma, multiple myeloma, Waldenstrom's macroglobulinemia), cancer of the digestive system (e.g. gastric carcinoma, pancreatic carcinoma, colorec-

tal carcinoma), cancer of the urogenital organs (e.g. prostate carcinoma, renal cell carcinoma, bladder carcinoma), other cancers (e.g. glioblastoma, malignant melanoma, sarcoma).

Categorization of nutritional supplements

The used questionnaire contains the answer options shown in ◆ Figure 1: trace elements and / or minerals, vitamin preparations, combinedpreparations, omega-3 fatty acids, curcumin, antioxidant preparations and "other" nutritional supplements. The participants' responses were sorted into the defined categories. The study team divided the category "other nutritional supplements" into further six sub-categories: herbal preparations, other preparations, "food", homeopathic remedies / globules, Traditional Chinese Medicine, enzyme preparations.

Statistics

The statistical evaluation was done using a descriptive approach and the program Microsoft Excel 2016. The results have been presented as absolute frequencies (N) with the corresponding percentages (%). Multiple answers were possible for some of the questions. In some cases, gender, age, cancer and nutrition-specific sub-analyses were carried out.

Results

Description of the participants

The data sets of 765 people were evaluated. Overall, more women took part (60.9%) than men. The average age of the sample population was 63.1 ± 13.1 years (minimum: 20 years, maximum: 86 years) and the average BMI was 25.2 ± 5.1 kg/m² (minimum: 12.1 kg/m², maximum: 51.4 kg/m²).

The largest participant sub-groups were people with a breast cancer diagnosis (28.6%), people with a cancer of the digestive system (24.1%) and people with a cancer of the lymphatic or hematopoietic tissues (22.6%). About half of the participants were currently undergoing chemotherapy / radiotherapy at the time of the survey (◆ Table 1). The average time lapsed since cancer diagnosis was 3.6 years.

Of the 754 participants for whom a MUST score was calculated, 15.4% (n = 116) had a medium risk of malnutrition (MUST score: 1 point) and 19.5% (n = 147) had a high risk (MUST score: ≥ 2 points).

Types of diet	N	%
Normal diet	**703**	**91.9**
special dietary features with regard to specific nutrients or foods[a]	65	9.2
no meat / reduced meat intake	41	
no sugar / reduced sugar intake	10	
no raw food / salad / fruit	10	
protein preparations	6	
low-fat	5	
no milk / milk products	4	
hypercaloric	2	
Other types of diet		
vegetarian / vegan diet[b]	**19**	**2.5**
low-carbohydrate diet[b]	**13**	**1.7**
Mediterranean diet[b]	**11**	**1.4**
ketogenic diet[b]	**4**	**0.5**
special diets for cancer patients[c]	**3**	**0.4**
other types of diet[d]	**18**	**2.4**
Nutrition-related medical care		
enteral nutrition (tube feeding)	**8**	**1.0**
parenteral nutrition (infusion solutions)	**15**	**2.0**
liquid nutrition	**50**	**6.5**
home care (tube feeding / liquid nutrition at home)	**19**	**2.5**

Table 2: **Types of diet and nutrition-related medical care among participants (N = 765) at the time of the survey**
N = number, multiple answers possible
[a] Intolerances with regard to certain foods
[b] Including reports of special dietary features with regard to specific nutrients or foods and special dietary features due to chemotherapy: for each mention, N ≤ 2
[c] Diet according to Dr. Coy, Dr. Budwig "Oil-Protein Diet"
[d] Hypocaloric diet (N = 6), general diets (N = 5, e.g.: food combining, acid-alkaline diet, paleo), fasting / intermittent fasting (N = 4)

Types of diet

The most common type of diet at the time of the survey was a normal diet (91.9%), but some of the participants also reported some nutrient or food type-specific features in their diet (9.2%; e.g. reduction of meat or sugar intake) (◆ Table 2). In addition, some patients (n = 30, 4.3%) also reported restrictions to their normal diet due to chemotherapy (e.g. due to changes in their sense of taste or aversion to certain foods). Only a small number of the participants self-reported a vegetarian or vegan diet, a low-carbohydrate diet, or a Mediterranean diet (◆ Table 2). Furthermore, four participants reported that they were following a ketogenic diet. Three participants reported following special diets for patients with cancer such as the diet according to Dr. Coy and the "Oil-Protein Diet" according to Budwig.

A few people (6.5%) supplemented their diet with liquid nutrition. Home care with liquid nutrition or tube feeding was rare (2.5%), as was enteral (1%) and parenteral (2%) feeding (◆ Table 2).

Parameter	Use of nutritional supplements					
	Total (N = 765)		Women (N = 466)		Men (N = 299)	
	n	%	n	%	n	%
Total	372	48.6	269	57.7	103	34.4
Age [years]						
18–39	22/44	50.0	15/22	68.2	7/22	31.8
40–59	129/238	54.2	90/149	60.4	39/89	43.8
≥ 60	221/483	45.8	164/295	55.6	57/188	30.8
BMI [kg/m²]						
< 18.5	24/47	51.1	23/42	54.8	1/5	20.0
18.5–24.9	199/372	53.5	142/233	60.9	57/139	41.0
25.0–29.9	98/228	43.0	65/117	55.6	33/111	29.7
≥ 30	51/116	44.0	39/73	53.4	12/43	27.9
Tumor location (initial diagnosis)[a]						
Breast	131/219	59.8	128/213	60.1	3/6	50.0
Digestive system	82/184	44.6	49/95	51.6	33/89	37.1
Lymphatic / hematopoietic tissue	81/173	46.8	51/87	58.6	30/86	34.9
Urogenital system	52/122	42.6	27/42	64.3	25/80	31.3
Other[b]	38/89	42.7	21/42	50.0	71/47	36.2

Table 3: **Frequency and distribution of the intake of nutritional supplements at the time of the survey**
BMI = Body Mass Index; N = total number of study participants; n = number of people in this group who take nutritional
supplements / total number of people in this group
[a] Multiple answers possible, e.g. more than one cancer (self-reporting by patients)
[b] e.g.: glioblastoma, malignant melanoma, sarcoma

Nutritional supplements

About a third of those surveyed reported having taken nutritional supplements in the past (n = 223, 29.2%). At the time of the survey, this percentage rose to about half of the participants (48.6%). Women used nutritional supplements more frequently than men (57.7% vs. 34.4%). When the prevalence of use of nutritional supplements is analyzed with regard to the age of the participants, this shows that those aged 40–59 years used supplements most frequently (◆ Table 3).

Out of those surveyed who had breast cancer, 59.8% reported taking nutritional supplements. There were also high rates of use of nutritional supplements among those with cancers of the digestive system (44.6%) and cancers of the lymphatic or hematopoietic tissues (46.8%) (◆ Table 3).

The most frequently reported preparations were minerals and vitamins (◆ Table 4). A third of the responses fell into the "other" nutritional supplement category (n = 132, 35.5%). In this category, the most frequently reported preparations were herbal preparations (such as mistletoe preparations, moringa capsules, hawthorn extract, medicinal mushrooms) (n = 61) (◆ Table 4).

Among the participants who had no risk of malnutrition (MUST score: 0 points, n = 491), the prevalence of use of nutritional supplements was 50.5% (n = 248). This prevalence of nutritional supplement use was hardly different from that of the participants with a medium risk (46.6%) or a high risk (47.6%) of the presence of malnutrition (◆ Figure 2).

Discussion

The results of the survey show that the vast majority of the patients with cancer surveyed have a "normal" diet, which might be considered equivalent to the average German diet [15]. However, about 9% of the participants reported making modifications to their normal diet or setting some restrictions. The extent to which the participants' usual diet ("normal diet") corresponds to the recommendations of the WCRF [1] is unclear. If it is assumed that their diet is equivalent to the current nutrition of the German population, it is unlikely that it does.

In this context, it is notable that special diets for patients with cancer were only reported in isolated cases. This was also true for the ketogenic diet, which is currently very popular. In the light of the lack of scientific evidence for the efficacy and safety of special diets for patients with cancer, this result can be considered positive. Special diets for these patients, which can often be restrictive and unbalanced, could cause malnutrition or make existing malnutrition worse [9]. They could also have a negative effect on response to chemotherapy [2], so they should be viewed with

Parameter	Intake of nutritional supplements					
	Total (N = 372)		Women (N = 269)		Men (N = 103)	
	n	%	n	%	n	%
Preparations						
Trace elements and / or minerals	211	56.7	151	56.1	60	58.3
Vitamin preparations	195	52.4	143	53.2	52	50.5
Combined preparations[a]	64	17.2	29	10.8	35	34.0
Curcumin	22	5.9	15	5.6	7	6.8
Omega-3 fatty acids	15	4.0	11	4.1	4	3.9
Antioxidant preparations[b]	13	3.5	13	4.8	–	–
Other products	132	35.5	107	39.8	25	24.3
Herbal preparations	61	16.4	49	18.2	12	11.7
Other preparations[c]	42	11.3	37	13.8	5	4.9
"Foods" [d]	27	7.3	16	5.9	11	10.7
Homeopathic remedies / globules	15	4.0	12	4.5	3	2.9
Traditional Chinese Medicine	16	4.3	5	1.9	11	10.7
Enzyme preparations	7	1.9	7	2.6	–	–

Table 4: **Categories of nutritional supplements used at the time of the survey**
The percentages refer to the people taking nutritional supplements.
(N = number; multiple answers possible)
[a] e.g.: Orthomol, LaVita
[b] e.g.: Q10, glutathione
[c] e.g.: Heilerde (medicinal clay), hyaluronic acid, L-carnitine
[d] e.g.: "herbs", black cumin seed oil

skepticism [16]. Furthermore, it has not been proven that a ketogenic diet has health benefits in the context of cancer treatment [17].

Only a few patients reported having additional enteral or parenteral nutrition and home care by professional staff (home care with liquid nutrition and / or tube feeding) (◆ Table 1). However, this may represent an underestimation of the actual prevalence of this situation because patients who are weak and malnourished would have very little mobility may present less frequently at outpatient cancer clinics. Patients who are cared for at home ("home care") were not surveyed.
Almost half of those surveyed reported that they took nutritional supplements, however this study did not include any data about the reason for taking nutritional supplements. These results are largely consistent with those of other studies, in which 30 to 80% of patients with cancer supplemented with antioxidant preparations or other preparations [11, 18, 19]. A survey by Patterson et al. showed that about half (48%) of the patients surveyed reported using nutritional supplements following their cancer diagnosis [20]. Most of the participants said that the reason they supplemented was because they wanted to have more personal control over their disease course [20]. A telephone survey of 659 patients with cancer conducted by the German Cancer Information Service (Deutsche Krebsinformationsdienst—DKIS) regarding self-medication showed that about half of the participants (51%) used nutritional supplements that they purchased themselves without the knowledge of their treating physicians [21].

In the present study, participants were asked about intake of mineral and vitamin supplements. These supplements are often also used by healthy adults, as confirmed by another recent German study. Among the 1,070 people surveyed, magnesium (59%) and vitamin C (53%) were the most frequently reported preparations, followed by vitamin E, calcium and selenium [22]. In the present survey, it was notable that in addition to the usual nutritional supplements that were explicitly asked about, the use of many other preparations was also reported. These included herbal products, mistletoe preparations, homeopathic remedies such as globules, Traditional Chinese Medicine, enzyme preparations and other products such as ginger powder, beetroot juice or specific teas.
As yet, there is no evidence in the scientific literature for the efficacy of nutritional supplements in the context of cancer. At high doses, antioxidants (such as vitamin C, E, or beta-carotine) in particular can reduce the efficacy of chemotherapy or radiotherapy [11]. The use of high-dose beta-carotine (20 mg/day) for 5–8 years even led to an increased risk of lung cancer in male smokers [23, 24]. Mistletoe preparations are also often said to have positive effects, but

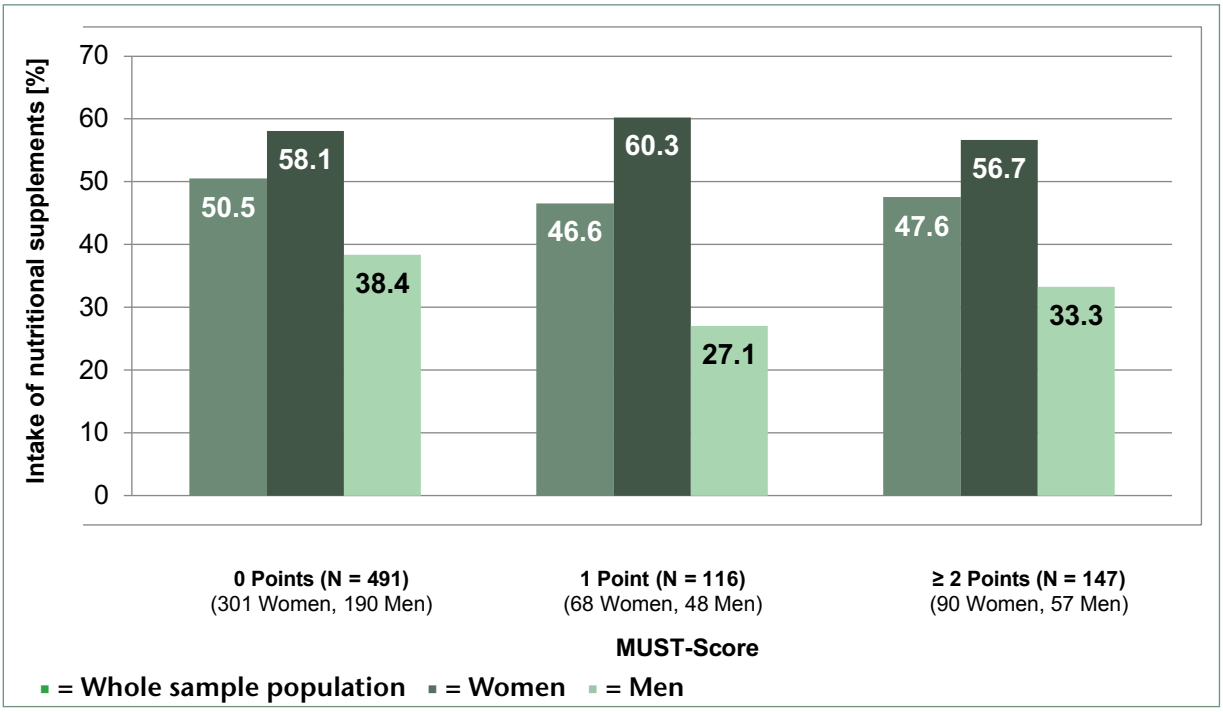

Fig. 2: **Intake of nutritional supplements according to MUST score**
MUST = *Malnutrition Universal Screening Tool*
Intake of nutritional supplements in the entire sample population and in women and men at the time of the survey according to the MUST score.
MUST-score 0 points: no risk of presence of malnutrition, 1 point: medium risk of presence of malnutrition, ≥ 2 points: high risk of presence of malnutrition

there is still no satisfactory evidence with regard to safety and efficacy. According to a Cochrane analysis, more high-quality clinical studies are required [25]. In a review on quality of life in patients with cancer who took mistletoe preparations, a positive effect was found with regard to the side effects of conventional cancer treatment. However, the authors also pointed out the methodological weaknesses of the studies included in the review [26].

In the present evaluation, it was also observed that intake of nutritional supplements varied depending on the type of cancer. Use of nutritional supplements was most commonly reported by those with breast cancer. Miller et al. obtained comparable results in a study of 1,233 patients with various types of cancer. In the group of individuals with breast cancer, the prevalence of use of nutritional supplements was about 80% [27]. It was notable that the use of nutritional supplements was more frequently reported by women with cancer than men with cancer. It is also worth noting that there was no relationship between nutritional status—defined by the MUST score—and the use of nutritional supplements. This could be an indication that people with cancer supplement independently, without any evidence of a nutrient deficiency, and without consulting their treating oncologists.

Strengths and weaknesses

This survey has for the first time provided an overview of nutrition and use of nutritional supplements in patients with cancer being treated at outpatient cancer clinics in Germany. However, of the 44 clinics in southern Bavaria that were invited to participate, only 17 clinics were willing to do so, which means that the representativeness of this survey is limited. It was not possible to determine the reason why the level of willingness to participate in the study was so low among the specialist clinics, but it may be because they do not place great importance on nutrition support. Nevertheless, based on the sample size and the standardized method used for the survey, it can be assumed that the results presented here reflect the current situation for outpatient cancer care in Germany.

A further limitation of this survey is that it relies on self-reported data. However, objective data collection would not be possible—for instance because nutritional supplements are freely available to purchase and are often taken without the knowledge of the treating physicians. In addition, in the question "Have you taken nutritional supplements in the past?" the term "past" was not precisely defined. Furthermore, the reasons why people took nutritional supplements were not asked about.

Conclusions

In conclusion, the survey shows that most cancer patients have a "normal" diet. Only a few people reported modifications such as avoiding certain dietary components or making changes with regard to certain dietary components. About half of those surveyed took nutritional supplements, even though there is no scientific evidence to support this. Therefore, the results show that there is a need for adequate advice for cancer patients with regard to nutritional supplements during routine care. As set out in current guidelines, every cancer patient should be given nutrition counselling by a qualified professional. The content of this counseling should be based on the recommendations of the WCRF, which are mostly the same as the 10 dietary guidelines of the German Nutrition Society. Regular physical activity should always be recommended as another aspect of lifestyle.

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Conflict of interests
Christina Holzapfel is a member of the expert advisory board of 4Sigma GmbH, Oberhaching.
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References

1. *World Cancer Research Fund/American Institute for Cancer Research: Diet, nutrition, physical activity and cancer: a global perspective. Continuous Update Project. Expert Report 2018.*
2. *Arends J, Bachmann P, Baracos V, et al.: ESPEN guidelines on nutrition in cancer patients. Clin Nutr 2017; 36(1): 11–48.*
3. *Santarpia L, Contaldo F, Pasanisi F: Nutritional screening and early treatment of malnutrition in cancer patients. J Cachexia Sarcopenia Muscle 2011; 2(1): 27–35.*
4. *Barker LA, Gout BS, Crowe TC: Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health 2011; 8(2): 514–27.*
5. *Norman K, Pichard C, Lochs H, Pirlich M: Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5–15.*
6. *Beeken RJ, Williams K, Wardle J, Croker H: "What about diet?" A qualitative study of cancer survivors' views on diet and cancer and their sources of information. Eur J Cancer Care 2016; 25(5): 774–83.*
7. *Deutsche Gesellschaft für Ernährung e. V.: Vollwertig essen und trinken nach den 10 Regeln der DGE. www.dge.de/fileadmin/public/doc/fm/10-Regeln-der-DGE.pdf (last accessed on 23 April, 2019).*
8. *Hübner J: Sinn und Unsinn von „Krebsdiäten". Dtsch Arztebl 2016; 1: 26–8.*
9. *Hübner J, Marienfeld S, Abbenhardt C, Ulrich CM, Loser C: Wie sinnvoll sind Krebsdiäten? Dtsch Med Wochenschr 2012; 137(47): 2417–22.*
10. *Leitlinienprogramm Onkologie : S3-Leitlinie Supportive Therapie. Version 1.2., November 2019. AWMF-Registernummer: 032/05402*
11. *Marian MJ: Dietary supplements commonly used by cancer survivors: are there any benefits? Nutr Clin Pract 2017; 32(5): 607–27.*
12. *Kondrup J, Rasmussen HH, Hamberg O, Stanga Z: Nutritional risk screening (NRS 2002): a new method based on an analysis of controlled clinical trials. Clin Nutr 2003; 22(3): 321–36.*
13. *Stratton RJ, Hackston A, Longmore D, et al.: Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. Brit J Nutr 2004; 92(5): 799–808.*
14. *Hauner H, Kocsis A, Jaeckel B, Martignoni M, Hauner D, Holzapfel C: Häufigkeit eines Risikos für Mangelernährung bei Patienten in onkologischen Schwerpunktpraxen – eine Querschnittserhebung. Dtsch Med Wochenschr 2020; 145: e1-e9*
15. *Deutsche Gesellschaft für Ernährung e. V.: 13. DGE-Ernährungsbericht. 2016.*
16. *Hübner J, Marienfeld S, Abbenhardt C, et al.: Counseling patients on cancer diets: a review of the literature and recommendations for clinical practice. Anticancer Res*

2014; 34(1): 39–48.

17. *Erickson N, Buchholz D, Hübner J für die Arbeitsgemeinschaft Prävention und Integrative Onkologie (PRIO) der Deutschen Krebsgesellschaft (DKG): Stellungnahme zu ketogenen und kohlenhydratarmen Diäten bei Menschen mit Krebs. Ernährungs Umschau 2017; 64(9): M514–6.*
18. *Micke O, Bruns F, Glatzel M, et al.: Predictive factors for the use of complementary and alternative medicine (CAM) in radiation oncology. Eur J Integr Med 2009; 1(1): 19–25.*
19. *Gröber U, Hübner J, Holzhauser P, Kleeberger UR: Antioxidanzien und andere Mikronährstoffe in der komplementären Onkologie. Der Onkologe 2010; 1: 7.*
20. *Patterson RE, Neuhouser ML, Hedderson MM, Schwartz SM, Standish LJ, Bowen DJ: Changes in diet, physical activity, and supplement use among adults diagnosed with cancer. J Acad Nutr Diet 2003; 103(3): 323–8.*
21. *Hiller B: Selbstmedikation bei Krebspatienten. Eine Erhebung des Krebsinformationsdienstes Deutsches Krebsforschungszentrum 2010. www.adka-arznei.info/aminfo2011/downloads/poster/08_Hiller-Poster-ArzneimittelinformationDIN3.pdf (last accessed on 23 April, 2019).*
22. *Heinemann M, Willers J, Bitterlich N, Hahn A: Verwendung von Nahrungsergänzungsmitteln mit Vitaminen und Mineralstoffen – Ergebnisse einer deutschlandweiten Verbraucherbefragung. J Verbr Lebensm 2015; (10): 131–42.*
23. *Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study Group: The effect of vitamin E and beta-carotene on the incidence of lung cancer and other cancers in male smokers. N Engl J Med 1994; 330(15): 1029–35.*
24. *Omenn GS, Goodman GE, Thornqvist MD, et al.: Risk factors for lung cancer and for intervention effects in CARET, the Beta-Carotene and Retinol Efficacy Trial. J Natl Cancer Inst 1996; 88(21): 1550–9.*
25. *Horneber MA, Bueschel G, Huber R, Linde K, Rostock M: Mistletoe therapy in oncology. Cochrane Database Syst Rev 2008; (2): CD003297.*
26. *Kienle GS, Kiene H: Review article: influence of Viscum album L (European mistletoe) extracts on quality of life in cancer patients: a systematic review of controlled clinical studies. Integr Cancer Ther 2010; 9(2): 142–57.*
27. *Miller PE, Vasey JJ, Short PF, Hartman TJ: Dietary supplement use in adult cancer survivors. Oncol Nurs Forum 2009; 36(1): 61–8.*

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