14th

DGE-Nutrition Report
Summary

German Nutrition Society

Imprint

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Introduction

This publication called "The 14th DGE-Nutrition Report – Summary" provides abstracts and key messages for each subchapter of the 14th Nutrition Report published by the German Nutrition Society in 2020. The 14th Nutrition Report is an important instrument for those responsible for nutrition and health policy, as well as for food manufacturers, the public, nutritionists, dietitians and the media. All five chapters provide substantial information about various aspects in the field of nutrition:

Chapter 1 provides insights into the nutritional situation in Germany, including data on food balance sheets. Furthermore, the chapter contains an article on misreporting based on a re-evaluation of the nutrient intake reported in the National Nutrition Survey II (Nationale Verzehrsstudie II, NVS II). The prevalence of (pre)obesity in Germany with a focus on body weight in pregnancy is also presented. The second representative German Eating Study as a KiGGS Module (EsKiMo II) provides an up-to-date overview of nutrition in children and adolescents in Germany. Based on the results of the BfR MEAL Study, cadmium and lead exposures in foods are described. Finally, strategies to reduce energy, sugar, fat and salt in processed foods, as well as monitoring systems in Germany and selected examples in Europe, are presented.

Chapter 2 describes the nutrition in German hospitals and nursing homes based on data from the nutritionDay project. Current data on breastfeeding and infant nutrition in Germany from the survey on breastfeeding and infant nutrition in Germany (SuSe II) are presented in Chapter 3. Chapter 4 describes the results of the Vegetarian and vegan diets in children and adolescents in Germany (VeChi-Youth-Study) comparing anthropometrics, dietary intake, and nutritional status of vegan, vegetarian and omnivorous children and adolescents in Germany.

In Chapter 5, three umbrella reviews on the relationship between selected nutritional factors and defined health outcomes are presented. First, the relationship between the consumption of vegetables, fruit and meat and the risk of diet-related diseases is analysed. Second, the effects of vitamin D status on the prevention and treatment of selected extra-skeletal diseases are evaluated. Finally, the current state of research on dietary factors and the incidence of neurodegenerative diseases is summarised.

Regrettably, the long version of this Nutrition Report (473 pages) is only available in German. For further information, please contact:

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1 Nutritional situation in Germany

1.1 Introduction to the chapter 'Nutritional situation in Germany'

Chapter 1 examines the nutritional situation in Germany from various perspectives. Among other things, the continued monitoring of trend analysis of food consumption, the development and prevalence of overweight and obesity, as well as the development and realisation of national strategies to reduce energy, sugar, fat and salt in processed food, establish the foundation to gain insight into the current status of nutrition policy issues in Germany.

1.2 Trend analysis of food consumption based on food balance sheets

Kurt Gedrich

Introduction: Yearly, food balance sheets offer data on agricultural and industrial food production and provide a database for current food consumption in Germany.

Methods: Since food balance sheets are based on foodstuff production levels, the data, in addition to the quantities intended for human consumption, may also in many cases encompass elements (e.g., bones, shells, skins or peels) that are not intended for human consumption (i.e., used for animal feed). In any case, human consumption represents by far the most important component and assumed that these elements will remain stable over time, food balance sheets offer a useful and valuable overview of the current development of food consumption from nutritional epidemiological aspects.

Results: In recent years, reduced consumption is seen for many products, e.g., rye and rye flour, bread and buns, fresh potatoes, and fruits (in total), especially for apples but also for pears, grapes, oranges, grapefruits and imported citrus products. In addition, a trend for reduction exists for sugar, glucose, hard and soft caramels, as well as for consuming milk, yoghurt, buttermilk and condensed milk products, cream cheese and processed cheese, pork meat and margarine. With respect to beverages, a decrease in vegetable and fruit juices, as well as nectars, and reduced consumption of beer, sparkling wine and spirits is observed.

On the other hand, consumption of wheat flour, rice and vegetables (in total) and of nuts and berries (except strawberries), bananas and lemons has increased. Furthermore, an increase in the consumption of beef, veal and chicken, as well as in the consumption of cheese, can be observed. Analysis of the consumption of beverages shows increased consumption of mineral water, coffee and herbal and fruit tea.

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Consumption of corn, pasta and potato products, leafy and stem vegetables, cabbage and cucumbers, plums, cherries, apricots, peaches, strawberries, fried fruits and clementines did not change. In addition, consumption of chocolate and confectionery, honey, gummy candies, jelly products, ice cream, cream, butter and meat (in total) and the consumption of soft drinks, black tea and wine remained unchanged.

Evaluation and conclusions: Due to methodological weaknesses, the data shown should be interpreted carefully. Furthermore, the trends represent only the average consumption in Germany. It should be considered that consumption may exhibit distinct trends in different population groups.

To evaluate the current data on food consumption in Germany, the food-based dietary guidelines (FBDGs) of the German Nutrition Society for a wholesome diet are suitable. The FBDGs recommend a diet high in plant-based foods with products of animal origin as a valuable addition. To cover the daily water requirement, energy-free drinks are preferred.

With this in mind, the increased consumption of vegetables, mineral water, herb and fruit tea and the reduced consumption of pork meat and alcohol are assessed positively. However, the decreased consumption of fruits, cereal products and fresh potatoes, as well as the increased consumption of beef, veal and chicken and cheese must be assessed negatively. This development is not in line with the aim of a diet high in plant-based products.

With regard to the consumption of products of animal origin, new actions and steps are necessary to change the focus from quantity to quality in this product group. Therefore, the nutritional and hedonic qualities of these foods would be enjoyed, and the undesirable consequences for health and the environment would be reduced.

Key messages

→ Despite methodological weaknesses, food balance sheets offer an important database on food consumption in Germany from nutritional epidemiological aspects.

→ From a public health point of view, the increased vegetable consumption and the decreased consumption of pork meat and alcohol can be rated positively.

→ A decrease in the consumption of fruits, cereal products and fresh potatoes, as well as an increased consumption of cheese, beef, veal and chicken, is not in line with the aim of a diet high in plant-based products.

→ To enjoy the nutritional and hedonic qualities and to reduce the undesirable consequences for health and the environment associated with the consumption of products of animal origin, the focus in this product group should be changed from quantity to quality.

1.3 Low-energy reporting using the example of the National Nutrition Survey II (Nationale Verzehrsstudie II, NVS II): Prevalence, contributing factors and impact on nutrient intake

Rhea Dankers and Helmut Heseker

Introduction: A common and well-documented problem that occurs in the context of nutrition surveys and leads to systematic bias is misreporting (over- and underreporting). To address this subject in large-scale nutritional epidemiological studies, statistical (estimation) equations were developed. These enable the identification of persons with an implausible, too low reported energy intake (Low-Energy-Reporter (LER)). To date, a detailed analysis of the characteristics of LER, as well as studies on contributing factors of underreporting on nutrient intake, have not been conducted for the German population. Therefore, the aim of the present study was to identify misreporting and to describe LER with respect to its demographic characteristics, weight status and physical activity. Furthermore, to what extent an adequate nutrient supply according to the D-A-CH-reference values is attained under conditions of sufficient energy intake should be examined and to what extent the intake differs between LER and Acceptable-Energy-Reporter (AER).

Methods: This investigation was based on 943 weighed food records from the National Nutrition Survey II. Misreporting was identified using the Goldberg cut-off. Energy and nutrient intake was calculated using BLS 3.02 and compared between LER and AER. Nutrient intake was examined in absolute terms, as well as energy adjusted, and compared to the D-A-CH-reference values.

Results: Low-energy reporting is associated with obesity, female sex, younger age groups and a lower socioeconomic status. LER indicated a lower intake of energy from proteins. Furthermore, in absolute terms, LER demonstrated a significantly higher intake of macro- and micronutrients, as well as fibre. However, after adjusting for energy intake, the diet of LER (for most micronutrients) was more nutrient dense. The proportion of those who did not reach the D-A-CH-reference values for the various micronutrients was significantly higher among the LERs.

Evaluation and conclusions: Overall, studies examining misreporting are heterogeneous, and the results are not consistent in some cases. Many studies have confirmed that misreporting is associated with increased body weight. However, there are uncertainties regarding the influence of gender, age and socioeconomic status. Furthermore, several studies indicate that low-energy reporting leads to overestimation of the prevalence of inadequate micronutrient intake. Therefore, it is important to consider misreporting in nutritional epidemiological studies.

To increase comparability between studies, future analyses of national nutrition surveys should be oriented to the recommendations of the European Food Safety Authority (EFSA) on the identification and handling of misreporting. Furthermore, an objective assessment of physical activity is recommended. However, the primary aim of research should be to

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minimise misreporting during the survey. For the objective measurement of physical activity, as well as for reducing misreporting, the development of information and communication technologies shows great potential.

Key messages

→ Weight status is an important contributing factor to low-energy reporting. (Pre)Obesity increases the probability of low-energy reporting by a factor of two or five.

→ In Germany, women and younger persons from the middle and lower middle classes tend to be more likely to record their eating habits in an implausible way. However, studies are very inconsistent.

→ Misreporting leads to an overestimation of the prevalence of inadequate micronutrient intake. Therefore, it is important to consider misreporting in nutritional epidemiological studies.

→ This study is the first extensive analysis of misreporting in the German population and thus contributes to the growing pool of literature on misreporting.

→ To enhance the comparability of results, the recommendations of the European Food Safety Authority (EFSA) should be used when assessing national nutrition surveys.

1.4 The development and prevalence of (pre)obesity in Germany

Helmut Heseker

Introduction: The observed worldwide epidemic of overweight and obesity continues to be major challenges for Germany, not least against the background of the prevention of widespread obesity-related chronic diseases and the associated social and economic consequences.

Due to an increasingly sedentary lifestyle and a transition of the diet to increasingly processed, high energy-dense food and dishes, the prevalence of obesity has increased significantly among our citizens in recent decades.

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Methods: The prevalence, development and different facets of health significance of (pre)obesity during the different phases of life – from pregnancy to infancy, toddlers, schoolchildren, adolescents and adults to seniors – are illuminated in detail based on current data and study results. For this purpose, large national samples of the microcensus were used, and data from other – in some cases regional – studies are presented.

Results: For pregnant women, the annual federal evaluations of obstetrics showed a continuous increase in overweight prevalence during the initial examination. There was a slight decrease for infants at birth: In 2017, 10.2 % of all new-borns were born with an increased birth weight of ≥ 4,000 g, of which 1.2 % had a very high birth weight of ≥ 4,500 g. For children and adolescents, the previously observed increase in the prevalence of overweight and obesity appears to have stopped but is still at high. In adulthood, the prevalence of overweight increases significantly with age, with men being more likely to be overweight than women across all age groups. The overall prevalence of obesity between the ages of 18 – 65 years is 59.4 % for men and 37.3 % for women. There is also a clear trend in individuals with preobesity to develop obesity as they age.

Evaluation and conclusions: The presented data on the prevalence of (pre)obesity clearly show that (pre)obesity affects all age groups in our population. Therefore, these are risk factors for individual health have far-reaching consequences for public health and national health systems. Therefore, in the future, considerable efforts will be needed in the areas of nutrition, physical activity and lifestyle changes to reduce the high prevalence of preobesity and obesity.

Key messages

→ Overweight and obesity are still represented in each age group, and their prevalence widely increased further during the observation period.

→ Due to its far-reaching consequences for pregnancy development and children's long-term health, the huge prevalence of overweight before pregnancy and excessive weight gain during pregnancy require effective prevention measures.

→ Overweight children have a high risk of being overweight or developing obesity in adolescence.

→ From the age group of 30 to under 35 years, men of normal weight are in the minority in Germany; for women this applies from the age of 60. Today, even very old people are more and more affected by obesity.

→ In groups of all ages, there are very significant social gradients. Groups of people with a lower social status are more often affected by overweight or obesity and thus have a higher risk of obesity-associated diseases, such as type 2 diabetes mellitus, high blood pressure and coronary heart disease.

1.5 Nutrient supply and general conditions of dietary behaviour among children and adolescents: results from the nutrition study EsKiMo II

Franziska Lehmann, Marjolein Haftenberger, Gert B. M. Mensink

Introduction: Data collected from the second "Eating study as a KiGGS Module" EsKiMo II (2015–2017) provide an up-to-date overview of the nutritional situation of children and adolescents in Germany. EsKiMo II examined the dietary behaviour of 2,644 children and adolescents aged 6 to under 18 years who previously participated in the second wave of the "German Health Interview and Examination Survey for Children and Adolescents" (KiGGS Wave 2) of the Robert Koch Institute.

Methods: Weighed records over a period of four days were used to assess the food intake of 6- to under-12-year-old children, which was conducted by their legal guardians. A comprehensive nutrition interview was conducted with participants aged 12 to under 18 years, in which the food consumption of the past four weeks was obtained. Further information on the surrounding conditions of dietary behaviour was determined with the help of a short questionnaire. For both age groups, energy and nutrient intake was calculated using the German Nutrient Database (BLS 3.02) and compared to current D-A-CH-reference values.

Results: On average, the percentage of energy from fats and carbohydrates corresponds to the recommendations. However, protein intake per kilogram of body weight exceeds the recommendation for the majority of children and adolescents. The median energy intake from sugar is approximately 20 %. Compared to the reference values, the supply for many vitamins is sufficient for the majority of children and adolescents. Exceptions are vitamins E and folate, for which the recommended intake is not achieved by most children and adolescents. Many girls aged 10 to under 18 also exhibit low intake of vitamin B_{12}. The majority of children and adolescents fail to achieve the respective reference values for iodine, potassium, calcium and iron. Therefore, consumption of nutrient-dense foods should be promoted.

Compared to EsKiMo I, shared family meals are taken together more often. Most often, dinner is eaten together. The opportunity to have a warm lunch at school has almost doubled in the past ten years. Use of this offer has also doubled, although the overall frequency of use is not very high. The 6- to under-8-year-olds most often take part in school meals. Furthermore, significantly more 12- to under-18-year-olds eat a vegetarian diet compared to about 10 years ago, and girls eat a vegetarian diet about three times more often than boys. Furthermore, girls went on diets almost twice as often as boys.

Evaluation and conclusions: The results from EsKiMo II show that nutrition in children and adolescents in Germany has changed in some aspects in recent years. There is a need for improvement in supply of several critical nutrients. Preventive measures should be implemented to improve healthy dietary behaviour.

Key messages

→ Proportionally, children and adolescents consume much energy through sugar.

→ The supply of many vitamins and minerals is sufficient for the majority of children and adolescents.

→ Mostly, the D-A-CH-reference values for vitamin D, E, folate, potassium, calcium and iron are not being achieved.

→ The frequency of shared family meals has increased in the past ten years.

→ The opportunity to obtain a warm lunch in school nearly doubled in the past ten years.

→ Compared to EsKiMo I, there is a significant increase in adolescents who consume a vegetarian diet.

1.6 Cadmium and lead in foods of exposure-relevant food groups – results of the BfR MEAL Study

Sebastian Ptok, Oliver Lindtner, Ulrike Pabel, Christin Hackethal, Tanja Berg, Matthias Greiner

Introduction: The BfR MEAL Study is the first total diet study (TDS) in Germany to determine average concentrations of substances in most commonly consumed foods. The results of the TDS are used in particular for intake estimations in the risk assessment of substances. The basic module of the BfR MEAL Study determined the concentrations of various elements and environmental contaminants in pooled samples of 356 foods. Two of these elements analysed in this module are the heavy metals cadmium and lead.

Methods: Foods were purchased according to market data in supermarkets, at weekly markets or at discount locations and were prepared in a consumer-typical way in the MEAL study kitchen. Following preparation, similar foods were pooled into composite samples and homogenised, and cadmium and lead levels were analysed via ICP-MS.

Results: Out of five investigated food groups, the food group nuts, oilseeds, legumes and spices exhibited the highest average cadmium and lead levels. The food group 'fruit and fruit products' presented the lowest average levels for both heavy metals. On average, the cereal products food group is the group with the highest proportion of estimated cadmium and lead partial exposure for individuals of the NVS II. For individuals

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who consume foods with high cadmium or lead concentrations, these foods are often responsible for high exposure to cadmium and lead, respectively.

Comparatively high cadmium levels were identified in cocoa powder (275 µg/kg), sunflower seeds (265 µg/kg) and linseed (185 µg/kg), as well as in squid (205 µg/kg), algae (120 µg/kg), spinach (87 µg/kg), mussels (84 µg/kg), pastries with poppy seeds (66 µg/kg) and cod liver (64 µg/kg). High lead levels were found in mussels (115 µg/kg), cocoa powder (113 µg/kg), fresh herbs (60 µg/kg), algae (55 µg/kg), chanterelles (26 µg/kg) and olives (24 µg/kg).

Evaluation and conclusions: The German Nutrition Society (DGE) recommends a diverse and varied selection of foods from all food groups. A varied selection of foods could also prevent individuals from frequently consuming foods with high levels of cadmium and lead. Furthermore, knowledge of foods with comparatively high levels of cadmium and lead can help limit their consumption and maintain exposure within ranges corresponding to a low health risk.

Key messages

→ Total diet studies determine average concentrations of substances in foods as consumed, providing a basis for chronic intake estimates in the process of risk assessment.

→ Foods with high cadmium levels include cocoa powder, sunflower seeds, linseed and squid.

→ Foods with high lead levels include mussels, cocoa powder, fresh herbs and algae.

1.7 Reduction of energy, sugar, fat and salt in processed food: Strategies and monitoring systems in Germany and selected examples in Europe

Lea Werner, Fiona Finkbeiner, Irmela Demuth, Silvia Roser, Ingrid Hoffmann

As a contribution to the prevention of noncommunicable diseases, strategies have been initiated in Europe and worldwide to reduce energy, sugar, fat and salt in processed food.

These reduction strategies are usually accompanied by monitoring systems to observe the development of energy and nutrient content in processed food over time.

At the European level, as well as in Germany, France and Great Britain, these reduction strategies have many similarities due to common objectives. Nevertheless, they differ in focus and hence design. This, in turn, affects the methods of the monitoring systems. In addition, comparability of the results of the monitoring systems is strongly limited owing to differences in the time points of data collection, in the status of reformulation measures in the respective countries or in the classification of and/or allocation of products to product categories. To allow better comparison of the results in the future, efforts are being made throughout Europe to harmonise these monitoring systems.

Generally, the results of the country-specific monitoring systems show that lower contents of energy, sugar, fat and salt are already evident in some product groups. However, further measures are needed to fundamentally improve the nutritional situation nationally and internationally.

Key messages

→ In order to prevent noncommunicable diseases efforts are being made, also across Europe, to reduce the intake of critical nutrients. Corresponding reduction strategies focus on the reduction of energy, sugar, fat, and salt in processed food.

→ Repeated surveys of the energy, sugar, fat, and salt content of processed food in the scope of monitoring systems allow observing developments and deducing the need for action.

→ Due to the shared objective of the reduction strategies, the approaches at European level as well as in Germany, France, and Great Britain have many common features. At the same time, they differ in design and focus.

→ Due to methodological differences, results from the product monitorings are only partly or not at all comparable between countries. Therefore, Europe-wide efforts are being made to harmonise the product monitorings.

→ On the one hand, the results from the country-specific product monitorings indicate decreasing contents of energy, sugar, fats, and salt in some product groups. On the other hand, the data show that further efforts are needed.

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2 Nutritional situation in German hospitals and nursing homes – Results of the nutritionDay project

Dorothee Volkert, Jasmin Weber, Eva Kiesswetter, lsabella Sulz, Michael Hiesmayr

Introduction: Hospital patients and nursing home residents are at increased risk for malnutrition and its serious consequences. Whereas the nutritional situation of institution-alised persons is internationally well documented, information from German hospitals and nursing homes is sparse. Therefore, the aim of the present project was to analyse existing German data from the worldwide nutritionDay project to describe nutrition in German hospitals and nursing homes and to compare it with international results. In addition, this project aimed to obtain up-to-date information through targeted advertisement of the project in a nationwide initiative at nutritionDay 2018.

Methods: nutritionDay is an annual worldwide day of action to increase nutritional awareness with systematic assessments in hospitals and nursing homes. Since 2006, data on the nutritional situation at the unit and patient/resident levels have been collected in the participating institutions using standardised questionnaires. Participation in nutrition-Day 2018 was intensively promoted throughout Germany using a variety of strategies. Data were analysed descriptively with a focus on the most recent information.

Results: In 2018, 48 hospital units in Germany with 767 patients participated. A dietitian was available in 10 % of these units (European reference group 63 %; n=116), and a nutrition support team was available in 58 % (Europe 82 %). The mean age of the 767 German patients was 68 years, and 51 % were female. 16 % (Europe 17 %; n=1,534) were underweight, 42 % (Europe 39 %) reported unintentional weight loss and 12 % (Europe 14 %) were malnourished according to the nursing staff subjective classification. Lunch on nutritionDay 2018 was eaten (almost) completely by only 37 % (Europe 44 %).

In nursing homes, 30 % of the 69 German units participating in 2018 stated having a dietitian available (Europe 86 %), and 45 % stated having a person dedicated to nutritional care (Europe 71 %). The 1,551 German residents were on average 87 years old, and 75 % were female. 23 % were underweight (Europe 29 %; n=1,985), 14 % (Europe 12 %) reported unintentional weight loss, and 11 % (Europe 10 %) were classified as mal-nourished by the nursing staff. 34 % (Europe 29 %) consumed half or less of their lunch on nutritionDay.

In both, hospitals and nursing homes, fortified diet and oral nutritional supplements (ONS) were offered more frequently when a dietitian or a person dedicated to nutritional care was available and when routine screening for malnutrition was established. The use of nutritional interventions increased with increasing severity of malnutrition. Nevertheless, even severely malnourished persons received only partial nutritional support. Patients and residents who were considered malnourished by the nursing staff received fortified food

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and ONS most often. Mortality (in hospital 2 %, in nursing homes after 6 months 13 %) and the length of hospital stay (median 6 days) increased with worsening nutritional status and with decreased food intake.

Evaluation and conclusions: Malnutrition in hospital patients and nursing home residents is a relevant public health problem in Germany. Nutritional expertise is lacking in many institutions. Appropriate measures to improve nutritional care in hospitals and nursing homes are urgently needed to prevent and adequately treat malnutrition.

Key messages

→ Malnutrition in hospital patients and nursing home residents is a relevant public health problem in Germany.

→ Nutritional expertise and nutritional routines in German hospitals and nursing homes are not in line with the recommendations in evidence-based guidelines from medical nutrition societies and internationally established standards.

→ With the increasing severity of malnutrition, nutritional interventions have been increasingly used; however, even severely malnourished persons receive only partial nutritional support.

→ Dietetic assistance and nutritional competence of nursing staff seem to be of central importance for the initiation of nutritional interventions.

→ Since participating institutions likely have a special interest in nutrition, it is assumed that the situation in German hospitals and nursing homes in general is even worse than reported here.

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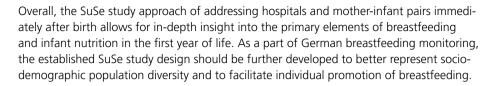# 3 Survey on breastfeeding and infant nutrition in Germany – SuSe II

Mathilde Kersting, Nele Hockamp, Constanze Burak, Thomas Lücke

Introduction: Twenty years after the epidemiological study "Breastfeeding and infant nutrition in Germany" (SuSe I), SuSe II was performed from 2017– 2019. Objectives of SuSe II were a) to describe promotion of breastfeeding in hospitals, breastfeeding behaviour and its determinants, as well as infant nutrition during the first year of life, b) to show trends since the previous study SuSe I 20 years ago, and c) to deduce recommendations for promotion of breastfeeding.

Methods: In a nationwide cross-sectional survey, breastfeeding management was assessed in 109 hospitals. In these hospitals, mother-infant pairs were recruited for a follow-up web-based questionnaire survey of breastfeeding and infant nutrition prospectively at infant ages of 2 weeks and 2, 4, 6, and 12 months. A total of 966 mother-infant pairs participated in SuSe II with a long-term compliance of approximately 90 %.

Results: Promotion of breastfeeding in hospitals was largely implemented in compliance with the national guidelines, especially with respect to structural conditions. Breastfeeding rates remained high during the first months, with 56 % for exclusive breastfeeding and 82 % for any breastfeeding at the age of 4 months. During the first weeks postpartum, approximately half of breastfeeding mothers reported breastfeeding problems, with an insufficient breastmilk supply being the primary reported reason for early weaning. The most important factors for the early cessation of breastfeeding were prenatal intentions, experience of mothers and postnatal factors, such as the use of breastfeeding aids and the early administration of additional fluids. Overall, mothers were satisfied with the breastfeeding guidance they received in hospitals as well as with the other information sources and consultation sources they used. At the end of the infant's first year of life, 41 % of mothers continued to partially breastfeed along with complementary feeding. During the first year of life, infant formula was most often used as a breast milk substitute. In the study sample, complementary feeding was mostly introduced as recommended in Germany, namely, between the fifth and seventh months of age as well as in the recommended sequence. As an additional beverage, tap water was the first choice during the first year of life.

Evaluation and conclusions: Compared to the previous SuSe I study 20 years ago, the measures undertaken to promote breastfeeding in hospitals, breastfeeding behaviour in mothers and infant nutrition are more in line with current recommendations for Germany. To advance the large-scale implementation of all relevant recommendations, adequate health care system resources need to be available to hospitals. Currently, shorter postnatal stays in hospitals require seamlessly continued and coordinated postdischarge breastfeeding care to facilitate long-term breastfeeding success in mothers. Drawing on well-established structures of paediatric check-ups may provide a low-threshold approach for offering nutrition counselling to young families.

Overall, the SuSe study approach of addressing hospitals and mother-infant pairs immediately after birth allows for in-depth insight into the primary elements of breastfeeding and infant nutrition in the first year of life. As a part of German breastfeeding monitoring, the established SuSe study design should be further developed to better represent socio-demographic population diversity and to facilitate individual promotion of breastfeeding.

Key messages

→ Breastfeeding rates are pleasingly high, with 56 % for exclusive breastfeeding and 82 % for any breastfeeding at 4 months of age. Complementary feeding was mostly introduced in the time frame and sequence as recommended by the "Dietary scheme for the first year of life".

→ Reasons for early weaning, as well as the main factors for a short duration of breastfeeding, are similar between today and 20 years ago.

→ Compared to 20 years ago, measures undertaken to promote breastfeeding in hospitals, breastfeeding behaviour of mothers and infant nutrition are more often in compliance with current recommendations in Germany.

→ With shorter durations of postpartum hospital stay, seamlessly following breastfeeding aftercare embedded within effective structures and the coordination of professional and voluntary actors is necessary to facilitate long-term breastfeeding success in mothers.

→ Further development and target-group sensitive adaptation of existing information and counselling services on breastfeeding and infant nutrition is necessary to sufficiently reach out to and ensure that parent groups with low motivation to breastfeed and with lower educational levels benefit as well.

4 VeChi-Youth-Study – Vegetarian and vegan diets in children and adolescents in Germany

Ute Alexy, Morwenna Fischer, Stine Weder, Alfred Längler, Andreas Michalsen, Markus Keller

Introduction: Vegetarian and vegan diets have become increasingly popular in Germany. Due to a lack of studies, it is not possible to validate the positive or negative impacts of a current vegetarian or vegan diet on children and adolescents compared to an omnivorous diet. The VeChi-Youth-Study aimed to provide more clarity on this subject.

Methods: The VeChi-Youth-Study is a cross-sectional study including 401 subjects aged 6 to under 19 years. The study was conducted in Germany between October 2017 and January 2019. The primary goal was to compare anthropometrics, dietary intake and nutritional status of vegan, vegetarian and omnivorous children and adolescents. A 3-day weighed dietary record assessed dietary intake, and an online questionnaire assessed lifestyle and other data. Subjects were examined in three study centres (Herdecke, Berlin, Filderstadt), where blood and urine samples were taken.

Results: After adjusting for age and stage of puberty, there were no significant differences in anthropometric data between vegetarian (n=150), vegan (n=114) and omnivorous (n=137) subjects. Energy intake was slightly beneath the recommended dietary reference values in all three dietary groups. Among vegetarians and vegans, older subjects barely met the D-A-CH-reference values for protein, while the youngest group in all dietary groups had an average protein intake higher than the D-A-CH-reference values. Blood and urine parameters revealed no nutrients that were specifically critical for the vegan and vegetarian study population. In all three diet groups, a substantial number of subjects exhibited critical levels of riboflavin (vitamin B_2), vitamin D, and iodine. According to the dietary records, the average calcium intake was generally low, especially in vegan subjects. Vegan children and adolescents presented a satisfactory vitamin B_{12} status, which could be explained by the high compliance with the use of vitamin B_{12} supplements. Compared to the two other diets, the vitamin B_{12} parameters of the vegetarian children were more often outside the normal range. Vegans had a high intake of vegetables, fruits, whole grains, legumes and nuts, which is favourable for the prevention of several noncommunicable chronic diseases.

Evaluation and conclusions: Vegetarian and vegan diets are apparently suitable for children and adolescents, ensuring normal growth and a sufficient supply of macro-nutrients and most micronutrients. Due to the lower quality of plant protein, vegetarian and vegan adolescents should increase their protein intake. Regardless of the diet group, the supply of riboflavin (vitamin B_2), vitamin D, iodine, and calcium needs to be improved for all children and adolescents. Because a significant number of vegetarian subjects had a low vitamin B_{12} status, it is recommended that vegetarians also use vitamin B_{12} supplements.

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Key messages

➔ For the first time, the VeChi-Youth-Study offers comparable current data on the food consumption, nutrient intake and nutrient supply of vegan, vegetarian and omnivorous children and adolescents aged 6 to under 19 years in Germany.

➔ After adjusting for age and stage of puberty, there were no significant differences in anthropometric data between vegetarian, vegan and omnivorous children and adolescents. One exception was girls following a vegetarian diet, who had a higher fat mass index, although all three groups had a lower body mass index (BMI) than the reference group.

➔ The energy intake and the intake of most nutrients, with the exception of calcium, were adequate. For vegans, the quality of carbohydrates and fat was the highest (low in sugar and saturated fatty acids, more fibre and polyunsaturated fatty acids).

➔ In all diet groups, a substantial number of participants exhibited critical levels of riboflavin (vitamin B_2), vitamin D, and iodine status. Significant differences between the groups was observed for iodine (vegans < vegetarians and omnivores), iron (ferritin; vegetarians and vegans < omnivores) and folate (vegans > vegetarians and vegans).

➔ All vegetarians and vegans exhibited a health-supporting diet with a high consumption of preventing food groups, such as vegetables, fruits, legumes and nuts. They also exhibited reduced consumption of sweets and snacks and finished meals more often compared to omnivorous children and adolescents.

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5 Nutrition in the prevention of chronic diseases

5.1 Vegetable, fruit and meat intake and the risk for selected nutrition-related diseases: An umbrella review of meta-analyses

Friederike Maretzke, Annemarie Schmidt, Andreas Lehmann, Nicole Kalotai, Anna Maria Amini, Angela Bechthold, Heiner Boeing, Bernhard Watzl

Introduction: Nutrition plays a critical role in the prevention of several diseases. The present umbrella review investigated the relationship between the intake of vegetables, fruit and meat and the incidence of cardiovascular diseases, type 2 diabetes mellitus, colorectal cancer and breast cancer. Food-based dietary guidelines (FBDGs) of the German Nutrition Society regarding the intake of vegetables, fruit and meat are in line with nutrient recommendations and were reviewed with respect to their primary preventive potential in the present umbrella review. The FBDGs for the three food groups were as follows: (1) "Enjoy at least 3 portions of vegetables and 2 portions of fruit each day.", and (2) "If you eat meat, you should not consume more than 300 to 600 g per week.".

Methods: A systematic literature search was conducted in PubMed by two independent reviewers for meta-analyses investigating the relationship between the intake of vegetables, fruit and meat and the selected diseases. Meta-analyses were selected by two independent researchers according to predefined inclusion and exclusion criteria, and the certainty of evidence was evaluated using NutriGrade.

Results: A total of 20 meta-analyses of prospective cohort studies were included for vegetable and fruit intake and 18 for meat intake. No meta-analysis of RCTs was identified. Overall, a higher intake of vegetables and fruit was associated with a reduced risk for the selected diseases. In contrast, the intake of meat was associated with an increased risk.

Evaluation and conclusions: The findings support the FBDGs of the German Nutrition Society. These recommend a wholesome diet that consists primarily of plant-based products, such as vegetables and fruit, and a lower proportion of animal products, such as meat. Prospectively, the results of this work can be used for the further development of FBDGs.

5.1

Key messages

➔ This umbrella review offers an overview of the meta-analyses available at the time of search and evaluation of the meta-evidence on the relation between the intake of different food groups (vegetables, fruits, red and white meat and meat products) and the incidence of cardiovascular diseases (stroke and coronary heart diseases), type 2 diabetes mellitus, colorectal cancer and breast cancer.

➔ A clearly inverse correlation was observed between the consumption of vegetables and the risk of cardiovascular diseases (stroke and coronary heart diseases) and the risk of colorectal cancer. No relationship could be determined between the consumption of vegetables and breast cancer, and most meta-analyses did not report a relationship for type 2 diabetes mellitus.

➔ A clearly inverse relationship was observed between the consumption of fruits and the risk of cardiovascular diseases (stroke and coronary heart diseases), as well as of the risk of breast cancer. No clear results were observed for the relationship between the consumption of fruits and the risk of type 2 diabetes mellitus and colorectal cancer.

➔ The results of this umbrella review suggest that vegetable and fruit intake described as high in the included studies has a beneficial effect on health and thus confirm the current recommendations of the German Nutrition Society on vegetable and fruit consumption.

➔ The majority of included studies showed a positive association between the consumption of red meat, processed meat and red meat in total and the examined diseases. No relationship was observed between the consumption of white meat and the examined diseases.

➔ The results of this umbrella review suggest that the consumption of red meat and processed meat, which is described as high in the included studies, has a negative influence on the examined disease risks. Therefore, these results support the current food-based dietary guidelines (FBDGs) of the German Nutrition Society.

5.2 Role of Vitamin D in preventing and treating selected extraskeletal diseases – an umbrella review

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Introduction: Accumulating evidence indicates that vitamin D may have beneficial effects on respiratory tract, autoimmune, neurodegenerative and mental diseases. The present umbrella review of systematic reviews (SRs) of cohort studies and randomised controlled trials (RCTs), plus single Mendelian randomisation studies, aimed to update current knowledge on the potential role of vitamin D in preventing and treating these extraskeletal diseases.

Methods: To answer the research question, systematic literature research on SRs and meta-analyses (MAs) was performed for each of the extraskeletal diseases (health outcomes) in the PubMed and Cochrane Reviews Library databases. Meta-analyses were selected by two independent researchers according to predefined inclusion and exclusion criteria. To evaluate the certainty of evidence, a modified version of the tool "Assessing the Methodological Quality of Systematic Reviews II" (AMSTAR II) was used. Based on the presence of critical or noncritical methodological weaknesses, the studies were classified on a scale from high to very low quality. At least two authors summarised the results for one of the extraskeletal diseases and assessed them.

Results: Altogether, 73 SRs were identified. Observational data on primary prevention suggested an inverse association between vitamin D status and the risk of acute respiratory tract infections (ARIs), dementia and cognitive decline, and depression, whereas studies regarding asthma, multiple sclerosis (MS) and type 1 diabetes mellitus (T1DM) are scarce. SRs of RCTs support observational data only for the risk of ARIs. No respective RCTs were available for the prevention of chronic obstructive pulmonary disease (COPD), MS, or T1DM. SRs of RCTs indicate beneficial therapeutic effects in vitamin D-deficient patients with asthma and COPD, while effects on major depression and T1DM need to be further elucidated. Mendelian randomisation studies do not consistently support the results of SRs.

Evaluation and conclusions: Since several limitations of the included SRs and existing RCTs did not permit definitive conclusions regarding vitamin D and the selected diseases, further high-quality RCTs are warranted. In general, supplied or endogenously synthesised vitamin D doses of 20 µg (800 international units [IU]) are considered to be safe and can significantly contribute to achieving a circulating 25-hydroxyvitamin D concentration (25 [OH] D) of $\geq$ 50 nmol/l (20 ng/ml). However, if supplementation is necessary (e.g., due to missing endogenous synthesis), administration of continuous daily doses (recommended daily intake of 10 to 20 µg (400–800 IU)) instead of high bolus doses is recommended.

Key messages

→ In total, 73 systematic reviews were included in this umbrella review.

→ Evaluation of the systematic reviews of RCTs and observational studies suggests an inverse association between vitamin D status and the risk of acute respiratory infections (ARIs).

→ For the prevention of other examined diseases, evaluation of the available studies showed heterogeneous results: data from observational studies suggested an inverse association between vitamin D status and the risk of dementia and decreased cognitive performance, as well as depression. The included RCTs did not clearly support these results. The present data from observational studies related to asthma, multiple sclerosis (MS) and type 1 diabetes mellitus (T1DM) are inconclusive or insufficient. Regarding the prevention of chronic obstructive pulmonary disease (COPD), MS and T1DM systematic reviews from RCTs are not available.

→ With regard to the treatment of diseases, systematic reviews of RCTs indicated beneficial therapeutic effects of vitamin D in asthma and COPD patients with vitamin D deficiency, while the effects in severe depression and T1DM require more investigation in the future. The results in patients with ARIs or MS did not indicate positive effects of vitamin D supplementation.

→ The additionally identified single Mendelian randomisation studies do not consistently support the results of the systematic reviews.

→ Since several limitations of the included SRs and existing RCTs did not permit definitive conclusions regarding vitamin D and the selected diseases, further high-quality RCTs are warranted.

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5.3 Dietary factors and neurodegenerative disorders: An umbrella review of meta-analyses of prospective studies

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Introduction: In addition to nonmodifiable risk factors, dietary factors could have preventive potential with respect to neurodegenerative diseases. The aim of this umbrella review was to summarise the current state of research on dietary factors and the incidence of neurodegenerative diseases, cognitive decline and cognitive impairment from systematic reviews with meta-analyses of prospective studies and to assess the methodological quality of the meta-analyses, as well as the quality of the evidence and thus the validity of the results.

Methods: The systematic literature search was performed in the PubMed, Embase and Cochrane databases. Systematic reviews with meta-analyses of prospective studies investigating the association between dietary factors (dietary patterns, foods, nutrients, and phytochemicals) and neurodegenerative diseases (dementia [Alzheimer's disease and other types of dementia] and Parkinson's disease), as well as cognitive decline or cognitive impairment, were included. Summary risk ratios (SRRs) and 95 % confidence intervals (CIs) were recalculated using a random effects model. The methodological quality of all included meta-analyses and the quality of the evidence for all identified associations were evaluated using ROBIS-Tools and NutriGrade.

Results: In total, 20 meta-analyses including 98 SRRs were identified. The risk of bias was high in all original meta-analyses. The quality of evidence was moderate for inverse associations between higher adherence to the Mediterranean diet (SRR: 0.63, 95 % CI: 0.48−0.82, n=4 primary studies) and higher fish intake (SRR: 0.72, 95 % CI: 0.59−0.88, n=6) and Alzheimer's disease, as well as for tea consumption and all-cause dementia (SRR: 0.74, 95 % CI: 0.63−0.88, n=2) and Parkinson's disease (SRR per 2 cups/day: 0.69, 95 % CI: 0.54−0.87, n=5). Associations between the consumption of vegetables and fruit, milk and dairy products, coffee, and intake of macronutrients and vitamins and neurodegenerative diseases, cognitive decline or cognitive impairment were assessed with low or very low quality of evidence, primarily due to the limited number of primary studies available.

Evaluation and conclusions: The results demonstrated that the Mediterranean diet and the consumption of fish may be inversely associated with the development of Alzheimer's disease and that the consumption of tea may be inversely associated with the development of Parkinson's disease. However, the quality of evidence for associations with other dietary factors was low or very low. This was primarily due to the small number of primary studies. Thus, further studies are needed to confirm the existing results and to further investigate dietary factors associated with neurodegenerative diseases, cognitive decline or cognitive impairment.

Key messages

5.3

➔ This umbrella review provides a summary and evaluation of previous meta-analyses of prospective associations between dietary factors and the incidence of neurodegenerative diseases, cognitive decline and cognitive impairment.

➔ The results showed that the Mediterranean diet and the consumption of fish may be inversely associated with the development of Alzheimer's disease and that the consumption of tea may be inversely associated with the development of Parkinson's disease. The quality of evidence is moderate, and thus, associations are possible.

➔ Associations between the consumption of vegetables and fruit, milk and dairy products, coffee, and intake of macronutrients and vitamins and neurodegenerative diseases, cognitive decline or cognitive impairment were assessed with low or very low quality of evidence. Therefore, validity is limited.

➔ In the future, more primary studies are warranted to confirm these findings and to investigate dietary factors associated with neurodegenerative diseases, cognitive decline or cognitive impairment.

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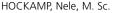Weihenstephaner Berg 2, 85354 Freising

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