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Effect of Two Nutritional Interventions on Postprandial Glucose Response in Hospitalised Patients with COPD: A Randomised Cross-Over Study

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Background/Aims: Oral nutrition support is frequently used in treatment of malnutrition in patients with chronic obstructive pulmonary disease (COPD) and are associated with significant improvements in a number of variables, e.g. energy- and protein intake and weight [1, 2]. Considering the use of corticosteroids in patients with COPD, little is known about the effect on postprandial glucose response and how they might interfere with glucose control. The timing of ONS administration among general patients in hospitals varies between studies but is most often given in-between meals or during medication rounds [3]. However, the optimal timing of consumptions of ONS for clinical benefits is not known [4]. Our aims were to compare the effects of two nutritional supplements (liquid ONS vs. a semi-solid in-between meal snack) and different timing of the supplements on postprandial glucose response.

Methods: Patients with COPD admitted to the Department of Pulmonary Medicine, Iceland and defined as at low or medium nutritional risk (score 0-3) were recruited. The screening tool used has been validated in COPD patients and is recommended by the clinical guidelines for hospital nutrition in Iceland [5, 6] In a randomised cross-over design, subjects consumed ONS or snack either in a fasting state (study 1) or following breakfast (study 2) and postprandial glucose responses were assessed at regular intervals for two hours (t = 15, t = 30, t = 45, t = 60, t = 90, t = 120 minutes). The study products used were a liquid ONS (Nutridrink (Nutricia, Denmark)) and a semi-solid snack (Skyr with cream (MS Iceland Dairies) and banana). The two study products were comparable in

Table 1. Nutritional content of the two interventions

	ONS Nutridrink	Snack Skyr (120 g), cream (20 ml) and banana (100 g)
Amount	200 ml	240 g
Kcal	300	313
Protein (g)	12	13
Fat (g)	12	13
Carbohydrate (g)	37	36
Fiber (g)	0.6	1.8
Flavors	Vanilla Strawberry	Vanilla Strawberry

energy and protein content and the nutritional content (Table 1). Wilcoxon Signed-Rank test was used to compare the two interventions.

Results: In total, 17 patients (6 males/11 females) were enrolled in the study. The mean age of the patients was 74.5 ± 11.2 years. Six patients (35%) were at low nutritional risk and 11 (65%) were at medium nutritional risk. Twelve patients (71%) were taking Prednisolone (corticosteroids) and 15 (88%) were using some kind of inhalers with corticosteroids, e.g. Symbicort and Seretide. In study 2, postprandial glucose was significantly higher after consuming ONS than the snack after 60 minutes (9.7 ± 2.4 mmol/L vs. 8.1 ± 3.2 mmol/L, p = 0.013 and 120 minutes 9.2 ± 3.2 mmol/L vs. 7.8 ± 2.4 mmol/L, p = 0.021, respectively). No difference was found in postprandial glucose concentrations between ONS and the snack when consumed after overnight fasting (study 1).

Conclusions: To our knowledge no study has assessed the effect of either liquid ONS or semi solid in-between meal snacks on glucose response in patients with COPD. Lower postprandial glucose concentrations were associated with the snack compared to ONS and being taken after a meal compared to overnight fasting. The clinical relevance of higher postprandial blood glucose after consuming a liquid ONS after breakfast compared with a semi solid snack needs to be studied further.

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Conflicts of Interests: We declare no conflicts of interests.

Keywords: COPD, Hospitalized, Oral nutrition supplements, In-between meal snacks, glucose response.

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The Effect of Unfiltered Coffee on Liver Enzymes in Healthy Habitual Drinkers

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Background/Aims: Considerable controversy exists regarding the link between coffee consumption and serum concentrations of liver enzymes. Moreover, it was observed that the effect of coffee on liver enzymes differ by gender [1]. In population studies, coffee consumption appears to be associated with lower blood levels of hepatic enzymes [2]. Numerous studies have shown hepatoprotective effect of filtered coffee while a potentially detrimental role of unfiltered coffee [3, 4]. It was seen that different coffee preparation (brewing) methods as well as roasting affect the concentration of compounds present in the final coffee brew [5]. Unfiltered coffee preparation causes a greater amount of biologically active components (caffeine and diterpenes) to remain in the liquid [6]. The diterpenes are found in unfiltered boiled coffee but disappear almost completely in filtered coffee brew, both immediately before consumption and while the production of soluble coffee powders [7]. Unfiltered coffee brews such as Scandinavian boiled coffee, cafetiére (French press) coffee and Turkish coffee, which are rich in the diterpenes, are associated with elevated liver enzymes. The diterpenes cafestol and kahweol are believed to be the cause of this adverse effect of coffee [8]. Nevertheless, favorable health effects have also been ascribed to diterpenes and data present in literature shows antioxidant activity, hepatoprotective, anticarcinogenic, anti-inflammatory and anti-angiogenic functions [9]. This study is carried out to investigate the effect of unfiltered coffee intake on liver enzymes in healthy participants. Also it is the aim of the study to clarify whether dark roast unfiltered coffee (DR) rich in diterpenes cafestol (C: 6.83 ± 0.27 mg/55 mL) and kahweol (K: 6.17 ± 0.12 mg/55 mL) has different effects on liver enzymes than light roast coffee prepared from almost similar caffeine amounts (LR: 1.71 ± 0.07 mg/mL or DR: 1.97 ± 0.03 mg/mL) and lower concentration of diterpenes (C: 1.79 ± 0.09 mg/55 mL and K: 1.67 ± 0.07 mg/55 mL). A small number of experimental studies on coffee consumption and liver health have been conducted [10]. Therefore, it would be interest-

ing to see whether the effects on liver enzymes would also be detectable in long-term habitual drinkers.

Methods: A survey was carried out to gather information regarding physical activity, medical condition and medication to evaluate the inclusion to the study. Additionally a food frequency questionnaire and anthropometric measures (weight, height, body mass index, body fat percent, fat free mass, waist circumference) were collected at the baseline interview. Those who had a history of acute or chronic diseases, severe illness with in-patient treatment during the last 3 months, use of regular medication or any supplements, BMI ≥ 25 kg/m² weight reduction >2 kg/week during the last month, current or former smoker (less than a year), pregnancy, breastfeeding, regular strong physical activity with ≥ 1 h/day were excluded. Also those, who had a high intake of alcohol (defined as a weekly intake of >7 units for women and >14 units for men), excess dietary consumption of total fat ($>35\%$ of daily calories), saturated fatty acid ($>10\%$ of daily calories) or cholesterol (>300 mg/day) were excluded. After a 2 week coffee refinement, 28 healthy, nonsmoker, habitual Turkish coffee drinkers, consisting of 14 men and 14 women, were asked to consume two different Turkish coffee roasts (three or more servings/day) for a month with a crossover study design. Participants were asked to refrain from other types of coffee beverages, to maintain a stable exercise routine, sleep pattern and dietary habits throughout the study. They were also asked to avoid vitamin supplements, food rich in caffeine and keep 3-day food diaries (1 weekend day and 2 weekdays) prior to each measurement. Anthropometric measurements and biochemical parameters of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) levels were measured after refinement and at the end of each 4 weeks of coffee consumption period. Activities of liver enzymes were determined using International Federation of Clinical Chemistry (IFCC) compatible measuring systems and standard clinical chemical methods. Daily nutrient intake was calculated by using computer software (Ebispro, Stuttgart, Germany; Turkish version: BeBiS, Vers. 6.1). In order to assess physical activity levels, the validated Turkish version of the International Physical Activity Questionnaire (IPAQ)-short was administered. Differences in human variables were analyzed by repeated-measures analysis of variance (ANOVA) for comparisons of LR coffee intake with DR and of each roast with the washout. All analyses were performed using SPSS 24.0 (IBM-SPSS Inc., Chicago, IL, USA). A two-tailed $P < 0.05$ was considered significant.

Results: The mean number of cups of coffee per day did not significantly differ between both coffee roast groups. Self-reported diets (a 3-d food diary) showed that nutritional intake was similar before (during washout) and after each intervention period for all subjects and volunteers did not report any changes in their physical activity and anthropometric measurements throughout the study. Relative to refinement values, coffee consumption did not alter mean liver enzyme concentrations significantly in either group (Table 1). ALP was found to be significantly higher ($p < 0.05$) in LR than DR group (56.04 ± 23.57 U/L and 49.15 ± 17.31 U/L for LR and DR respectively). No differences across gender groups were observed. The mean AST, ALT and ALP concentrations in individual male and female groups were not significantly altered ($p > 0.05$ in each case).

Conclusions: The result obtained from the study shows that consumption of 3–5 cups of unfiltered coffee for 4 weeks does not have a significant effect on the integrity of the liver enzymes stud-

Table 1. Concentration of serum liver enzymes (AST, ALT, ALP) in coffee-free period and changes after 4 weeks of LR or DR coffee ingestion

Liver enzymes	WO	LR	DR
AST (IU/l)	20.04±4.86	19.59±8.65	21.07±11.42
ALT (IU/l)	24.44±13.67	28.81±19.7	23.74±14.42
ALP (U/l)	47.22±11.05	56.04±23.57 ^a	49.15±17.31 ^b

Data expressed as mean ± standard deviation (n = 28). Different letters in the same line indicate significant difference (ANOVA for repeated measures): p < 0.05.

ied. Likewise, the findings suggest that depending on the degree of roasting and diterpene content, consuming unfiltered coffee in moderate amounts have discrete effects on ALP and has negligible effects on AST and ALT levels. Furthermore, we can conclude that coffee is a complex blend of chemicals and a partial tolerance to caffeine, kahweol and cafestol or other components of coffee might be developed in habitual drinkers. A potential limitation of the study is the lack of serum gamma-glutamyltransferase (GGT) assessment. Additional experimental research is warranted to further explore the effect especially on individuals with risk of liver disease.

Conflict of Interest: The authors F. H. Eren and H.T. Besler declare that they have no conflict of interest.

Keywords: Liver enzymes, unfiltered coffee, diterpenes.

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Determine Whether Having a Specified Weigh Day Improves Compliance with Patient Weighing and MUST Screening Guidelines on Admission and One Week Post-Admission in an Acute Hospital

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The aim of this audit was to determine whether having a specified weigh day improves compliance with weighing and MUST screening guidelines on admission and one week post-admission in an acute hospital. MUST screening was examined in four wards, two with a specified 'weigh day' (Ward A and B), and two without (Ward C and D). Eligible patients included those admitted to the study ward for a minimum of 7 days; those transferred onto or off of study wards post-admission were excluded. 80 eligible patient's MUST care plans and weight records were audited over 13 days; 36 on 'weigh-day wards', 44 on 'non-weigh day' wards.

18.75% (N = 15) of patients presented with symptoms on admission that would indicate disruption to oral intake, putting them at risk of malnutrition.

A similar proportion on 'weigh day' and 'non-weigh day' wards were weighed on admission (63.89% vs. 68.18%) and post-admission (8.33% vs. 6.82%). A higher proportion of patients on 'weigh day' wards were weighed during their first (19.44% vs. 11.36%) and second week (30.56% vs. 11.36%) of admission. Twice as many patients on 'weigh day' wards had more than 1 weight recorded (61.11% vs. 29.55%). 16% of patients on 'non-weigh day' wards were never weighed over the course of admission.

A similar proportion of patients on 'weigh day' and 'non-weigh day' wards were also screened using MUST on admission (22.22% vs. 27.27%) and post-admission (0% vs. 2.27%). Admission MUST screening was the only MUST screening conducted for 91.67% of patients on 'non-weigh day' wards, compared to 50% on 'weigh day' wards.

Guidelines recommend completing nutritional screening within 24 hours of admission to hospital, repeating the screening weekly regardless of nutritional status. A 'weigh day' allows ward staff to allocate a day where wards are generally quieter, enabling weekly systematic screening of all patients in a timely manner. This audit demonstrated that weigh days do not result in increased screening exactly one week post-admission, however, they do foster a culture of weighing and screening patients throughout their admission. The increased screening culture can be clearly evidenced by the higher proportion of patients being weighed and screened over the course of admission and, while every patient on a 'weigh day' ward was weighed at least once, 16% of patients on 'non-weigh day' wards were never weighed. A higher proportion of patients were weighed on admission in comparison to that found by a 2016 Health Information and Quality Authority report [1], however, this is not translating into increased screening via MUST. The MUST care plan should act as a prompt for ward staff to use weights to calculate MUST scores, however, 13.89% of patients on 'weigh day' wards and 36.67% of patients on 'non-weigh day' wards had no form in their nursing folders. Having a 'weigh day' helps focus ward staff and ensures that screening becomes part of the weekly routine with patients, moving wards towards achieving recommended guidelines.

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Body Composition, Nutrition Status and Hand Grip Strength of People with Mental Disabilities in Northern Germany

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Background and Aims: The number of people with mental disabilities (DP) in Germany doubled in the last twenty years to 1.7 Mio. people in 2017 [1]. Suggested reasons include shifts in the population pyramid and the closing of the generation gap (Euthanasia second world war) [2]. Previous international research shows that DP tend to have a higher prevalence of overweight (34.8%) and obesity (17.5% up to 42%) compared with the normal population [3–5]. Additional general risk factors for overweight and obesity are the female gender [3, 6, 7] and living arrangements, especially living alone with help of caregiver as often seen in DP [8]. A high prevalence of eating problems is also mentioned for this target group. For example, self-induced vomiting, frequent over-eating or over drinking (alcohol and sweetened beverages) and binge eating, for naming only some of them [9, 10]. Still, only a few data are available for German DP.

Therefore, the primary aim of this study was: to determine the prevalence of overweight and obesity in a sample of free-living German DP cared by a community service agency (Ambulante Dienste Volmarstein GmbH) and to compare these results with those from the most recent German national survey. Additional aims focused on the effects, reasons and predictors for a potentially higher risk of overweight and obesity in German DP. These aims included further parameters of nutrition status, body composition,

muscle strength, eating habits and nutrition literacy. Whenever possible, results were compared with reference thresholds.

Methodologies: The degree of disability was assessed by checking the disabled person's pass. Body height was measured in upright position with the back against a stadiometer (Seca 264, Seca, Hamburg, Germany). Weight was measured with light clothing and emptied bladder with a calibrated digital scale (mBCA515, Seca, Hamburg, Germany). The waist circumference was measured with a tape 1 cm over the belly button with free tummy and in a relaxed position and results were compared with the second risk step of the WHO classification (men 102 cm, women 88 cm). The body composition was assessed by bioelectrical impedance analysis in standing position (Seca mBCA 515, Seca, Hamburg, Germany). Overnight fasting was attempted but was not feasible in a high number of participants. The handgrip strength was measured three times on the strong hand of the participant and the average was calculated (Jamar dynamometer, Cederburg, WI, USA). Every participant was analysed by the same 2 members of the study group in a standardised way. Nutrition literacy, eating habits, physical activity and body-image were asked by study members using self-made questionnaires which were developed by the researchers and were not validated. These Questionnaires were used because there were no suitable validated Questionnaires for this study. They were constructed in easy language and with showing graphical displays for every answer option because of the high illiteracy rate in DP. For each right answer in the nutrition literacy part the participant gets one point and no point for a wrong answer. The eating habits, physical activity and body-image parts were only descriptive parts, and the incidence for each answer was recorded.

Results: In total, 24 DP were included in this cross-sectional study, 10 male participants (42.5 ± 11.7 years of age) with a mean degree of disability of 75 ± 17.8 and 14 female participants (38.5 ± 10.7 years of age) with a comparable mean degree of disability of 71.4 ± 15.6 . All participants were aged between 24 and 64 years. Mean BMI was significantly higher in the study group compared with the German population (35.8 ± 10.1 kg/m² vs. mean 25.9 kg/m², $p < 0.001$) resulting in a significantly different distribution among the BMI categories (see Figure 1). Most strikingly, the BMI-category for normal weight (18.5 – 25 kg/m²) was only reached by one female DP (4%) compared with 45% of the normal German population. Women tended to have a higher BMI compared with men (38.8 ± 1.4 vs 31.4 ± 6.3 kg/m², $p = 0.054$). The mean waist circum-

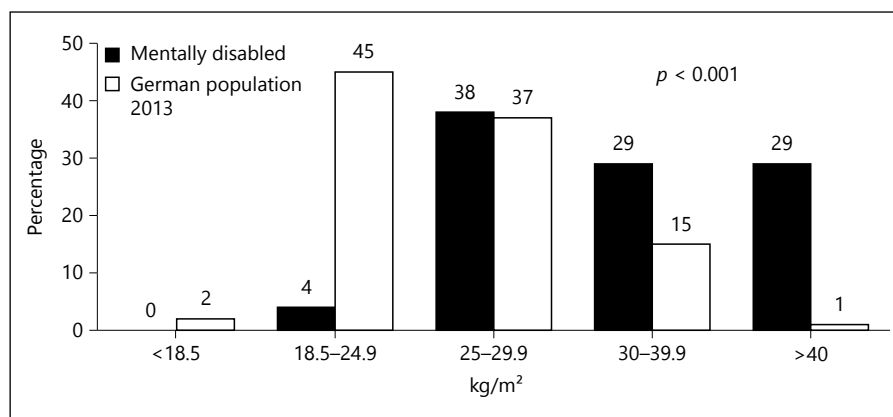


Fig. 1. Comparison of the BMI-categories of the DP and the German population.

ference of the study group was significantly higher than the WHO reference threshold (111 ± 18.8 cm vs 93.8 ± 7.1 cm, $p = 0.002$). The difference was mainly due to the higher waist circumference in women (108 ± 19.1 cm vs 88 cm, $p = 0.04$). Whereas in men results were comparable to the reference thresholds (113 ± 18.9 cm vs 102 cm, $p = 0.33$). Handgrip strength was significantly lower in the complete study group compared with age-adjusted references values for people living in Germany (27.4 ± 10.2 kg vs 40.5 ± 10.6 kg, $p < 0.001$), and this was true for women (22.9 ± 6.58 kg vs 31.8 ± 2.12 kg, $p = 0.001$) as well as for men (33.6 ± 11.4 kg vs 52.6 ± 1.43 kg, $p = 0.007$). Interestingly the fat free mass index (FFMI) was similar in DP and the German population (20.6 ± 3.6 vs. 19.2 ± 1.8 kg/m², $p = 0.13$) pointing against higher prevalence's of sarcopenia. The questionnaires showed that overall, 54.2% of the DP misjudged their own BMI-category as significantly lower than the actual BMI ($p = 0.002$). Nutrition literacy was low in average (50.3% of 100%) and did not correlate with the BMI ($r = 0.335$, $p = 0.11$). Results from the eating habit questionnaire showed that 54% of the DP buy their food with help of a caregiver and 88% prepared meals regularly for themselves.

Conclusion: In DP higher BMI and waist-circumference can lead to an increased long-term risk for metabolic syndrome and cardiovascular diseases compared with the normal population. Both low nutrition literacy and the high need for developing cooking competences support the need for dietary counselling, not only for DP but also for their caregivers. With evidence-based dietetic interventions, such as qualified prevention programs, the eating behaviour, nutritional status, body composition, self-efficacy and quality of life of DP may be improved. Therefore, there is a high need to develop and evaluate programs for the prevention and the treatment of overweight and obesity for DP that are specifically tailored to this special target group. Furthermore, such programs should include the caregiver of the DP and must sensitize them for the increased long-term risks resulting from obesity.

Conflict of Interest: The authors declare that they have no conflict of interest.

Keywords: Mentally disabled, obesity, nutrition, cardiovascular risk.

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Preliminary Results for 6 Month-Change in a Mediterranean Diet Score in American Working Population

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Background/Aims: Mediterranean lifestyle and Mediterranean eating pattern are the keys to a better quality of life [1,2]. Not only they protect people against the development of chronic diseases (obesity, CVD and metabolic syndrome) but they

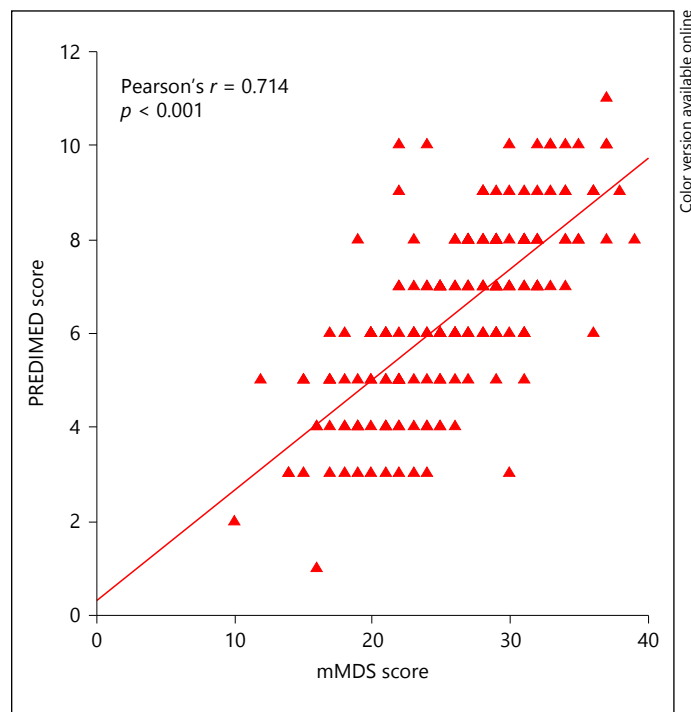


Fig. 1. Association of mMDS and PREDIMED scores in the six month follow up survey.

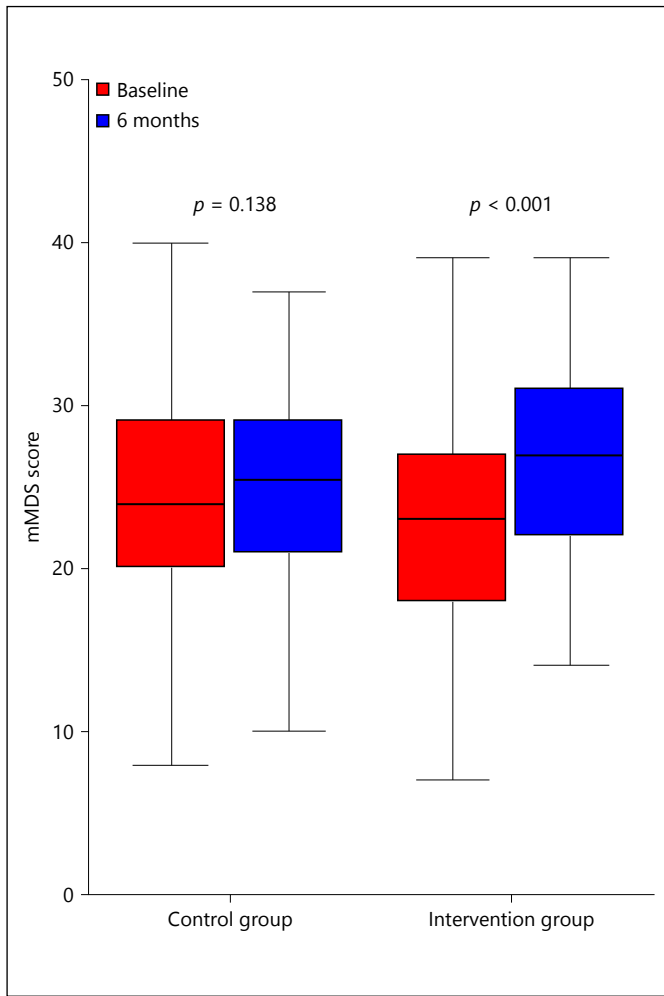


Fig. 2. Modified Mediterranean Diet score in the control group and the intervention group (baseline and 6 months follow-up). P values indicate statistical significance for the comparison between baseline and 6-month mMDS scores within each group.

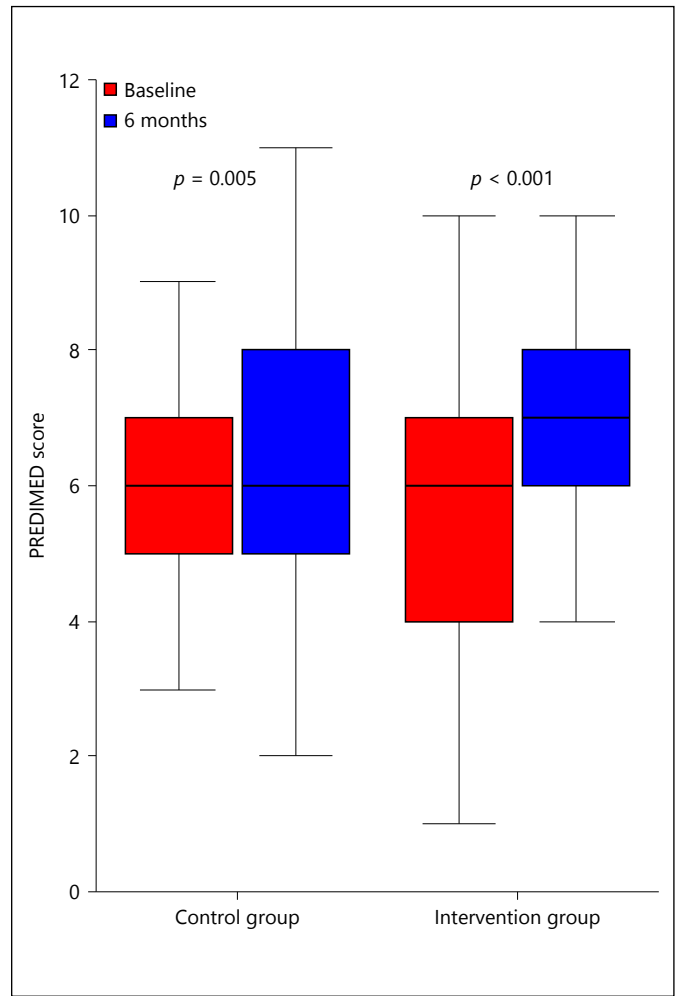


Fig. 3. PREDIMED score in the control group and the intervention group (baseline and 6 months follow-up). P values indicate statistical significance for the comparison between baseline and 6-month PREDIMED scores within each group.

Table 1. Baseline characteristics of participants

	Control group (N = 104)	Intervention group (N = 97)	P value
Age (years)	49.54±7.10	48.49±8.21	0.335
Male gender	99 (96.1)	92 (94.8)	0.665
Smokers	4 (3.8)	4 (4.1)	0.920
Weight (lbs)	212.99±36.08	210.85±35.56	0.672
BMI (kg/m ²)	29.86±4.18	29.85±4.46	0.986
Waist Circumference (in)	39.54±4.43	30.02±4.72	0.423
Body Fat %	27.59±6.66	28.93±7.34	0.176
Systolic BP (mmHg)	123.53±7.85	123.85±9.04	0.791
Diastolic BP (mmHg)	78.60±5.52	79.61±6.07	0.217

Table 2. MDNI Career Firefighter Change (6months follow up-Baseline) in mMDS and PREDIMED 14-item Scores

	Control group (N = 104)	Intervention group (N = 97)	P value
PREDIMED score			
Baseline	5.80±1.92	5.70±1.94	0.722
6 months	6.27±1.98	6.58±1.77	0.248
Baseline to 6 months change	0.47±1.69 [8.1%]	0.88±1.86 [15.4%]	0.107
P value	0.005	<0.001	
mMDS score			
Baseline	24.56±6.57	23.10±6.59	0.119
6 months	25.19±5.52	26.69±5.82	0.062
Baseline to 6 months change	0.63±4.33 [2.6%]	3.59±4.74 [15.5%]	<0.001
P value	0.138	<0.001	

have protection against work stress [3–5]. There are questionnaires that evaluate the Mediterranean diet score and to the best of our knowledge have never used to a non-Mediterranean population [6]. Thus, the aim of this research is to present preliminary data on changes in Mediterranean diet score Diet Scores over the 6 months of the study for subset of subjects with complete data for both time points as a result of the intervention to US firefighters. Moreover, we validated and verified the method reliability of the indices assessing adherence to the Mediterranean Diet.

Methods: A cluster-randomized controlled trial is being performed within 44 stations of the Indianapolis Fire Department. Detailed demographics are provided in Table 1. Comparison of a Mediterranean Diet Nutritional Intervention (MDNI) will be applied vs. usual care (control group) for 6 months. We used the modified Mediterranean Diet Score (mMDS) and the PREDIMED trial (the 14-Item Mediterranean Diet Assessment Tool) to calculate the Mediterranean Diet adherence scores from a population of career firefighters in the United States [6, 7]. We used baseline and six month follow up survey data from the ongoing study Feeding America's Bravest: Mediterranean Diet-Based Interventions to change Firefighters' Eating Habits and Improve Cardiovascular Risk Profiles [8]. These questionnaires provided information about the firefighters' eating habits, lifestyle, and their daily routine. After calculating the mMDS and PREDIMED scores at the baseline of the study and six months later, we then compared these two scoring methods using Student's t test and evaluated their association using Pearson's correlation coefficient with SPSS ver. 19 [9].

Results: There was a statistically significant positive correlation between the mMDS and PREDIMED scores in the six month follow up survey ($r = 0.714$, $p < 0.001$; Figure 1).

The two scores in control and intervention groups, at baseline and 6 months follow up, are shown in Table 2. In intervention group, mMDS score exhibited a statistically significant elevation (by 15.5%) at the 6 months follow-up compared to baseline score (23.10 ± 6.59 vs 26.69 ± 5.82 , $p < 0.001$), while the elevation of mMDS score by 2.6% in the control group was not statistically significant ($p = 0.138$). Consequently, the change in mMDS score was significantly greater in intervention group compared to control group ($p < 0.001$) (Figure 2).

The mean PREDIMED score increased significantly at the 6 months follow-up by 8.1% in the control group (5.80 ± 1.92 vs 6.27 ± 1.98 , $p = 0.005$) and by 15.4% in intervention group (5.70 ± 1.94 vs 6.58 ± 1.77 , $p < 0.001$). The tendency toward greater elevation in the intervention group compared to control group did not reach the statistical significance ($p = 0.107$) (Figure 3).

Conclusions: The modified Mediterranean diet score (mMDS) and the PREDIMED score at the 6 month follow-up were statistically significantly correlated in our career firefighter population. After 6 months follow-up, the Intervention Group showed greater and more consistent increases at both Mediterranean Diet Scores, while mMDS score was proven to be more precise in detecting the Mediterranean Diet adherence.

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Keywords: Firefighters, Mediterranean diet, Randomized control trial, Workplace.

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Hot Topics in Nutrition and Cancer European Federation of the Associations of Dietitians (EFAD) Conference

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As medical care shifts to interdisciplinary care, nutrition is still an often-neglected and undervalued component of cancer care. Data collected from 907 cancer patients from 10 European Countries revealed a substantial gap in terms of the patient's need for information and access to appropriate nutrition information. This information gap is underscored by the fact that 69,7% of respondents lost weight after diagnosis [1]. Data also reveals that 70% of patients cannot differentiate scientific advice from Quackery, up 42% of patients follow special diets and that 68% of oncology physicians are unaware of nutritional supplement and diet use among their patients [2–5]. Nevertheless, advances in nutrition research and individualized medical nutrition therapy can help improve diseases prognosis, and quality of life [6]. Furthermore, nutrition research may also play a major role in eliciting and understanding of how diet can help regulate inflammation and the immune system [7]. Therefore, greater collaborations among members of academia, industry and government need to work on innovative and cost-effective solutions regarding cancer and nutrition.

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Nutrition Makes a Difference in Healthy Ageing – A Conference Report

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Background/Aims: Although the European population is getting older, ageing is not automatically equivalent to healthy ageing. Older adults are at risk for nutrition(-related) disorders, like malnutrition, sarcopenia and/or frailty, which may result in disability and poor clinical outcomes. The aim was to give a theoretical background on nutrition-related disorders associated with ageing and to explain the role of nutrition in its etiology, prevention and treatment, and to share knowledge gained from both national and international research projects on nutrition and ageing conducted in Europe.

Methods: Firstly, the concepts of sarcopenia, frailty, and physical frailty, and the role of proteins in these conditions were explained. Secondly, results from two national cross-sectional studies in Portugal in which prevalence of malnutrition (i.e., undernutrition) and its determinants (Nutrition UP65), results from the second National Food, Nutrition and Physical Activity Survey of the Portuguese general population (2015–2016), and results from the Pronutrisenior study on nutritional challenges in older adults were discussed. Thirdly, some results of the Horizon 2020 project 'Prevention Of Malnutrition In Senior Subjects in the EU' (PROM-ISS) were discussed: prevalence of a low protein intake in older persons across Europe using a multi-cohort approach, characteristics of protein intake in older persons, and the association between low protein intake and relevant clinical outcomes, with specific attention to the trajectory of disability over time in older persons.

Results: Sarcopenia and frailty are common nutrition-related disorders in older people that may lead to disability. Sarcopenia

(muscle failure) is a condition of acute or chronic loss of muscle mass and function that is associated with adverse health outcomes. Many conceptual advances have emerged since the European Working Group on Sarcopenia in Older People published the most widely used definition, including a better understanding of the metabolic role of skeletal muscle. Low physical activity and poor nutrition habits sharply increase the risk of sarcopenia. Frailty, however, is a biologic syndrome of decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, that increases vulnerability to adverse outcomes. Frailty has multiple domains, but most advances have been done in physical frailty. Sarcopenia is a leading (but not the only) cause of frailty. Both nutrition-related disorders share some pathophysiological aspects, mainly related to nutritional status. The role of protein intake and protein metabolism in sarcopenia and frailty is now widely accepted, based on basic science, epidemiological and clinical studies. However, the best way to use proteins to prevent or treat sarcopenia and frailty is not fully understood, as most trials have been negative [1, 2]. Studies using leucine and β -Hydroxy β -methylbutyric acid are also promising approaches to the management of these conditions [2].

The Nutrition UP65 study revealed a considerable prevalence of sarcopenia (11.6%) in Portuguese older adults, according to the EWGSOP criteria. According to the Mini Nutritional Assessment, prevalence of undernutrition risk was also considerable (14.8%) but prevalence of undernutrition (1.3%) was low, with the majority of the Portuguese population being overweight (44.3%) or obese (38.9%) [3]. Moreover, this national multicenter study showed that more than half of the Portuguese older adults are pre-frail (54.3%) and 21.5% is frail, using the Fried criteria [4]. Other key findings of the Nutrition UP65 study were: high prevalence of vitamin D deficiency (median 25(OH)D concentration 35.9 nmol/L) in which the ultraviolet index was a predictor of 25(OH)D levels (negative association in December-March [$s\beta = -0.149$, 95% CI -0.211 ; -0.087 , $P < 0.001$] and positive association in April-June [$s\beta = 0.295$, 95% CI 0.299 ; 0.362 , $P < 0.001$]) [5], and high prevalence of hypohydration (16.3%) [6]. Results from the Portuguese National Food, Nutrition and Physical Activity Survey showed that median energy intake of Portuguese older adults (65–84 years) is 1706 kcal (Interquartile range: 1401–2060), of which 19.3 energy% is from protein. Compared to younger ages, Portuguese older adults consume less of the following food groups: yoghurt and other fermented dairy products, pasta, breakfast cereals, meat, sweets, pastry and cookies, and salted snacks, chips and pizza. In addition, from the results of the Pronutrisenior study it was concluded that interventions aiming to reduce prevalence of undernutrition among non-institutionalized Portuguese older adults should focus particularly on those with worse social support and lower eating-related quality of life.

Within the PROMISS project, protein intake is hypothesized to importantly contribute to the development of malnutrition and active and healthy aging. A protein intake below the current recommended daily allowance (RDA) of 0.8 grams per kilogram body weight per day is frequently reported in community-dwelling older persons, with prevalence rates ranging from 28% up to 40% [7, 8]. These results emphasize that more attention towards optimizing protein intake in older persons is needed. Especially since recent evidence from prospective observational studies indeed confirms that a protein intake below the current RDA is associated with poor clinical outcomes, such as the development of persistent malnutrition [8] and a more severe disability trajectory over time

in the very old [9]. Future nutritional intervention studies are needed to confirm the causality of these associations, by investigating whether increasing protein intake in older persons with a protein intake below the RDA may benefit physical functioning and other relevant outcomes. The PROMISS trial, which is currently ongoing in two European countries, will importantly contribute to our understanding on the role of protein intake. To facilitate this research, a quick screening tool for identifying older persons at high risk of low protein intake has been developed [10].

Conclusions: Nutrition interventions, especially those linked with proteins, are a promising way to prevent or treat sarcopenia and frailty, thus leading to reduction or retardation of disability in old age. Recent Portuguese studies provide better understanding of the older adults' dietary intake, both in terms of nutrients and food groups, and insight in age-related challenges in realizing an adequate food intake, which contributes to a better understanding of the underlying factors that affect nutritional status, health and well-being of the Portuguese older adult population. Nutritional intervention studies in well-characterized samples of older persons, such as in the PROMISS trial, are currently underway to provide the underlying evidence for optimal dietary advice for older persons.

Keywords: Healthy ageing, malnutrition, sarcopenia, frailty, protein intake.

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Dietary and Lifestyle Strategies to Manipulate Gut Microbiota

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Background and Aim: Functional gastrointestinal disorders, including irritable bowel syndrome (IBS) have a complex etiology that involves gut-brain interaction, and are characterized by morphologic and physiologic abnormalities pertaining to visceral hypersensitivity, altered mucosal and immune function, motility disturbance, altered gut microbiota and altered central nervous system processing. Patients with these disorders often self-report food-related symptoms, such as flatulence, bloating, diarrhoea and abdominal pain. These symptoms are not life threatening, but they can lead to dietary changes to an extent that may compromise nutrition, affecting the general wellbeing and quality of life of those affected [1].

The human gastrointestinal tract is composed of a complex population of microorganisms – the gut microbiota – which plays an important role in human health. Intestinal bacteria carry out a large range of crucial physiological functions, such as protecting against pathogens, maintaining immune and metabolic homeostasis etc. Modulation of the gut microbiome has become part of the lifestyle wellness strategy to maintain or improve human health or even treat disease. The composition and quantity of ingested food, as well as several non-dietary lifestyle factors have a large impact, orchestrating host–microbiota crosstalk across the life time. Alterations in the gut bacterial composition (i.e., dysbiosis) could lead to the pathogenesis of many diseases, including IBS, inflammatory disorders and gastrointestinal infections [2].

Therefore, the aim of this abstract is to discuss the role of nutrition and lifestyle in maintaining gut health as well as to describe how several dietary strategies to manage symptoms in IBS could impact the microbial community, as it was discussed by a round table organised by ESDN Gastroenterology in the EFAD Conference 2018.

Discussion: In recent years an enormous scientific interest has developed in the area of probiotics and prebiotics, due to their ability to manipulate the microbiota and/or their metabolic imprint. Prebiotics are defined as the compounds (mainly dietary fibre, carbohydrate-based, phenolics, polyunsaturated fatty acids) that are selectively utilized by host microorganisms conferring a health benefit, while probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host [3]. Moreover, the consumption of fermented foods – such as yogurt, kefir and other cultured dairy products, containing live microorganisms, including *Lactobacillus* and *Streptococcus*, is considered beneficial against some metabolic disturbances, namely cardiovascular disease and diabetes type 2 that are derived from their probiotic effect and the ingestion of the microbial metabolites and products of fermentation [4].

Apart from diet, other non-dietary factors such as smoking, stress and sedentary lifestyles have been associated with alterations in gut microbiota profiles, including reductions in potentially beneficial microorganisms, and increase the risk of several disorders. For example, smoking-induced alterations in microbial composition has been associated with increased risk of Crohn disease, while stress has been proven to have an impact on colonic motor activity via the gut-brain axis contributing to IBS. Moreover, exercise seems to influence microbial populations that are associated with obesity [5]. Therefore, the adherence to a healthy lifestyle pattern including a wide variety of foods, namely whole grain products, fruit and vegetables as well as fermented foods, while engaging with behaviours such as participating in physical activity and stress management processes and avoiding smoking, could beneficially affect the gut microbiota.

IBS is a functional bowel disorder characterised by abdominal pain with disordered defecation. Alterations of the microbial composition of the gut that are observed in some people with IBS may play a role in its pathogenesis causing instability of the gut microbiota, including hypersensitivity to colonic gas. This dysbiosis of the luminal and mucosal colonic microbiota in IBS, frequently characterised by a reduction in species of Bifidobacteria, has been associated with worse symptom profile.

Probiotic supplementation trials suggest intentional modulation of the GI microbiota may be effective in treating IBS. Although, there are numerous probiotic randomized clinical trials, there is still insufficient good evidence to recommend a specific probiotic product, although there are some strains of probiotics that have an impact in some people with IBS. Thus, individuals with IBS who choose to try probiotics and find a beneficial effect after 4 weeks should know that long-term effects are still unknown [6]. A smaller number of prebiotic supplementation studies have also demonstrated some effectiveness in IBS whilst increasing Bifidobacteria, suggesting a specific prebiotic-stimulated growth of those bacteria as a therapeutic target [7].

In contrast, a novel method of managing IBS symptoms is the restriction of short-chain fermentable carbohydrates termed as *Fermentable Oligo-, Di-, Mono-saccharides and Polyols* (FODMAP). Studies consistently demonstrate clinical effectiveness of the low FODMAP diet in patients with IBS, while a possible mechanism includes reduction in colonic gas production, which leads to luminal distension improvements, and therefore management of symptoms in IBS, such as abdominal pain and bloating [8]. This efficacy has been shown only with dietitian-led dietary counselling including three stages of education: FODMAP restriction; FODMAP reintroduction; and FODMAP personalisation as it is important that people with IBS do not follow a lifelong restriction [9].

Indeed, one unintentional consequence of this dietary intervention is its impact on the microbiota. This leads to an interesting paradox; namely, increasing luminal Bifidobacteria through probiotic supplementation is associated with a reduction in IBS symptoms while in direct conflict to this, the low FODMAP diet has clinical efficacy but markedly reduces luminal Bifidobacteria concentration. Given the multifactorial aetiology of IBS, the heterogeneity of symptoms and the complex and diverse nature of the microbiome, it is probable that both interventions are effective in patient subgroups. However, combination has recently been explored and as such, presents an exciting opportunity for optimising clinical management using the low FODMAP diet, whilst preventing potentially deleterious effects on the GI microbiota [10].

Conclusions: Several dietary and lifestyle habits could impact the composition of gut microbiota. The adherence to a healthy lifestyle is considered the cornerstone of maintaining gut health. Nevertheless, changes in the gut bacterial composition could lead to the pathogenesis of many disorders, including IBS. To date, emerging evidence supports the efficacy of limited microbiota-directed therapies in treating IBS and that is probiotics, prebiotics and the low-FODMAP diet.

Conflicts of Interest: There are no conflicts of interest to declare.

Keywords: Gut microbiota, diet, probiotics, prebiotics, FODMAPs.

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