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Editorial

It gives us great pleasure to write the second editorial and welcome to the DIETS Student e-journal. This journal was conceived for three reasons. Firstly, because dietetic students wanted to know what other students are researching in Europe. Secondly, because dietetics professes to be an evidence based profession and where better to look for evidence than in our Higher Education Institutions, where students are developing their expertise? And, finally, because dietetics and future dietitians do have a significant contribution to make to improving the food choice and nutritional health of European citizens and this needs to be acknowledged and shared.

We have been delighted at the response to calls for projects completed within the past year by undergraduate and students working at master's level. The diversity is quite outstanding, with contributions from Austria, Belgium, Greece, Hungary, Ireland, Portugal and Spain. Topics cover a wide range of nutrition and dietetics science, from clinical, including non-alcoholic fatty liver disease, anthropometry, and nutritional risk to sports nutrition and catering. Students undertake a variety of projects, but all are designed to help them understand the principles of research methodologies and bioethics.

Each submission has been reviewed by members of the editorial team and external reviewers and we are grateful to them for their commitment to careful reading and subsequent feedback to the students and their supportive academic teams. The e-journal signifies commitment and also acknowledges the research expertise of the academic staff who support their students and their willingness to engage in driving up standards through peer review.

The future plan is to have two issues a year of the Student e-journal, hosted by the European Federation of the Associations of Dietitians (EFAD) now that DIETS funding has ended and to go onto encouraging students of dietetics (of which all of us are to some extent) to continue to share their interests and expertise.

We hope you enjoy, find encouragement and stimulation in this second edition.

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ANTHROPOMETRIC EVALUATION AND CHARACTERISATION OF THE EATING HABITS AND PHYSICAL ACTIVITY OF 4TH YEAR SCHOOL CHILDREN FROM MAFRA MUNICIPALITY, PORTUGAL

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Introduction: Childhood obesity results from a multiple factors. Is influenced mainly by everyday life habits. Childhood obesity is a major public health problem so is crucial to understand the related factors. As such, the present study aims to evaluate the prevalence of overweight in 4th year school children from Mafra municipality, Portugal, and characterize their dietary and physical activity habits.

Methods: Anthropometric measurements (weight, height and waist circumference) were carried in 740 children. Was applied dietary habits and physical activity questionnaire. The nutritional status was categorized using the percentile curves of the World Health Organization.

Bioethics: All children had parental or responsibility person permission to participate in this study.

Results: From the 740 children evaluated, there were 388 (52.4 %) boys and 352 (47.6 %) girls between 9 and 13 years old. The total prevalence of overweight was 35.4 %, of which 22.8 % was pre obese and 12.6 % obese. Males contribute more to that prevalence with 37.9 % (23.7 % pre obese and 14.2 % obese) of overweight. The girls prevalence was 32.7 % (21.9 % pre obese and 10.8 % obese) of overweight. Importantly, it was found that 13.6 % (101) was in the waist circumference percentile of $\geq P90$.

Regarding their dietary habits, there is a high consumption of sugar drinks and sweets, and low consumption of fruit, vegetables and fish. In general, females had better eating habits than males. Strikingly, it was found that the obesity children consume less sweet, sugar drinks and fast-food and consume more fish and salad than other nutritional status groups ($p < 0.05$).

In what refers to sporadic physical activity, was identified that the average number of energy spending periods is 6.2 ± 2.9 times per week. However, they spent 1.5 ± 0.76 hours per day in sedentary activities. The main sedentary activity was the watching TV. On average, the boys spend more time in physical activity than girls and are the same for sedentary activities ($p = 0.085$; $p = 0.00$). As expected, the obesity children had a lower frequency of physical activity and spend, on average, more time in sedentary activities than the other children ($p = 0.933$;

p=0.041).

Discussion: In general, the prevalence of overweight is lower than what was reported in previous similar Portuguese studies. However, it appears that Portugal needs more studies that using the WHO body mass index percentiles curves in order to permit more results comparability at national level. These results are relevant to the establishment of priorities for intervention, especially in the matter of food education and awareness, and encourage children to practice physical activity.

Conflicts of interest & Acknowledgements:

The author declares no conflicts of interest.

The author acknowledges to Camara Municipal de Mafra (Mafra municipality), Mafra, Portugal.

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Key Words: children, overweight, eating habits, physical activity habits, Portugal.

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COMPARISON OF DIETARY INTAKE OF CHOLINE AND BETAINE IN A SAMPLE OF PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE AND HEALTHY CONTROLS

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Introduction: Non alcoholic fatty liver disease (NAFLD) covers a wide range of liver disorders from steatosis to nonalcoholic steatohepatitis and cirrhosis. The increased prevalence of the disease and its association with other pathological conditions, such as type II diabetes, metabolic syndrome and cardiovascular diseases, make NAFLD an interesting field for study. The implication of several environmental factors in the occurrence and progression of NAFLD has been investigated, and dietary habits are amongst them. Data from epidemiological and clinical studies support association between choline and betaine intake and the risk of developing NAFLD. Dietary intake of these nutrients may affect the proper liver function; betaine mainly through the metabolism of homocysteine and choline through oxidation of fatty acids. The aim of this study is the evaluation and comparison of the dietary intake of betaine and choline between patients with NAFLD and healthy controls.

Methods: The study sample was comprised of 58 NAFLD patients and 58 healthy controls matched with the patients according to gender, age and body mass index. Dietary intake was assessed with three 24-hour dietary recalls, and these were used to calculate the intake of betaine and choline. Furthermore, personal history and physical activity habits were recorded and anthropometric parameters and blood biochemical markers' concentrations were measured. For 25 of the patients liver biopsies were also available. Student t-test, Mann-Whitney U-test, Pearson's correlation and logistic regression were used for the conduction of the statistical analysis. Data were analyzed with SPSS v18.0.

Bioethics: This thesis was approved by the Ethics Committee of the Hippokration General Hospital of Athens and by the Ethics Committee of Harokopio University and was carried out in accordance with the Declaration of Helsinki.

Results: The evaluation of participants' anthropometric characteristics and dietary habits revealed significant differences, between the two groups, in the waist circumference ($p = 0.03$), level of abdominal fat ($p = 0,008$) as assessed by abdominal bioelectrical impedance analysis, and the consumption of starchy products ($p = 0,03$). There was no difference in dietary betaine and choline intake between the two groups, as well as between patients with simple steatosis and patients with steatohepatitis. The percentage of patients and controls who covered the adequate intake (AI) of choline were remarkably low and the lowest was observed in male patients (2,9%).

Positive correlations were observed between betaine intake and adiponectin ($r = -0,223$, $p = 0,02$) and interleukin-8 (IL-8) ($r = -0,193$, $p = 0,04$), as well as between choline intake and

adiponectin ($r = -0,229$, $p = 0,001$) and C-reactive protein (CRP) ($r = -0,223$, $p = 0,02$). Finally, dietary intake of betaine and choline was not significantly associated with the presence of NAFLD in multivariate logistic regression models.

Discussion: According to this epidemiologic study, there were no significant differences in dietary intake of betaine and choline between patients with NAFLD and healthy controls. The results from the present study should be confirmed by other studies with larger samples.

Conflicts of interest & Acknowledgements:

The author declares no conflicts of interest.

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Key Words: non-alcoholic fatty liver disease, betaine, choline, diet

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THE ROLE OF COFFEE CONSUMPTION ON THE RISK OF DEVELOPING STROKE

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Introduction: Coffee intake on the risk of coronary heart disease has already been studied. However, the effect of coffee consumption on stroke development remains not well understood. The purpose of this work was to investigate the relation between coffee consumption and stroke in Greek population.

Methods: A multi-centred, case-control study was conducted during 2009-2010. The study included 250 patients with a first stroke event (77 ± 9 years, 56% men) and 250 age-sex matched controls (73 ± 9 y, 56% men). The data were collected from two Hospitals in Athens and the University Hospital of Ioannina. The information obtained from participants included socio-demographic and anthropometric characteristics, lifestyle habits (i.e., physical activity, smoking), nutritional and psychological assessment and medical history. Regarding coffee drinking, volunteers were asked about the frequency of coffee consumption, the daily number of cups consumed, the kind and type of coffee, the addition of sugar or substitute, and the amount of sugar and coffee per cup. The statistical analysis included analysis of descriptive features and characteristics associated with coffee consumption and the development of multiple logarithmic regression models.

Bioethics: The study has been approved by the Scientific Committee of Cardiology Clinic of Medical School of Ioannina University and was conducted according to the principles of the Helsinki Declaration (1989). Before collecting the information, the participants were informed for the purposes and the procedures of the study and gave their written consent.

Results: Crude analysis revealed that consumption of 0-1 cup of coffee per day compared to no-consumption was associated with 52.8% lower likelihood of having a stroke event (Odds Ratio (OR): 0.47, 95%Confidence Interval(CI): 0.25 - 0.89). However, after adjustment for possible confounding factors (age, sex, BMI, physical activity, smoking, family history of cardiovascular disease, hypertension, hypercholesterolemia, diabetes mellitus), the aforementioned relationship did not remain significant, suggesting a potential mediating effect. Added sugar was associated with 31.3% higher likelihood of stroke (OR: 1.313, 95%CI: 1.001-1.722) for each additional tablespoon added to coffee. Among different kinds and types of coffee, only Turkish (OR: 0.584 95%CI: 0,348-0,981) and light coffee (OR: 0.491 95% CI: 0,264-0, 913) seemed to act protectively, but the relationship was, again, mediated as other factors were included in the model.

Discussion: The present work stated a hypothesis that daily consumption of up to 1 cup of coffee, especially the Turkish and light one, with little or no added sugar may associated with a reduction of the risk of stroke.

Conflicts of interest & Acknowledgements:

The authors had no conflicts of interest and the present study did not receive any financial support.

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Key Words: coffee consumption, stroke, risk, epidemiology

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NUTRITIONAL KNOWLEDGE OF SOCCER PLAYERS

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Introduction: Food intake is known to have an important influence on sport performance. Soccer is a glycogen-depleting activity and carbohydrate intake should be optimized to maintain adequate glycogen stores. Nutritional knowledge is an important determinant of dietary habits.

This study aims to compare the nutritional knowledge and awareness of its impact for optimal sports performance between professional soccer players and amateur soccer players.

Methods: The participants to this study were aged between 16 and 36 with various level of education. A validated questionnaire was completed by 100 professional male soccer players (age $25,4 \pm 4,2$ y) and 100 amateur male soccer players (age $23,4 \pm 4,6$ y) from different provinces in Belgium (Antwerp, East Flanders and Flemish Brabant). The professional players belonged to five primary division soccer clubs and one secondary division club; amateur players belonged to fifteen different soccer clubs. The questionnaire consisted of 45 multiple choice questions and 2 open questions, was available in three different languages (Dutch, English and French) and was completed in the presence of a graduating dietetic student.

Results: On average, professional soccer players scored $18,4 \pm 5,2$ questions out of 39 multiple choice questions correctly. Lowest score was 6, whereas the highest score was 30, indicating a diverse nutritional knowledge between players. Amateur players' scores ranged between 11 and 32, and therefore also varied considerably, but their score on average was $19,5 \pm 4,3$ which was significantly higher than professional players' score ($+2,1$; $p < 0,05$). On the other hand, 70% of the professional players versus 47% of the amateur players believed they consisted of sufficient nutritional knowledge for optimal sport performances. Furthermore, 92% of the professional players and 71% of the amateur players indicated to believe that specific sport nutrition is essential for optimal sport performance. Level of education did not have a significant effect on the nutritional knowledge of both professional and amateur players.

Discussion: Although actual eating behaviour wasn't examined in this study, these results indicate that nutritional knowledge of soccer players might be insufficient to result in optimal sport performance. Professional soccer players in particular could be targeted to improve nutritional knowledge in order to contribute to their sport performance.

Conflicts of interest & Acknowledgements: No conflict of interest or ethical issue

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Key words: nutritional knowledge – soccer - professional players - amateur players – sport nutrition

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OVERWEIGHT IN BRAZILIAN AND AFRICAN IMMIGRANTS LIVING IN PORTUGAL - PREVALENCE AND ITS ASSOCIATION WITH LENGTH OF RESIDENCE

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Introduction: Past research has shown a positive association between length of residence in the host country and body mass index, in immigrant populations. In Portugal, immigrants represent 4.3% of the overall population and their overweight prevalence is unknown. The main goal was to estimate overweight prevalence in adult immigrants (18 to 64 years old), living in Lisboa and Setúbal.

Methods: The present work consists in a secondary analysis of a previous research concerning the health of African (imigrAfr) and Brazilian (imigrBr) immigrants living in Portugal and it follows an observational and cross-sectional design, with a simple spacial sampling method and collection of data by face-to-face interview.

Bioethics: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and following general good practices guidelines for clinical investigation. Verbal informed consent was obtained from all participants. This verbal consent was witnessed and formally recorded.

Results: The sample had 1980 immigrants (46,6% were male). The average age for imigrAfr was $36,6 \pm 11,7$ years (and $32,5 \pm 9,0$ in imigrBr). The length of residence in Portugal (tRes) was $4,0 \pm 3,0$ (imigrBr) and $13,4 \pm 8,2$ (imigrAfr). Based in self-reported weight and height data, 20,9% of imigrBr males were overweight and 7,8% were obese (28,0% and 7,1%, respectively, for female). 36,0% of imigrAfr male were overweight and 9,1% were obese (33,0% and 17,8%, respectively, for female). By applying a generalized linear model, we verified that age, being married, tRes, number of meals per day (refPrinc) and number of snack per day (refInt) were determinants of BMI in men. In women, the same determinants were found, except for refPrinc. In logistic regression, the overweight determinants in men were: age, being married, refPrinc, refInt. In women they were: age, tRes, refInt.

Discussion: Immigrants present lower overweight and obesity prevalence rates when compared with Portuguese natives. Nonetheless, in the multivariate analysis, these prevalence rates tend to increase with tRes. This factor is especially important in women. It's important to identify which acculturation variables are more important promoters to prevalence rates among immigrants, in order to boost effectiveness in interventions to promote weight control in this population.

Conflicts of interest & Acknowledgements: No conflict of interest. rd like to thank the High Comissary for Health for financing this study and all its participants, field workers and researchers involved.

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Key Words: Obesity; Overweight; Acculturation; Immigrants' health

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EFFECT OF OIL, WHOLE WHEAT AND BEAN FLOUR SUPPLEMENTATION ON PHYSICAL AND SENSORY PROPERTIES OF RUSKS

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Introduction: Rusk is a Greek traditional bakery product, daily consumed as part of a balanced Mediterranean diet and potential carrier of bioactive compounds and dietary fiber. The use of healthier fats, such as olive oil, is nowadays a consumer demand and additionally legume flours could be an excellent component for rusk production with nutritional and functional properties. Although rusk quality is highly related to its physical and sensory properties, little research has been conducted. Consequently, the aims of this study were to conduct a research of the mechanical, physical and sensory characteristics of rusks when adding oils, whole wheat and bean flour, and to examine the factors affecting consumers acceptance.

Methods: Wheat rusks were supplemented with different contents of oils (olive oil 5%, 20%; sunflower oil 20%), whole wheat flour (0%, 40%, 100%), as well as bean flour (40%). Chemical analysis was performed for all rusks and flours and included moisture, ash, protein, total lipid and dietary fibre content determination. Hardness and fracturability of rusks were evaluated using a TA-XT2 Texture Analyzer, porosity using a gas multipycnometer, while color, including lightness, yellowness and browning index, was determined by a Minolta CR200 tristimulus chromatometer. Organoleptic evaluation was conducted by 32 untrained panelists, who performed hedonic sensory tests and intensity tests of characteristics. Data were analyzed using SPSS 20.0 for Windows. Comparison of variables was performed with single factor analysis of variance or non parametric Kruskal-Wallis test. A significance level of $P < 0.05$ was used. Simple linear correlations (Pearson or Spearman correlation) between some analyses were evaluated.

Bioethics: -

Results: Texture analysis showed that a rusk with high oil content (20%) or whole wheat flour substitution level (100%) is significantly harder and less fragile (hardness was strongly correlated with fracturability, $r = -0.801$, $P < 0.05$). The above results were confirmed by porosity measurements, as rusks with increasing hardness and low fracturability showed lower porosity. The type of fat showed no differentiation, whereas rusks prepared with 40% bean flour showed higher hardness, lower fracturability and porosity compared to all other samples ($P < 0.05$). Color evaluation observations revealed that an increase in oil content and whole wheat flour incorporation resulted in more yellow and more brown rusks, respectively. Hedonic and intensity sensory tests showed that rusks were acceptable for all their attributes except for the flavor of those containing sunflower oil, and the textural properties of rusks with bean flour. Increasing hardness decreases consumer liking ($\rho = -0.319$, $P < 0.05$), the opposite trend was estimated for fracturability ($\rho = 0.215$, $P < 0.05$),

while color did not affect consumers preference.

Discussion: Adding olive oil and dietary fibre in rusks is a promising prospect, as it leads to the production of bakery goods with remarkable nutritional value and highly accepted sensory attributes. Additionally, the use of bean flour is a well promising alternative in the field of rusk production and bakery science generally. Its textural properties could be enhanced either by using higher amounts of yeast, or by modification of the fermentation and baking time. Further research is needed to examine the exact supplementation required for obtaining the best compromise for sensory and nutritional balance.

Conflicts of interest & Acknowledgements: No conflicts of interest.

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Key Words (3-5): baked products, dietary fibre, oils, sensory properties

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EVALUATION OF SALT IN SCHOOL MEALS AND CONSUMERS SALT PERCEPTION

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Introduction: Considering the fact that high blood pressure is a major risk factor for cardiovascular disease and its association to salt intake and the fact that schools are considered ideal environments to promote health and proper eating habits, the objective of this study was to evaluate the amount of salt in meals served in school canteens and consumers perceptions about salt.

Methods: Quantification of salt was performed using a portable salt meter- PAL ES2. For food perception we constructed a questionnaire that was applied to students from high schools.

Bioethics: Authorizations for sample retrieving and questionnaires were obtained from all entities involved in the study. The study was approved by the university's scientific committee.

Results: A total of 798 food samples were analyzed. Bread presents the highest value with a mean of 1.35 (SD=0.12). Salt in soups ranges from 0.72 g/100 g to 0.80 g/100 g ($p=0.05$) and main courses from 0.71 g/100 to 0.97 g/100g ($p=0.05$). Salt in school meals is high with a mean value from 2.83 to 3.82 g of salt per meal, which is between 2 and 5 times more than the RDA for children. Moreover, a high percentage of students consider meals neither salty nor lacking in salt, which shows they are used to the intensity/ amount of salt consumed.

Discussion: Making healthy choices is only possible if backed up by an environment where such choices are accessible. Therefore salt reduction strategies, aimed at the food industry and catering services should be implemented, with children and young people targeted as a major priority.

Conflicts of interest & Acknowledgements: No conflicts of interest.

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Key Words: salt intake, salt evaluation, health promotion, catering, school meals, salt perception

DIETARY PATTERNS AND 10-YEAR INCIDENCE OF CARDIOVASCULAR DISEASE RISK: A MULTIVARIATE ANALYSIS OF THE ATTICA STUDY

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Introduction: Cardiovascular disease risk is affected by nutrition. The aim of this study is to evaluate the ten-year cardiovascular disease (CVD) risk regarding to dietary habits of healthy men and women living in the Attica area.

Methods: Research was based on the cross-sectional study ATTICA. From 2001 to 2002, 1514 men and 1528 women (over 18 years old), without any clinical evidence of CVD, living in the Attica area, were enrolled in the ATTICA Study. The classification of individuals into subgroups was based on HellenicSCORE, a score that predicts the ten-year cardiovascular disease risk. Particularly components of the HellenicSCORE were age, sex, systolic blood pressure, total cholesterol levels and smoking habits. The score estimated the likelihood of having a fatal CVD event, stratified by sex, age category and smoking habits. To extract dietary patterns a-posterior analysis was used by applying factor analysis. The correlation matrix among the dietary variables was set over 0,4 ($r > 0.4$) while the Principal Component Analysis (PCA) was applied.

Bioethics: The study has been approved by the ethics committee of the First cardiology clinic, School of Medicine University of Athens.

Results: According to the calculated HellenicSCORE, 76% of women and 83% of men belong to the low risk subgroup of having 0% to 5% likelihood for developing a CVD event during the next ten years, 21% of women and 11% of men run 5% to 10% CVD risk, and 3% of women and 6% of men belong to the high-risk subgroup of >10% CVD risk. From the applied Factor Analysis, 3 dietary patterns have been extracted that interpret 8% of variation in dietary habits of the participants; the first factor represents the current Greek diet, the second factor represents an unhealthy dietary pattern with main features the increased consumption of red meat and low consumption of vegetables and the third factor is a healthy eating pattern characterized by increased consumption of poultry and decreased consumption of sweets and nuts. None of these dietary patterns was associated with HellenicSCORE.

Discussion: A considerable proportion of men and women are at high risk. Although it was not associated with CVD risk score, the most dominant pattern of the participants was an unhealthy dietary pattern; a fact that should be seriously be taken into attention by public health authorities.

Conflicts of interest & Acknowledgements: No conflicts of interest have arisen.

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Key Words: cardiovascular diseases; nutrition surveys; risk

Contributors: This study is completed due to the contribution of my supervisor Professor D. Panagiotakos. Contributors in the ATTICA Study were : Professor Christos Pitsavos, Professor Christodoulos Stefanadis, Drs Christina Chrysohoou and John Skoumas as well as the ATTICA Study group.

NUTRITION RISK SCREENING IN HOSPITALIZED PATIENTS THROUGH THE PROJECT «nutritionDay»

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Introduction: The prevalence of disease related malnutrition is increasing worldwide and has negative consequences for both patients' outcome and the healthcare system. The «nutritionDay worldwide» is an one-day multinational research program, aiming at monitoring patients' nutritional status and raising awareness regarding hospital malnutrition. The aim of the present study was to describe the results of the Greek participation in the "nutritionDay 2012" initiative. Moreover, current practices regarding nutritional screening and dietary treatment of hospitalized patients and nutritional variables affecting the length of hospital stay (LOS) were also explored.

Methods: The study included 513 patients, from 35 different wards in 8 Greek hospitals. During the nutritionDay, all the relevant questionnaires of the project, available at www.nutritionday.org, were completed. One month later, patients' clinical outcome was recorded by the dietitian in charge and LOS was evaluated till that day. The collected information included anthropometric indices, affected organs, type of therapeutic diet/nutritional support, weight and appetite history. The student was involved in patients' interviews during the nutritionDay, data transfer in the project's electronic database and in the statistical analysis of the data by using PASW Statistics 18.0.

Bioethics: This project has been approved by the Ethics Committee of the Medical University of Vienna and also by the Ethics Committees of each hospital participated in the nutritionDay. Student had the permission to interact with patients and to manage data from their notes.

Results: Only 4 departments included, applied nutritional screening as a routine procedure. The 94,9% of the patients received hospital food or a special diet, 1% of the patients received oral nutritional supplements and 2,4% of the patients received enteral and/or parenteral nutrition. The 49,3% of patients reported unintentional weight loss during the last trimester, whereas 50,5% reported dietary intake less than usual the week before the nutritionDay. On nutritionDay, 22,6% of the patients consumed half of the main meal offered and 15% of the patients didn't consume it at all, mainly due to loss of appetite and dislike of the hospital menu. In addition, 45% of the patients consumed food prepared out of hospital, namely their favorite home dish, cake/biscuits and fresh fruits/juices. One month after the nutritionDay median LOS was 11 days (5,18) and 76% of patients were at home, 12,5% still at hospital and 3,5% were deceased. In multiple regression models, LOS was associated with ICU stay ($\beta=0.303\pm 0.080$, $p<0,001$), gastrointestinal disease ($\beta=0.222\pm 0.058$, $p<0,001$), musculoskeletal disease ($\beta=0.094\pm 0.048$, $p=0.05$), unintentional weight loss during the last trimester ($\beta=0.151\pm 0.044$, $p=0.001$) and decreased dietary intake during the last week ($\beta=0.037\pm 0.017$, $p=0.03$).

Discussion: Nutritional screening is not a routine procedure in Greek hospitals. Among several

variables of the nutritional assessment, percentage of unintentional weight loss during the last trimester before hospitalisation and reduced dietary intake the week before the assessment, were significant predictors of LOS. It is therefore crucial to establish an integrated nutritional care system with key components the trained healthcare providers, the adequate food supplies, the nutritional screening, the frequent weighing of patients and the monitoring of dietary intake.

Conflicts of interest & Acknowledgements: There are no conflicts of interest.

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Key Words (3-5): hospital malnutrition, nutritional screening, length of hospital stay

Contributors: A. Anastasiadou, A. Baschali, M. Bletsas, Z. Bouloumbasi, P. Detopoulou, C. Dimosthenopoulos, P. Giannoulaki, G. Kabatzi, D. Karayiannis, S. Karantaglidou, I. Karli, T. Lappa, E. Papagiannidou, V. Papamikos, K.A. Poulia, A. Tsagari

THE REAL NUTRITIONAL VALUE OF BREAD AND BAKERY PRODUCTS COMPARED IN THE NUTRIENT TABLE

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Introduction: Nowadays, although the principles of healthy nutrition are becoming more and more widespread, white bread is still the most commonly consumed type of bread. Also, concerning the frequency of consumption, other popular bakery products include the watery bread roll, cocoa roll and cheese scone. The ingredients and the amount of energy, protein, fat and carbohydrate of these products do not fully match the data written in nutriment facts labels.

Methods: During the research we analysed the content of some watery rolls, cocoa rolls and cheese scones purchased from different bakeries and hypermarkets. We defined the water content by gravimetric methods, the fat content by bakery methods, the protein content by the Kjeldahl method (MSZ EN ISO 6367-11 regulation) and the carbohydrate content by muriatic acid hydroanalysis and the Luff-Schoorl method (MSZ EN ISO 3-1-79-796 regulation).

Results: During the chemical analysis we came to the conclusion that the energy of white bread types diverge from the data shown in nutriment chart by 23.2 kcal or 9 per cent on average. As for macronutrients, only in the case of carbohydrate content can we talk about significant, a 6.6 g difference in a 100g product. The average figures of the bread roll were identical with the official figures, but there was a substantial division between the sizes of them. The bread roll of Tornycs Bakery was nearly 20 g (19.14 g) bigger than the one from Aranycipó Bakery. Apart from size differences, we experienced numerous interesting facts. The energy value that diverged from the nutriment chart the most was 296.576 kcal, which means a 137 kcal difference. Significant distinction appeared in the fat content of products, the lowest was 4.27 g, the highest was 19.1 g in 100g of scone. I must highlight the comparison of calory values of cocoa rolls. The biggest difference between the products was 233.44 kcal. It is important to mention the division of carbohydrate values, because instead of the official 30.9 g we only found samples containing more carbohydrate. The values ranged between 7.34 and 42.48 g.

Discussion: In most cases we were able to prove that the ingredients of products sold under the same name show significant differences on the basis of where they were produced. This fact is true concerning the protein, fat and carbohydrate content. The diversity of their sizes can easily mislead the customer or consumer, as there are many products available in shops whose size differ from the values of the nutriment chart.

Key Words (3-5): bread, bakery products, nutritional value

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FOOD WASTE AND FOOD INTAKE ASSESSMENT IN A CATERING ESTABLISHMENT

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Introduction: World population is increasing, leading to the need to increase food production (70%). The assessment of food waste and the nutritional intake is very important, since there are approximately 870 million malnourished people worldwide. The aim of the present study was to assess the food waste and the nutritional intake in a Catering Establishment (CE) through the quantification of meals, amount of food produced, distributed, rejected, leftovers, plate waste and rest per capita.

Method: This is an observational cross-sectional study, developed for 8 days, at lunch. In the selection process were included 12 dishes of the menu (4 of diet, 4 of meat, 4 of fish) selected by convenience, choosing plates without bones or fishbones. The CE receives, daily, nearly 185 employees, mostly in the age group between 30 and 60 years. To verify the existence of statistically significant differences in the plate waste between both genders, the Rest Intake (RI) between components of the dish, and for the comparison of nutritional intake and nutritional requirements, was used the *Student's t-test*. The level of significance was 5% ($p < 0.050$).

Results: In this study the food waste was 23.1%, with an RI of 10.1% and 14.5% of leftovers. The value of RI showed that, according to Aragão, 2005, the CE has a regular (8.6%) performance in meat, and bad performance in fish (11.7%) and vegetable component's (10.4%). The leftovers were higher in vegetables (rice, pasta, potatoes) (26.2%) and smaller in fish (3.4%). In females, all macronutrients, fiber and energy intake was higher than the requirements ($p = 0.001$) and lower in fat ($p = 0.880$). In males, the intake of fat and fiber was lower than the requirements ($p = 0.001$), and in the other macronutrients and energy in meals with dessert, was higher than requirements ($p = 0.001$).

Discussion: Assessing food waste, the RI and leftovers, it is concluded that the values obtained exceeded the limits of known references. Similar studies also showed high values of these variants. The assessment of energy intake showed that this isn't proper, being higher than requirements. There aren't known studies of nutritional intake in CE, however consulted studies reveal nutritional intake values lower than requirements, with exception for carbohydrates. This study may suggest the need of better planning of meals having a real perception of what are the preferences of customers.

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Key words: catering, food waste, plate waste, dietary intake, nutritional intake.

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FOOD INTAKE AND BODY COMPOSITION OF PORTUGUESE MIDDLE DISTANCE ATHLETES

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Introduction: The athletic performance is influenced by several factors, such as anthropometric profile and nutrition status. The middle-distance discipline is widely practiced in Portugal with many medals won, although currently there are less medals by this discipline. The purpose of this study is to evaluate the nutritional intake and anthropometric profile of the professional Portuguese middle distance athletes.

Methods: Dietary intake of 16 elite Portuguese athletes (n=11 males; n=5 females; age 19-35 years) from short middle-distance (n=10) and long middle-distance (n=6) was evaluated over a period of seven days of training during the pre-competition period, by food diary. Food diaries were evaluated through *FoodProcessor*[®]. Height, weight and body composition were also assessed by vertical stadiometer *SECA220*[®], *TanitaBC418*[®] and *AkernBIA101*[®], respectively. For statistical analysis the software *IBM SPSS Statistics*[®]-version 21.0 was used. Means and standard deviation were estimated and Pearson's correlation with p values<0.05 were considered significant.

Bioethics: Informed consent was requested to individuals participating in the study.

Results: The athletes' diet consisted of 2585±367 kcal and 2115±442 kcal daily for males and females, respectively. The amount of ingested carbohydrates was 5.45±0.8g/kg for males and 5.71±1.84g/kg for females. The amount of protein intake was 1.94±0.31g/kg for males and 1.89±0.6g/kg for females and of lipids 1.17±0.27g/kg for males and 1.3±0.51g/kg for females. Total fluid intake from water, food and beverages was 2785±534mL (males) and 2228±861mL (females). The athletes mean height was 176±7.18cm (males) and 164.2±7.98cm (females), mean weight 64.26±6.87kg (males) and 51.06±5.29kg (females), mean fat mass of 5.31±2.27% (males) and 8.24±3.34% (females), and total body water of 69.31±1.66% (males) and 67.18±2.42% (females). There was a difference in weight, height and percentage of fat mass among short middle-distance and long middle-distance athletes, with the first having more body mass and less fat mass percentage than the seconds (p<0.05). There was no significant association (p>0.05) between macronutrient intake and body composition of the athletes.

Discussion: The diet of these athletes was not in accordance with most of the recommendations for this sport namely recommendations for energy, protein, carbohydrate, micronutrients and fluid intake. The amount of carbohydrates was low for males and appropriate for females. The protein content was high in both genders. Athletes reported low fluid consumption and low micronutrient intake because of low vegetables and fruit intake. Although, water intake was the main component of total fluid intake, representing 50.84% (males) and 47.95% (females) of the total fluids ingested daily, was low for athletes.

The body composition of these athletes was appropriate for practicing this sport, namely low

weight, average height, low fat mass, low muscular mass and good hydration status. Athletes followed a pattern of the greater the distance, the lighter and less tall the athlete. This tendency facilitates the physiology of the competition. The results are in line with the literature, recording body composition similar to other studies. Moreover, at this stage of the season, training is possibly the most important factor that contributes to the maintenance of body composition.

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Key Words (3-5): athletics, middle-distance, nutrition, food intake, body composition.

Contributors: Bernardo Emanuel, Bruno Pereira, Lino Mendes, Rute Borrego, Athletes and Coaches involved in collecting data for this research.

HIGH-PROTEIN, LOW-CARBOHYDRATE DIET SUPPORTS CLIMBING PERFORMANCE: A PILOT STUDY

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Introduction: Sport climbing can be defined as the ascent of an artificial or outdoor natural wall, climbers aim to reach the top of a high-rated climbing wall. This sport is considered as a strength sport and thus an increase of the fat free mass benefits the sports performance. Besides training, nutrition has an influence on body composition, especially protein intake. A high-protein, low-carbohydrate diet is associated with a decrease of the fat mass (FM) and an increase of the fat free mass (FFM) during the diet period without negative effects on sports performances. This study therefore observes the effect of a high-protein, low-carbohydrate diet on climbing performance.

Methods: 6 climbers (35 ± 8.3 years) participated to this study; each had achieved a climbing level of minimum 6A corresponding to approximately 7.5 hours of climbing training a week. At the start of the study period, all participants received a schedule of the high-protein diet with a list of the permitted and non-permitted food, recipes, and some practical advice. During the 4-week diet period they were asked to report their food intake and their climbing performances (such as the climbing level of the climbed walls, the rate of fatigue and climbing performance compared with those before the study) by completing a food record, and a climbing report/questionnaire respectively. The anthropometric measurements were taken at the baseline, after 2 weeks and at the end of the diet intervention, particularly body weight, fat percentage via 4-points skin fold measurements, FM and FFM via bio-impedance-analysis, hand strength via electronic hand dynamometer.

Results: The average daily energy amount of the diet was 1667 ± 120 kilocalories; with a percentage energy distribution of 12% carbohydrates, 37% protein and 49% fat and micronutrients: Sodium 3.3 g, Potassium 4.2 g, Calcium 1.2 mg, Iron 10.9 mg, Vitamin B1 1.4 mg, Vitamin B2 1.9 mg, Vitamin B3 23.1 mg, Vitamin B6 1.8 mg, Vitamin A 803 RE, Vitamin C 130 mg, Vitamin D 14 μ g, and fluid intake 3 l per day. Anthropometric measurements (body weight, BMI, waistline, % FM and the absolute amount of FM) changed significantly. After the diet intervention, body weight had decreased significantly from 74.2 ± 7.1 kg to 70.9 ± 5.6 kg ($p < 0.05$). The absolute amount of FM had also decreased significantly from 8.4 ± 3.9 kg to 5.3 ± 4.3 kg, ($p < 0.05$), although lowest levels of FM were measured at week 2 (4.5 ± 4.4 kg). Even more, the absolute amount of FFM showed a significant increase from the baseline at week 2 (from 65.8 ± 5.0 kg to 67.7 ± 5.5 kg, $p < 0.05$), but not at the end (65.6 ± 5.9 kg). Based on the report of the climbing trainings, no significant differences in climbing level or handgrip strength were observed during the diet intervention. Nevertheless, the climbers perceived an improvement in climbing performance with regard to the endurance; particularly they were able to continue their climbing training more easily without fatigue. Probably due to a reduced lactate production, this cannot be confirmed.

Discussion: In conclusion, a high-protein intake in this study resulted in a favourable change in body composition, although an improvement in climbing level could not be established. The climbing performance therefore should be evaluated on different kind of aspects, including maximal climbing level, strength, endurance, self-reported sports performance, and tactics. Besides, a protein diet cannot be a recommendation on the longer term.

Conflicts of interest & Acknowledgements: /

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Key Words (3-5): High-protein – low-carbohydrate– body composition – weight loss – sport climbing

Contributors:

Elly Mertens: graduated dietitian July 2013 performed all research and data analysis

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COMPARISON OF PSYCHOLOGICAL THERAPIES AS A SUPPLEMENT TO THE NUTRITIONAL MANAGEMENT INTERVENTION FOR OVERWEIGHT AND OBESITY: COGNITIVE BEHAVIORAL THERAPY VERSUS THIRD GENERATION PSYCHOLOGICAL THERAPIES.

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Introduction: Diet should be the basis of any intervention in a weight reduction program, but by itself has shown limited effectiveness in maintaining long term weight loss. Therefore, multidisciplinary programs are recommended. Several psychological therapies are used for the management of overweight and obesity as a complementary treatment to nutritional intervention. Cognitive behavioral therapy has been the one that has won more effectiveness for weight reduction and maintenance. One component is training in self-control, which allows the individual to identify and control their behavior in situations that can act as triggers that response.

Objective: The objective of this review is to determine which of the currently used psychological therapies, cognitive behavioral therapy or third-generation therapies (mindfulness or acceptance and commitment therapy) is more effective in the treatment of overweight and obesity with the support of nutritional intervention

Methods: We conducted a search for articles related to the above therapies in databases such as Scopus, Sciencedirect and ProQuest, which was accessed through RedIRIS University of Alicante.

Bioethics The data obtained in this bibliographic research are available to the general public on the databases mentioned above. There is not conflict of interest.

Results: All studied therapies were effective in reducing weight in the short term. Cognitive behavioral therapy is one that had a greater number of studies related to the topic. Furthermore, as third-generation therapies have been recently emerged, few controlled studies included these therapies for the treatment of overweight and obesity.

Discussion: The objective of this review was to know which of psychological therapies currently used, cognitive behavioral therapy or therapies third generation (mindfulness therapy or acceptance and commitment) are more effective in the treatment of overweight and obesity with the support of the nutritional intervention. In reviewing the databases we found several studies in regard to cognitive behavioral and obesity therapy, while in relation to therapy third generation, Mindfulness and Acceptance and Commitment, there are very few studies available. In studies related to cognitive behavioral therapy, was found greater weight reduction in those who had a restriction between 1200 -1500 calories per day. The long term results of cognitive behavioral therapy are not promising, because they regained the lost weight. More research is needed with control in the post-treatment stage for better results. In the studies related to Acceptance and Commitment therapy, a significant weight reduction was found, which maintained in a long term. Only one study was found in terms of Mindfulness Therapy, which had a good weight reduction

but did not present control group and post treatment information. Third generation therapies have few studies related to overweight and obesity.

Conflicts of interest & Acknowledgements: This study does not present conflicts of interest.

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Key Words (3-5): mindfulness, obesity, weight loss, cognitive behavioral therapy.

Contributors:

ANALYSIS OF GLUTEN CONTAMINATION IN SPECIAL DIETARY-USE GLUTEN-FREE PRODUCTS AND INVESTIGATION OF THEIR REGULATORY COMPLIANCE

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Introduction: Celiac disease is a genetically determined autoimmune disease, which is primarily characterized by intestinal mucosal damage and malabsorption. The process is triggered by alpha-gliadin, secalin, hordein, and avenin found in wheat, rye, barley and oats respectively, as well as in food products made by using these ingredients, when entering the body. Celiac disease affects 0.5% to 1% of the general population.

Methods: *Study aims:* The aim of the present study was to measure the contamination of special dietary-use gluten-free products and the compliance of these products with the legal regulations. The gluten content of commercially available gluten-free products cannot exceed 20 mg/kg as specified in the decree. The gluten content of extremely low gluten-content food products can range from 20 mg/kg to 100 mg/kg. Manufacturers take responsibility and guarantee that there is no contamination in these products. However, in some cases there is a risk of contamination due to impurities of the raw materials. *Analyzed samples:* For the study's purposes, the products of six different manufacturers were chosen. Twenty gluten-free products available in Hungarian retail outlets were analysed. Products of both Hungarian and international manufacturers are included in the analyzed samples (n=2). The analyzed products are classified into the following categories: ready-to-consume, flour mixes and other products. The samples were analyzed in two parallel measurements. The R5 antibody-based ELISA method was chosen as it is the measurement method officially accepted by the Codex Alimentarius Commission to measure gliadin contamination. The Veratox for Gliadin R5 Kit of the Neogen Corporation was used. The results were detected by Thermo Scientific Multiscan FC ELISA Reader.

Bioethics: This thesis was approved by the Ethics Codex of the Faculty of Health Sciences, Semmelweis University, Budapest, Hungary.

Results: The percentage of contaminated samples are given below. 15% of the samples did not meet the above requirements but contained contamination in excess of the limit values. Samples exceeding the 20 mg/kg threshold were only found in the flour-mixes category, no non-compliant samples were found either among ready-to-consume products or among other products. 30% of samples were contaminated with gluten in flour mixes category. However, none of the samples exceeded the 100 mg/kg threshold. The above samples represent products that are sold as gluten-free products, although, not all met the criteria for very low gluten-content food products.

Discussion: In conclusion, no samples of excessively high contamination were identified but even lower levels of contamination are not permissible, since they lead to further deterioration in the condition of celiac disease patients, who should follow a strict gluten free diet. Therefore, it is necessary to encourage greater caution among manufacturers. It would make sense to regulate

the introduction of kits that can be used simply and quickly for tasks ranging from the controlling of raw materials, through the entire process, to the distribution of the finished products.

Conflicts of interest & Acknowledgements: Acknowledgements to Dr. Zsuzsa Varga, associate professor of dietetics, for her advice and support.

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Key Words: : celiac disease, gluten- free diet, gluten-free products, gluten contamination

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IN VITRO ASSESSMENT OF SURVIVAL TO GASTROINTESTINAL TRACT OF PROBIOTIC MICROORGANISMS IN KEFIR

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Introduction: Probiotics are microorganisms that, when consumed in adequate amounts, confer a beneficial effect on the health of the host. In order to estimate the viability of probiotic microorganisms in dairy products, we proceeded to submit a sample of non-commercial kefir to an *in vitro* digestion, simulating human digestion.

Methods: We evaluated two types of experiments, one experiment was composed by combined phases (gastric and intestinal) and one experiment composed by an intestinal phase independent of gastric phase. We produced two analog exocrine substances ejected into the gastrointestinal lumen, the gastric juice and the intestinal juice, using methodology of *Charteris et al.* (1998). Samples of kefir were incubated with gastric juice for 2 hours at 37°C. Subsequently, samples were centrifuged and mixed with intestinal juice for 24 hours at 37°C. The enumeration of colony forming units (CFUs) in culture mediums MRS (anaerobiosis), MPCA and CGA, from incubated samples, allowed estimating the survival rate of different groups of microorganisms. The identification of gastrointestinal transit survivors was performed by PCR and sequencing.

Results: An important reduction on CFUs was observed after 1.5 hours of digestion. A decrease of 61.54 ± 2.32 % in the viability in MPCA, 1 order of magnitude in CGA and 2 orders of magnitude in MRS were observed after the gastric phase. After the intestinal phase, only MRS medium contained colonies after 6 hours in intestinal juice (previous gastric phase) and no viable was detected after 12 hours. In the intestinal phase independent of gastric phase test, a reduction of 2-3 log units in the number of CFUs was observed in all cases. There were cell survivals after 12 hours (all culture medium). Molecular analysis of survivors showed the yeast *Saccharomyces cerevisiae* as one of the microorganisms more resistant to intestinal transit in kefir.

Discussion: In the present study, we observed that there is a possibility of adaptation of microorganisms after 1.5 hours or a possible elimination of sensitive microorganisms before that. Unsurprisingly, intestinal stress was more harmful than gastric stress due to the presence of acid tolerant microorganisms. In addition, the combined experiment (according to human physiology) was more stressful than independent phases experiment due to great contrast between phases. Therefore, some results of experiment with separate steps are not solid. Many published studies do not consider the human digestive physiology. To simulate digestion, numerous models of separated phases (gastric and intestinal) are created and they could extrapolate untrusted results. Finally, it was concluded that *Saccharomyces cerevisiae* (identified in various mediums and both types of experiment) can survive to gastrointestinal stress according to the

literature (Martins et al., 2005; Pennacchia, Blaiotta Pepe and Villani, 2008; Tompkins, and Arcand Mainville 2011; Rajkowska and Styczyńska Kunicka-2010) and causes beneficial effect in mammals (Martins et al., 2005) indicating the possibility of a beneficial effect to the host.

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Key Words (3-5): *Saccharomyces cerevisiae*, Probiotics, Digestion, Kefir

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HEALTHY FOOD MADE EASY: AN EVALUATION OF ITS EFFECTIVENESS AS A PEER-LED COMMUNITY NUTRITION AND COOKING PROGRAMME

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Introduction: Internationally it is recognised that individuals of low socio-economic status (SES) experience higher rates of mortality, morbidity¹, and poorer diet quality². It has also been found that disadvantaged women living with children and women in lone-adult family units are at an increased risk of consuming a poor diet³. Healthy Food Made Easy (HFME) is a peer-led community nutrition and cooking programme which aims to improve dietary behaviours, cooking skills and nutritional knowledge in order to reduce diet-related diseases. We aimed to evaluate HFME in terms of (i) improving self-reported dietary behaviour, nutritional knowledge and self-efficacy, (ii) ascertaining effectiveness among sub-groups of participants, and (iii) providing recommendations to guide future development of HFME.

Methods: Design: Observational, comparison-group impact evaluation. **Setting:** Peer-led community nutrition and cooking programme delivered in an urban community in Dublin, Ireland. **Subjects:** 91 female participants; 61 post-course participants who had attended HFME 8-12 months previously and 30 pre-course participants. **Methods:** A telephone-assisted questionnaire was used to elicit all data including quantitative and qualitative responses relating to dietary behaviours, nutritional knowledge and self-efficacy. Mann-Whitney U tests and Chi-square tests for Independence were used to analyse quantitative data and to determine effectiveness of the programme. Sub-group analysis was carried out based on age, education, family demographics and area deprivation index score.

Bioethics: Undergraduate projects are subject to consideration by the Final-Year Research Project Committee (comprised of academic staff from the DIT and TCD) which reviews and approves each project for compliance with the Declaration of Helsinki.

Results: Comparison of the pre- and post-course participants illustrated that HFME is effective in reducing consumption of fast food ($P<0.05$), improving self-efficacy in cooking a meal from basic ingredients ($P<0.05$) and shopping for a healthy diet on a budget ($P<0.05$). Post-course individuals categorised as "confident" in cooking reported lower fast food consumption ($P<0.05$), increased frequency of breakfast consumption ($P<0.05$), and were less likely to cook ready-meals ($P<0.05$) than those categorised as "not confident". Younger women (<39 years) were more likely to consume fast food ($P<0.05$) and soft drinks ($P<0.005$) and less likely to consume breakfast ($P<0.05$). Women living with children were more likely to consume fast food ($P<0.05$) and less likely to consume breakfast ($P<0.005$). There was no significant difference between the pre- and post-course individuals in terms of nutritional knowledge or consumption of fruit, vegetables, soft drinks, breakfast or wholegrain pasta/rice and bread.

Discussion and Conclusion: HFME is effective in terms of improving dietary behaviours and self-efficacy, but not nutritional knowledge among low SES individuals. This study highlights the

importance of building self-efficacy and confidence in order for dietary behaviour change to occur. Limitations to this study include a small sample size, different pre- and post-course groups and self-reporting of dietary behaviour. Recommendations for development of the programme include: (i) build cooking confidence through increased focus on practical cooking component of sessions; (ii) create link with local community garden and stress-management classes; (iii) target young women and mothers with tailored dietary messages; (iv) follow-up classes.

Conflicts of interest & Acknowledgements: The author declares no conflicts of interest.

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Key Words (3-5): low socio-economic status, cooking programme, health promotion, self-efficacy, dietary behaviours

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DESIGN OF A FOOD SAFETY SYSTEM BASED ON HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCP) PRINCIPLES FOR A DISABLED CENTER

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Introduction: A Hazard Analysis and Critical Control Point (HACCP) system allows the identification, evaluation and control of physical, chemical and biological hazards through the food chain, being a European legal requirement (Regulation (EC) 852/2004). Due to the relevance of its design and application, this tool must be adapted to the specific needs and peculiarities of each food chain operator. The study is focused in *Hogar Don Orione*, a private center placed in Madrid (Spain). At this moment, 106 people with severe intellectual and physical disabilities (autism, cerebral palsy, multiple disabilities, and mental and sensory disorders, etc.) live in this center.

Method: A set of visits was required to get the information for the design of the HACCP system (flowchart activity, processes, procedures, menus, etc.). HACCP plan was set based on seven principles included in Regulation (EC) 852/2004 and the *Codex Alimentarius*:

1. Identifying any hazards that must be prevented, eliminated or reduced to acceptable levels.
2. Identifying the critical control points (CCP's).
3. Establishing critical limits at critical control points.
4. Establishing and implementing effective monitoring procedures at critical control points.
5. Establishing corrective actions when monitoring indicates that a critical control point is not under control.
6. Establishing verification procedures.
7. Establishing documents and records commensurate with the nature and size of the food business.

Bioethics: Privacy and confidentiality of resident's data have been respected. The distribution of their data is completely forbidden.

Results: The scope of the developed HACCP study is "to prepare and serve meals in *Hogar Don Orione*". To identify and evaluate specific hazards in the target center, food was classified according with the nature of the hazards (physical, chemical and biological) and the heat treatment applied to each kind of food. HACCP system involves specific and general control measures described as:

- Critical Control Points (specific control measures):
- Control of food chain temperature.
- Vegetable disinfection.
- Renewal of frying oil, etc.
- Hygiene General Prerequisites (general control measures). It involves controlled conditions through different plans (e.g. cleaning and disinfection), which ensure food safety and make

this a proactive tool. Hygiene General Prerequisites must be implemented before CCP implementation.

The HACCP team was recruited with the purpose of being multidisciplinary. The management commitment was essential for the appropriate design of this objective.

Discussion: A HACCP system is a tool that provides food safety through the food chain. It must ensure that food is suitable for its intended use. Based on the legal requirement Regulation (EC) 852/2004, there must be a compromise from the food operator to implement efficiently the developed HACCP system. To check the implementation and effectiveness of this study, the food operator shall apply the sixth HACCP principle using verification procedures.

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Conflicts of interest & Acknowledgements: The author declares no conflicts of interest.

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Key Words (3-5): Food safety; Hazard; Critical Control Point (CCP); HACPP

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