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COHORT PROFILE

The DiSA-UMH Study: A prospective cohort study in health science students from Miguel Hernández University

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KEYWORDS

Students, Health Occupations;
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Health Status;
Life Style;
Food Habits;
Obesity;
Hypertension;
Cohort Studies.

ABSTRACT

Introduction: Young adulthood is an important stage to establish dietary habits and lifestyle behaviors that could be linked to the long-term development of chronic diseases in later life. The 3 years follow-up prospective cohort DiSA-UMH study was set up with the main objectives of determining the nutritional status, lifestyle behaviors and health status, assessing the possible changes during the follow-up, and estimating their influence on the occurrence and development of chronic diseases.

Material and Methods: Baseline information of 1204 health science students from Universidad Miguel Hernández (UMH) aged between 17 and 35 years was collected during the period from 2006 to 2012. All the participants completed a general questionnaire divided into separate sections that included a food frequency questionnaire, specific questions on physical activity, tobacco consumption, nutritional labelling use, weight, height, health status, and questions about the diagnosis of several diseases. In order to validate self-reported data, several reliability/validity investigations with different subsamples were specifically conducted. After baseline questionnaire, students were asked to obtain anthropometric measurements and fasting blood samples. To evaluate our assessment of dietary intake, between three and nine 24-hour recalls administered by telephone were conducted over one year.

Results: The first follow-up period of 3-years finished in 2015 and the second 3-year follow-up period is still ongoing. Although the retention rates during these assessment periods were 59.2% and 52.2% respectively, the losses of follow-up happened in a random way because of characteristics of participants and non-participants during follow-up were similar.

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El Estudio DiSA-UMH: Estudio de cohorte prospectivo en estudiantes de ciencias de la salud de la Universidad Miguel Hernández

PALABRAS CLAVE

Estudiantes de Ciencias de la Salud;

Epidemiología;

Estado de salud;

Estilo de vida;

Hábitos alimentarios;

Obesidad;

Hipertensión;

Estudios de Cohorte.

RESUMEN

Introducción: La edad adulta es una etapa importante para el establecimiento de hábitos dietéticos y estilos de vida que pueden estar implicados en el desarrollo de enfermedades crónicas posteriormente. El estudio de cohortes prospectivo con seguimiento a 3 años DiSA-UMH nació con el objetivo de determinar el estado nutricional, estilos de vida y la salud, evaluar los posibles cambios de estos durante el seguimiento y ver cómo influyen en la aparición y desarrollo enfermedades crónicas.

Material y Métodos: La información basal de 1204 estudiantes de ciencias de la salud de entre 18 y 35 años de la Universidad Miguel Hernández fue recogida entre los años 2006 y 2012. Todos los participantes autocumplimentaron un cuestionario que incluía un cuestionario de frecuencia de alimentos, preguntas sobre actividad física, consumo de tabaco, alcohol, uso del etiquetado nutricional, peso, talla, tensión arterial sistólica y diastólica y estado de salud, así como preguntas sobre la presencia de diversas enfermedades. Con el fin de validar la información autoaportada, se realizaron específicamente diversos estudios de validación con diferentes submuestras. Tras el cuestionario basal, se les preguntó a los estudiantes para obtener medidas antropométricas y muestra de sangre en ayunas. Para valorar la evaluación de ingesta dietética se recogieron entre 3 y 9 recordatorios de 24 horas realizados por teléfono durante un año.

Resultados: En 2015 finalizó el trabajo de campo del primer seguimiento de 3 años, estando aún en marcha el segundo periodo de 3 años de seguimiento. Aunque las tasas de retención durante estos periodos fueron de 59,2% y 52,2% respectivamente, las pérdidas de seguimiento se produjeron de forma aleatoria, ya que las características generales de los que participan y no participan en el seguimiento eran similares.

CITA

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INTRODUCTION

The DiSA-UMH study (*Dieta, Salud y Antropometría-Universidad Miguel Hernández*) began in 2006 enrolling students from the health sciences campus at Miguel Hernández University in San Juan (Alicante, Spain). The study was initially aimed to develop and validate a food frequency questionnaire (FFQ) in a small number of young adults, although the research team after considering the accurate information obtained, decided to broaden the sample size and the study aims.

Young adulthood represents an important life period for the establishment of eating habits and lifestyles that could be linked to the development of the chronic diseases later in life[1,2]. Starting a cohort in health science students was a unique opportunity to obtain reliable information for lifestyles, dietary habits and health status in young people. Thus, the study aims were extended to:

1) Examine dietary intake, nutrition status, lifestyle factors and health status in science university students;

2) Evaluate changes in eating habits and lifestyles during a short-medium follow-up period;

3) Explore the association between diet and lifestyles and some health outcomes such as overweight/obesity or high blood pressure.

The project has been partially funded by public agencies.

In 2009, a small grant from the Government of *Comunidad Valenciana* and some additional resources from the Department of Public Health at Miguel Hernández University. In addition, the success of the DiSA-UMH project is, to a large extent, due to the help of Public Health Master students and PhD candidates who collaborated on the project and were working on data collection and analyses of the cohort as part of their master work or doctoral work.

MATERIAL AND METHODS

Participants from the DiSA-UMH study were health science university students from the Miguel Hernández University. Baseline information was collected for 1204 subjects (868 girls and 336 boys) aged 17 to 35 years during the enrolment period from 2006 to 2012. The recruitment took place during the school cycle from different health science degrees such as Medicine (72%), Physiotherapy (10%), Master of Public Health program (9%), Occupational Therapy (5%) and Pharmacy (4%). All participants gave informed consent and responded to a self-administered questionnaire at the baseline interview.

Follow up

Most participants provided information on postal address, telephone number and personal email at the baseline interview in order to facilitate follow-up. A 12.6% of participants were not included in the study because they did not provide this personal information.

Participants were emailed every 3 years in order to update relevant information using questionnaires. There were two options for sending the information, either using a provided website link and filling in an online questionnaire or using a printed copy of questionnaire previously sent with a prepaid envelope enclosed for their convenience. We attempt to contact with the participants up to 9 times in each follow-up period. Firstly, participants were contacted by email, but when participants do not responded, a postal letter with the questionnaire was sent to them or we make a phone call to remember them about the questionnaire they were sent by email or post as a last resort. If the participant remained unresponsive after the final reminder, he or she was considered a non-compliant for that assessment period. However, all participants were sent e-mails to complete questionnaires every 3 years during the whole follow-up period regardless whether they completed or not previous assessments.

Measurement

We used structured (and validated) questionnaires to collect information on socio-demographic characteristics, lifestyles (tobacco smoking, alcohol consumption, physical activity, television watching, sleep duration), diet, including the use of nutritional labelling, self-reported health status and diseases.

In order to collect information on dietary intake and alcohol consumption we used two FFQ. The first included 84 food items and the second included a short version with 25 food items. Both FFQs were based on the questionnaire by Willett *et al.*[3] and adapted and validated for Spanish populations[4,5]. Participants were asked to report how often, on average, they had consumed each food item over the past year. Serving sizes were specified for each food item in the FFQ. The questionnaire offered nine options for the frequency of consumption for each food, ranging from never or less than once a month to 6 or more times per day. Nutrient values for each food in the questionnaire were mainly obtained from the food composition tables of the US Department of Agriculture and other Spanish sources[6,7].

To evaluate the reproducibility and validity of both FFQs, we carried out a validation study among 169 participants of DiSA-UMH cohort who agreed to participate from the beginning of follow-up. The participants completed both FFQs in two times apart over one year, which allowed testing reproducibility. During the one-year period in between the two FFQs, participants completed between three and nine 24-hour recalls administered by telephone on non-consecutive days and all seasons of the year that we used as the reference method to test validity of the FFQs. Participants also provided a fasting blood sample at baseline to determine biomarkers of several carotenoids, vitamin C and α-tocopherol for biochemical calibration of the FFQs.

Questions on level of physical activity at work (studying), hours per day of walking/bicycling, home/household work, leisure-time activity/inactivity and sleeping were asked at the baseline and the follow-up assessments using a questionnaire by Norman and colleagues[8] adapted and used in previous surveys with Spanish population[9]. Based on the same work, we measured physical activity levels as metabolic equivalent (MET) hours per day. In addition, we asked participants about their perception of usual physical activity taking into account all the activities, using the following question: "*Considering your overall physical activity (main activity, home and leisure), how do you regard yourself?*" Participants had five possible response options ranging from sedentary to very active.

After the first questionnaire at baseline, participants were invited for a health examination that included anthropometric measurements such as height, weight, waist circumference, body fat percentage and blood pressure (Table 1). All baseline measurements were taken following standard protocols used in other health examination surveys[9]. During the anthropometric measurements, participants were lightly dressed and barefoot. Body weight was measured, with participants standing, to the nearest 0.1 kg, using electronic weight scales with direct digital reading (type Tefal, Topline model). Height was measured to the nearest 0.1 cm with the person standing without shoes and with their back to a stadiometer. Waist circumference was measured midway between the lowest rib and the iliac crest to the nearest 0.1 cm using a flexible metric measuring tape (type SECA 201). Percentage of body fat was determined by bioelectrical impedance (type TANITA BC 571). Blood pressure measurements (i.e. systolic and diastolic blood pressure) were obtained in a sitting position after a 5 minute rest using a validated automatic BP measurement device Omrom M4-I[10]. Between 1 and 3 measurements were attempted for all participants at intervals of 2-3 minutes. For the purpose of validating later, information on self-reported weight, height, systolic and diastolic blood pressures was requested previously to the health examination.

RESULTS

Since the DiSA-UMH study started, the research team has been involved in the recruitment of participants, the data collection and monitoring participants in the follow-up period. Approximately, 90% of invited students agreed to participate. Table 2 illustrates the main characteristics of the population included in the study.

We started the first assessment period at the third year of follow-up in 2011. At present, we have contacted with 839 participants for the first assessment period (3rd year of follow-up) and 527 participants for the second assessment period (6th year), with a positive response rate of 59.2% and 52.2%, respectively (i.e. completed the follow-up questionnaires). No significant differences in lifestyle factors, body mass index (BMI) and self-rated health between participants and non-participants were found at these mentioned follow-up periods (Table 3). The third assessment period was initially scheduled to start in 2015 although the lack of funds impeded it; we hope to start it shortly as soon as new financial support is available.

Preliminary results support that both FFQs are good instruments for assessing dietary intake of relevant nutrients and food groups in young adults (unpublished results). The interest in validating and using the short FFQ for dietary assessment in this longitudinal study and other studies with young populations is to guarantee the participation and the retention rate during the follow-up.

Association between hours watching television, physical activity, sleeping time and excess weight among young adults[11]

At baseline, the prevalence of excess weight (BMI≥25kg/m^2) was 13.7% (11.2% were overweight and 2.5% were obese). A statistically significant positive association was found between excess weight and a greater amount of time spent watching television. Participants who reported watching television >2h a day had a higher risk of excess weight than those who watched television ≤1h per day (OR=2.13; 95% CI:1.37-3.36; p-trend=0.002). A lower level of physical activity was associated with an increased risk of excess weight,

Table 1. Number and percentage of participants in different clinical explorations in DiSA-UMH study (n=1204).

	% (n)
Height	59.0 (710)
Weight	59.0 (710)
Waist circumference	58.8 (708)
Body fat percentage	47.4 (571)
Blood pressure	
One measurement	54.8 (660)
Two measurement	45.3 (545)
Three measurement	18.2 (219)

Table 2. Main characteristics of the population included in the DiSA-UMH study (n=1204)

	Total (n=1204)	Men (n=336)	Women (n=868)
Degree, % (n)			
Medicine	71.4 (860)	68.8 (231)	72.5 (629)
Age in years, mean (SD)	22.9 (3.0)	23.2 (3.4)	22.8 (2.8)
Tobacco smoking, % (n)			
Yes	33.3 (401)	31.3 (105)	34.1 (296)
Alcohol consumption (g/d), % (n)			
<0.5	19.9 (239)	17.0 (57)	21.0 (182)
0.5-6	55.8 (671)	46.1 (155)	59.5 (516)
>6	24.4 (293)	36.9 (124)	19.5 (169)
Physical activity in Mets per day, mean (SD)	34.1 (3.3)	34.9 (3.3)	33.8 (3.3)
Television hours per day, % (n)			
≤1	46.3 (558)	45.2 (152)	46.8 (406)
1,1 – 2	33.1 (398)	34.8 (117)	32.4 (281)
>2	20.3 (244)	19.3 (65)	20.6 (179)
Missing information	0.3 (4)	0.6 (2)	0.2 (2)
Sleep hours per day, % (n)			
<7	34.6 (417)	36.9 (124)	33.8 (293)
7-9	58.2 (701)	55.7 (187)	59.2 (514)
>9	6.4 (77)	6.0 (20)	6.6 (57)
Missing information	0.7 (9)	1.5 (5)	0.5 (4)
Body mass index (Kg/m^2), % (n)			
Underweight (<18.5)	7.1 (85)	0.3 (1)	9.7 (84)
Normal (18.5-24.9)	76.6 (922)	74.4 (250)	77.4 (672)
Overweight (25.0-29.9)	11.2 (135)	20.2 (68)	7.7 (67)
Obese (≥30)	2.4 (29)	3.3 (11)	2.1 (18)
Missing information	2.7 (33)	1.8 (6)	3.1 (27)
Self-rated health			
Excellent	22.4 (270)	26.8 (90)	20.7 (180)
Good	64.3 (773)	59.2 (199)	66.1 (574)
Fair/poor or very poor	11.5 (138)	11.9 (40)	11.3 (98)
Missing information	1.9 (23)	2.1 (7)	1.8 (16)

SD: Standard deviation; **Mets:** metabolic equivalent (MET, kcal/kg x h).

although the association was only statistically significant in multiple linear regression (p=0.037). No association was observed with sleep duration.

A lower adherence to Mediterranean diet is associated with a poorer self-rated health in university population[12]

We assessed the adherence to Mediterranean Diet using the relative Mediterranean Diet Score (rMED; score range: 0-18) according to the consumption of 9 food components. Participants were classified into a low (0-6 points), 26.8%; medium (7-10 points), 58.7%; and high (11-18 points), 14.4%, level of adherence to the Mediterranean Diet. Regarding self-rated health, 23.1%, 65.1% and 11.8% reported an excellent, good, and fair/poor or very poor health, respectively. In multivariate analysis, a lower adherence to Mediterranean diet was significantly (p<0.05) associated with a poorer self-rated health. Compared to a low adherence to Mediterranean

Table 3. Baseline characteristics between participants and non-participants in the DiSA-UMH cohort.

	First assessment (3rd year of follow-up)			Second assessment (6th year of follow up)		
	Yes (n=474)	No (n=342)	p-value	Yes (n=267)	No (n=248)	p-value
Age in years, mean (SD)	22.3 (2.9)	22.6 (2.9)	0.190	23.6 (2.8)	23.7 (3.1)	0.539
Sex, % (n)						
Women	75.1 (356)	68.7 (235)	0.047	73.4 (196)	70.6 (175)	0.493
Men	24.9 (118)	31.3 (107)		26.6 (71)	29.4 (73)	
Tobacco smoking, % (n)						
No	68.0 (321)	69.5 (237)	0.702	64.4 (172)	62.9 (156)	0.783
Yes	32.0 (151)	30.5 (104)		35.6 (95)	37.1 (92)	
Alcohol consumption (g/day), % (n)						
<0.5	20.7 (98)	19.6 (67)	0.915	17.2 (46)	21.0 (52)	0.235
0.5-6	56.7 (268)	57.9 (198)		52.8 (141)	55.2 (137)	
>6	22.6 (107)	22.5 (77)		30.0 (80)	23.8 (59)	
Physical activity in Mets/day, mean (SD)	33.9 (3.2)	34.3 (3.1)	0.140	34.1 (3.6)	34.2 (3.4)	0.888
Television hours per day, % (n)						
≤1	46.1 (218)	47.1 (160)	0.374	44.4 (118)	46.6 (115)	0.837
1,1 – 2	32.1 (152)	35.0 (119)		33.1 (88)	32.8 (81)	
>2	21.8 (103)	17.9 (61)		22.6 (60)	20.6 (51)	
Sleep hours per day, % (n)						
<7	36.4 (172)	38.9 (131)	0.586	31.8 (85)	35.9 (89)	0.325
7-9	57.2 (270)	53.7 (181)		61.0 (163)	59.7 (148)	
>9	6.4 (30)	7.4 (25)		7.1 (19)	4.4 (11)	
Body mass index (Kg/m^2), % (n)						
Underweight (<18.5)	8.0 (37)	7.8 (26)	0.470	4.5 (12)	7.3 (18)	0.226
Normal (18.5-24.9)	79.7 (368)	76.8 (255)		82.6 (218)	78.9 (194)	
Overweight (25.0-29.9)	9.7 (45)	13.3 (44)		11.4 (30)	10.2 (25)	
Obese (≥30)	2.6 (12)	2.1 (7)		1.5 (4)	3.7 (9)	
Self-rated health						
Excellent	24.3 (113)	22.6 (76)	0.353	25.1 (65)	22.8 (55)	0.754
Good	65.8 (306)	64.3 (216)		64.1 (166)	64.7 (156)	
Fair/poor or very poor	9.9 (46)	13.1 (44)		10.8 (28)	12.4 (30)	

SD: Standard deviation; **Mets:** metabolic equivalent (MET, kcal/kg x h).

diet (low rMED), a medium adherence was related to a lower risk of good (RRR=0.81; 95% CI:0.67-0.97) or fair/poor or very poor self-rated health (RRR=0.70; 0.58-0.85); the highest adherence (high rMED) was associated with a lower risk of good (RRR=0.69; 0.61-0.79) or fair/poor or very poor (RRR=0.68; 0.65-0.72) self-rated health. Smoking, low physical activity and excess weight (body mass index ≥25kg/m^2) were also associated with a poorer self-rated health.

Validity of self-reported height, weight and body mass index[13]

In 628 participants, we observed high correlation coefficients between self-reported and measured height, weight and BMI of 0.96, 0.97 and 0.95 respectively. The sensitivity to detect excess weight (BMI≥25kg/m^2) using self-reported data was 81.0%, the specificity was 98.5%, the predictive value was 90.6%, and the kappa index was 0.75.

DISCUSSION

The DiSA-UMH study is composed of students with a high educational level more prone to participate and respond questionnaires in a more reliable way, particularly on health issues, which ensures the quality of the collected data. Moreover, the prospective design of the study aimed at following up late adolescence into adulthood will permit to explore tracking changes in lifestyles relevant later in life for the development of chronic diseases throughout adulthood. Thus, the DiSA-UMH is expected to make important contributions regarding research on exposures and some health outcomes during the transition period from late adolescence to adulthood.

90% of the invited students agreed to participate, but we cannot evaluate differences between participants and non-participants due to we do not have any information on those refusing to participate in the study. In previous works on this study, we showed that our participants had a lower prevalence of obesity[11] when comparing with general population in the same age range[14], although similar results were obtained regarding self-rated health[12].

Use of a validated FFQ minimizes bias in dietary assessment and reassures the estimation of intakes for a wide range of nutrients, foods and dietary patterns. Furthermore, the research team comprises a large disciplinary variety of expert knowledge (i.e. in the fields of epidemiology, medicine, nutrition, nurse, psychologist, philosophy and biostatics), which provides a multifaceted perspective in the management and evaluation of the data.

The discrepancy between measured and self-reported weight, height and BMI was associated with a higher age, while a higher sleeping time was also associated to differences in self-reported and measured height. Overall, self-reported data for height and weight among young people in our study may be considered satisfactory.

The sample could not be representative of the general population, as it is the case in most cohort studies, although the aim of the study was not to be representative of the whole population of students but to assure quality of information to validate instruments and explore associations. Another great disadvantage of cohort studies is the high cost of the follow-up. We normally used the public educational system to deliver and retrieve questionnaires and information because of post is unreliable and costly. Because of the increasing use of technological devices and the familiarity with internet-based applications allows direct communication with participants, preference is given to email contact and online questionnaires during the follow-up. The loss of follow-up in our study is considerable although it was not related to the main characteristics of participants, which might minimise potential differential bias of effect estimates. In order to minimize the loss to follow-up, we maintain close contact with participants through regular personal replies by emails, the project website, twitter of the research team and telephone calls. More recently, we have elaborated a newsletter to inform the participants about the advances in the research.

DATA COLLECTION AND MORE INFORMATION

Collection, management and distribution of the data are under responsibility of DiSA-UMH research team. In order to obtain additional information beyond what it is discussed in this article, readers may visit the DiSA-UMH's website at http://bibliodieta.umh.es/epinut/estudios-y-colaboraciones/disa/. Researchers with an interest in using DiSA-UMH study data for research purposes should send a research proposal including their objectives and contact information to the DiSA-UMH research team at bibliodieta@umh.es. The research team evaluates proposals. Thus, we encourage interested researchers to contact us.

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COMPETING INTERESTS

Authors state that there is no conflict of interest when drawing the manuscript.

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AUTHORS' CONTRIBUTIONS

Study concept and design (EMNM, JV, MGH); acquisition, analysis, or interpretation of data (all authors); drafting of the manuscript (SGP, EMNM, DVG); critical revision of the manuscript for important intellectual content (all authors); statistical analysis (EMNM).

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