Nutrition UP 65 | nutritional strategies facing an older demography

Nutritional status assessment descriptive results

http://nutritionup65.up.pt

Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto

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Promoter:

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Abstract

The lack of data on Portuguese older adults' nutritional status was a challenge. Nutrition UP 65 aimed to reduce nutritional inequalities in the Portuguese older population and to improve the knowledge on Portuguese older adults' nutritional status, specifically on undernutrition, obesity, sarcopenia, frailty, hydration, sodium intake and vitamin D status.

A representative sample of Portuguese older adults regarding sex, age, country region and educational level was selected. Data were collected on socio-demographics, lifestyles, anthropometric, functional and clinical parameters. Sodium excretion, hydration and blood vitamin D status were assessed.

Data collection (n = 1,500) took place between December 2015 and June 2016. Summary descriptive results are presented here and are being disseminated in detail in conjunction with other Nutrition UP 65 Project outputs in national and international scientific journals.

Nutrition UP 65 results provided evidence for the design and implementation of effective preventive public health strategies regarding the nutritional status of older people.

1. Introduction

Recent estimates show that the number of people over 60 is expected to double by 2050. In Portugal, data from the last national census showed that Portuguese aged 65 years and over represent circa 19% of the population[1]. Ageing of the world population is a dividend for all the investment that has been made in health[2]. This successful trend is now a challenge and a cause for concern as major modifications are required in order to reduce the burden associated with major diseases in adulthood[2].

Nutritional status has been identified as one of the most important modifiable factors determining health and function in older people[3]. Despite the upsetting data released during the last decade on the negative influence of nutritional disorders in the health status of the older population, the prevalence of undernutrition is still very high in Europe[4,5], including Portugal[6]. Consequently, it is necessary to implement and standardize protocols for assessment and monitoring of older adults´ nutritional status in Portuguese primary health care institutions.

Current trends indicate that the prevalence of obesity and two late life syndromes, sarcopenia and frailty, are also increasing in this age group, reaching unprecedented figures[7-9]. Less evident nutrition status disorders are also of concern in this age group. Nutrition UP 65 also looked into other priority areas, such as vitamin D deficiency and hydration.

Due to the physiology of aging and other individual factors, older adults produce less vitamin D in their skin than younger people, and they also spend less time in the sun. Therefore, they have an increased risk of vitamin D deficiency. Data from European populations report a prevalence of vitamin D deficiency up to 40%[10]. In Portugal, studies on calcidiol serum levels of hospitalized patients also found high frequencies of vitamin D deficiency. Moreover, vitamin D deficiency increases with age[11]. However, information on vitamin D status of older people is scarce, particularly for those living in the community

or care institutions. Hence, this study will give an innovative and important contribution to overcome this lack of data.

Dehydration is also a frequent condition among older people, leading to a number of medical conditions. Despite the absence of data on hydration status of older people in Portugal, the assessment of fluid intake in a representative sample of Portuguese adult population has shown a low intake of fluids by the older subjects, particularly elderly men who reported a fluid intake 51% lower than the recommended intake[12]. In the rest of Europe data on elderly´s hydration status are also scarce. However, the difference between their fluid intake and current recommendations show this group is exposed to dehydration, especially the very old ones[13,14] and those who are institutionalized[15].

The World Health Organization recommends no more than 2 grams of sodium (5 grams of salt) per day for adults, in order to reduce the burden of non-communicable diseases associated with excessive salt intake[16,17]. Although approximately 75% of the Portuguese elderly has been classified as hypertensive[18], to the best of our knowledge, no published data on salt consumption based on urinary excretion estimates was available for Portuguese elderly before Nutrition UP 65.

The current socio-economic situation in Portugal, leads us to predict that the prevalence and consequences of the aforementioned nutritional disorders are increasing[19] and will increase in the forthcoming years. Moreover, the Portuguese seem to have low nutrition knowledge as well as inadequate food habits which is a challenge for the improvement of the nutritional status of the population[20].

This project expects to improve the knowledge on the burden of the aforementioned nutritional disorders in Portugal providing a basis for public health interventions. This is likely to result in a better nutritional healthcare with predictable health gains and lower costs.

2. Methodology

Study design, setting and participants

A cross-sectional observational study was conducted in Portugal in a cluster sample of 1,500 older Portuguese, ≥65 years old, representative of the Portuguese older population, concerning age, sex, regional area (NUTS II) and education level, according to Census 2011[1]. The recruited study sample corresponds to 0.075% of the Portuguese older population. The detailed description of the sources, selection and the recruitment of participants and also of data collection procedures was already published[21]: (http://www.researchprotocols.org/2016/3/e184/).

Data were collected between December 2015 and June 2016.

Ethics

This research was conducted according to the guidelines established by the Declaration of Helsinki. The study protocol was approved by the Ethics Committee of the "Department of Ciências Sociais e Saúde" (Social Sciences and Health) from the Faculty of Medicine of University of Porto (nº PCEDCSS – FMUP 15/2015) and by the Portuguese National Commission of Data Protection (nº 9427/2015).

Questionnaire, anthropometric and other measurements

Data were gathered on demographics, current and former professional occupation, lifestyles, health status and clinical history including cognitive status and nutritional status, skin phenotype and household income, using a structured questionnaire. The interview was conducted by seven previously trained registered nutritionists, also responsible for the anthropometric data collection.

Demographic data included information on sex, date of birth, marital status and education. Cognitive performance was assessed by the Portuguese version of the

Mini-Mental State Examination[22]. The previously validated cut-off scores used to identify cognitive impairment in the Portuguese population are as follows: individuals with no education, ≤15 points; 1–11 years of school completed, ≤22 points; and >11 years of school completed, ≤27 points. For the individuals identified as presenting cognitive impairment, the "Informed Consent" was asked to be signed by two representatives and all data was provided by a person close to the participant, such as a family member or caregiver.

Lifestyles were evaluated through the involvement of physical activities during the past seven days by the short form of the International Physical Activity Questionnaire[23]. Current and former tobacco use and alcoholic beverages consumption were assessed. The adhesion to the Mediterranean diet was quantified with the Portuguese version of PREDIMED[24].

Data on subjective general health concerning the self-reported diagnosis of chronic diseases in the past 12 months were collected using questions withdrawn from the Portuguese National Health Survey 2005/2006[25].

Detailed information about each participant's nutritional status was gathered, including body weight, standing height, mid-upper arm, waist and calf circumferences and triceps skinfold thickness using standard methodology[26]. The functional status was evaluated through handgrip strength and walking speed assessments. The Portuguese version of the Mini-Nutritional Assessment® - Short Form (MNA-SF) was also applied[27,28]. For participants with visible kyphosis or when it was impossible to measure standing height due to participant's paralysis or due to mobility or balance limitations, height was obtained indirectly from non-dominant hand length[29].

Non-dominant hand grip strength (HGS) was measured with a calibrated Jamar Hand Dynamometer (Sammons Preston), as recommended by the American Society of Hand Therapists[30]. Frailty phenotype was identified according to Fried et al criteria[31]. Sarcopenia was defined as the combined presence of low muscle mass and low muscle strength or diminished physical performance according to the European Working Group

on Sarcopenia in Older People (EWGSOP) consensus[32]. Information on cohabitation, skin phenotype by Fitzpatrick classification[33] and household income was also collected.

Laboratory Procedures and Biological Samples

A sample of blood and the 24-hour urine was collected for each participant. A certified laboratory, Labco Portugal, was responsible for blood and urine samples collection and analyses.

Vitamin D status was evaluated by dosing the plasmatic levels of 25 hydroxycholecalciferol [25 (OH) D] or calcidiol through electrochemiluminescence immunoassay using Roche Cobas Vitamin D total assay reagent (Roche Diagnostics GmbH, Mannheim, Germany).

For the hydration status identification, the interviewers gave to the participants oral and written instructions on how to proceed with the collection and storage of the volume of 24 h urine. The following urinary markers were quantified: urine volume (ml), urinary creatinine (mg/day), urine osmolality (mOsm/kg) and urine density for 24 hours. Hydration status was evaluated using the free water reserve method (ml/24 hours)[34-40], calculated by subtracting 24-hour urine volume to obligatory urine volume [(solutes in urine 24hr (mOsm / day) / (830 - 3.4 x (age - 20)] euhydrated vs. hypohydrated subjects or at risk of hypohydration[37]. Urine samples were analysed also for urinary sodium expressed in mEq/day. For comparative purposes, it was converted to mg/day by using the molecular weight of sodium (23 mg Na =1 mmol Na or 1 mEq Na).

Data analysis

Nutritional status assessment descriptive results are presented as counts and proportions considering sex, age, educational level and income. Analyses were carried out using the Software Package for Social Sciences for Windows V.23.0.

More detailed analyses are being published in international scientific journals.

3. Results

3.1 Sample characterization

Sample characterization by sex, age, educational level (nº of completed school years), country region and reported income is displayed in Table 1:

		Female		Male		Total	
		872	%	628	#	1500	%
Age (years)	64-69	221	25.3	191	30.4	412	27.5
	70-74	206	23.6	165	26.3	371	24.7
	75-79	189	21.7	132	21.0	321	21.4
	80-84	140	16.1	84	13.4	224	14.9
	85-89	77	8.8	42	6.7	119	7.9
	>=90	39	4.5	14	2.2	53	3.5
			0.0		0.0		0.0
Education (nº completed school years)	Without	352	40.4	145	23.1	497	33.1
	1st cycle	399	45.8	347	55.3	746	49.7
	2nd cycle	25	2.9	27	4.3	52	3.5
	3rd cycle	36	4.1	44	7.0	80	5.3
	secondary	26	3.0	31	4.9	57	3.8
	post-secondary	0	0.0	1	0.2	1	0.1
	superior	34	3.9	33	5.3	67	4.5
Region NUTS II	North	275	31.5	195	31.1	470	31.3
	Centre	225	25.8	166	26.4	391	26.1
	Lisbon	225	25.8	159	25.3	384	25.6
	Alentejo	77	8.8	59	9.4	136	9.1
	Algarve	36	4.1	29	4.6	65	4.3
	Madeira	20	2.3	10	1.6	30	2.0
	Azores	14	1.6	10	1.6	24	1.6
			0.0		0.0		0.0
Income (€)	<=499	188	21.6	60	9.6	248	16.5
	500-999	180	20.6	125	19.9	305	20.3
	>=1000	77	8.8	98	15.6	175	11.7
	Without answer	427	49.0	345	54.9	772	51.5

Table 1. Characteristics of 1,500 Portuguese older adults, ≥65 years old (Nutrition UP 65) according to sex.

3.2. Pre-obesity and obesity

Pre-obesity and obesity were identified through body mass index categories classification, calculated for the 1,496 participants whose information was available. In this sample of older people, three subjects (0.2%) were underweight, 249 (16.6%) presented normal weight, whereas 662 (44.3%) had pre-obesity and 582 (38.9%) were obese.

A higher proportion of men was found in the pre-obesity category, while a higher proportion of women was found in the obesity category (Figure 1).

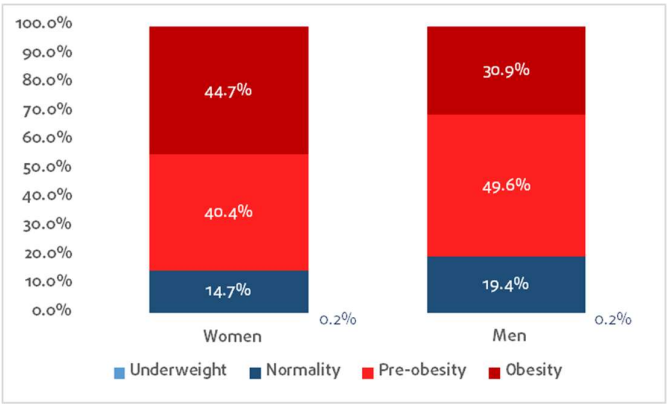

Figure 1. Proportion of 1,496 Portuguese older adults, ≥65 years old, by body mass index categories according to sex (Nutrition UP 65).

There was a slight decrease in the frequency of pre-obesity from the age group 65-69 years to 80-84 years, whereas the frequency of obesity increased. A higher frequency of pre-obesity was observed for the 85-89 years old participants group. After the 80-84 years, obesity occurrence is lower (Figure 2).

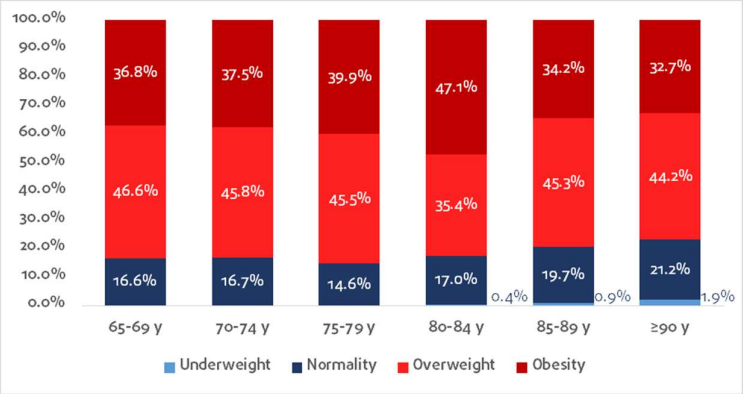

Figure 2. Proportion of 1,496 Portuguese older adults, ≥65 years (y) old, by body mass index categories according to age (years) categories (Nutrition UP 65).

Concerning the educational level, the prevalence of pre-obesity was the highest for the participants with superior education (Figure 3). However, the highest frequencies of obesity were observed for the subjects with lower educational achievement, those without formal education and those who only completed the first cycle of studies (Figure 3).

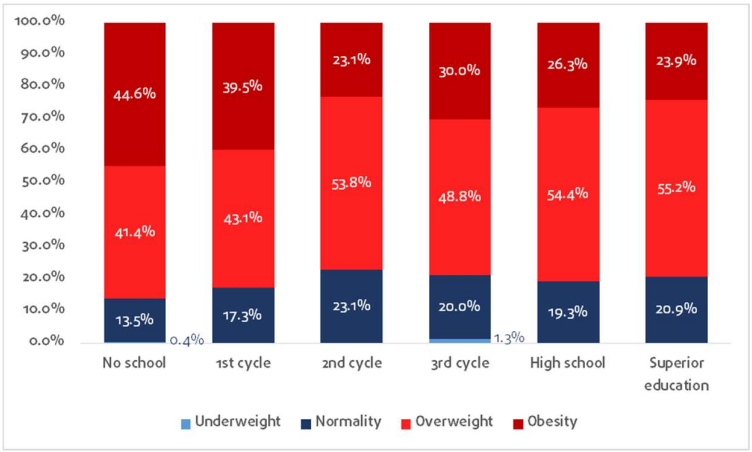

Figure 3. Proportion of 1,496 Portuguese older adults ≥65 years old, by body mass index categories according to education categories (Nutrition UP 65).

The frequency of pre-obesity rose with increasing income. Otherwise, a clear inverse tendency between obesity and income was observed. (Figure 4).

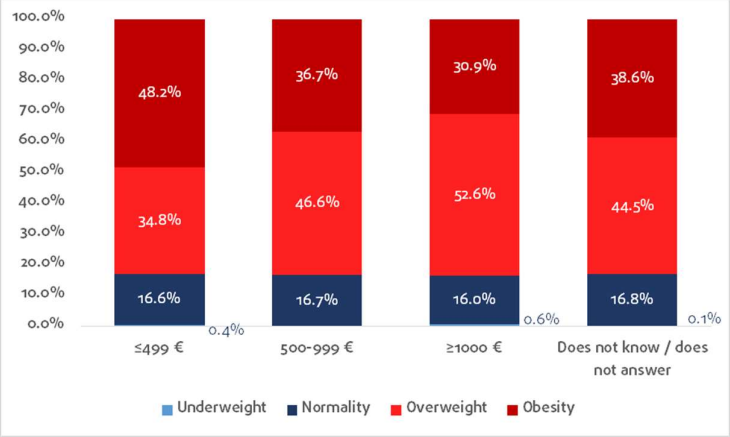

Figure 4. Proportion of 1,496 Portuguese older adults, ≥65 years old, by body mass index categories according to monthly household income (euros) categories (Nutrition UP 65).

3.3. Undernutrition

Information on undernutrition was available for entire sample of 1,500 participants; 1,259 (83.9%) were not undernourished, 222 (14.8%) were at undernutrition risk and 19 (1.3%) were undernourished.

Compared to men, a higher proportion of women were at undernutrition risk, whereas the same frequency of undernutrition was found for women and men (Figure 5).

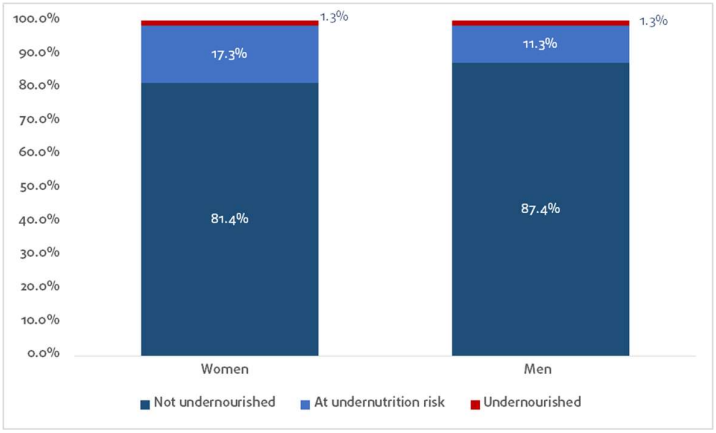

Figure 5. Proportion of 1,500 Portuguese older adults, ≥65 years old, by undernutrition status categories, evaluated with the Mini-Nutritional Assessment - Short Form, according to sex (Nutrition UP 65).

An increase in the frequency of undernutrition risk from the age group 65-69 until the age group 75-79 years was seen, followed by a decreased in the age group 80-84 years (Figure 6). From age 85 forward an increase in the prevalence of undernutrition risk was observed. The highest proportion was found in the oldest group, ≥90 years (Figure 6).

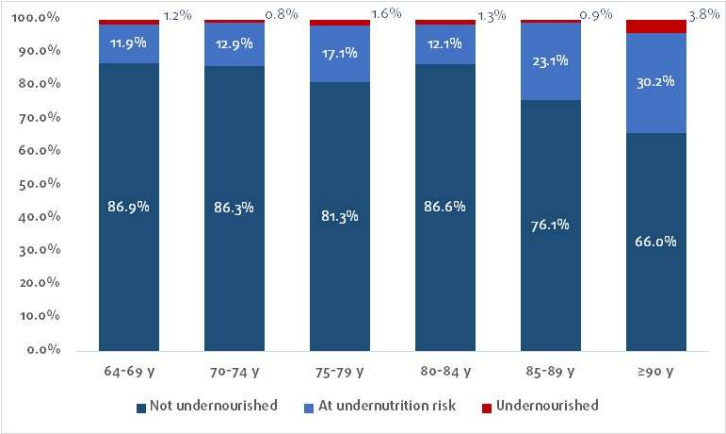

Figure 6. Proportion of 1,500 Portuguese older adults, ≥65 years old, by undernutrition status categories, evaluated with the Mini-Nutritional Assessment - Short Form, according to age (years) categories (Nutrition UP 65).

A fluctuation in the prevalence of undernutrition risk and status according to educational level was observed. However, from the third cycle and beyond, lower prevalence of both undernutrition risk and of undernutrition were seen (Figure 7).

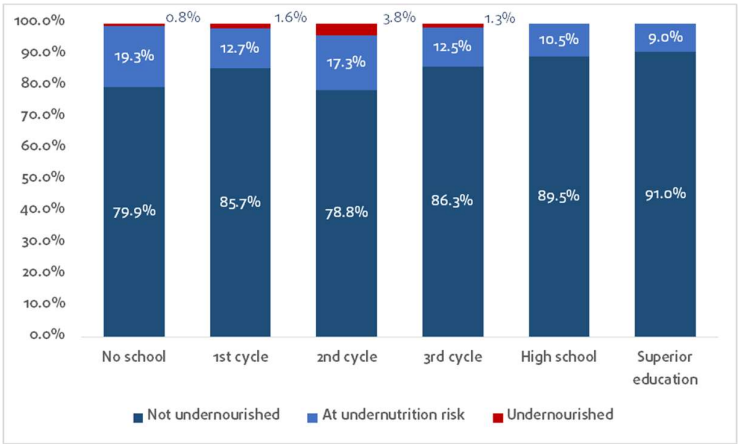

Figure 7. Proportion of 1,500 Portuguese older adults, ≥65 years old, by undernutrition status categories, evaluated with the Mini-Nutritional Assessment - Short Form, according to educational status categories (Nutrition UP 65).

The proportion of older adults presenting undernutrition risk varied inversely with income. For undernutrition status, a lower frequency was observed between ≤499 and 500-999€ categories, followed by an increase in the ≥1,000 € category (Figure 8).

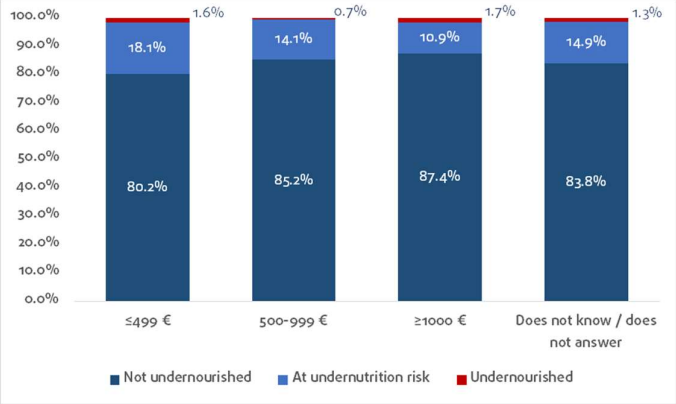

Figure 8. Proportion of 1,500 Portuguese older adults, ≥65 years old, by undernutrition status categories, evaluated with the Mini-Nutritional Assessment - Short Form, according to monthly household income (euros) categories (Nutrition UP 65).

3.4. Sarcopenia

It was possible to evaluate sarcopenia status for 1,493 older adults. Of those, 1,319 (88.3%) were not sarcopenic, 108 (7.2%) presented sarcopenia and 66 (4.4%) presented severe sarcopenia. Compared to women, there were higher proportions of men with sarcopenia and with severe sarcopenia (Figure 9).

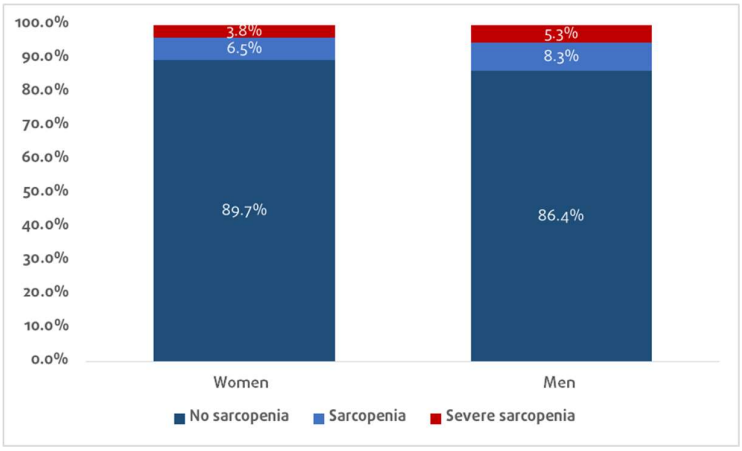

Figure 9. Proportion of 1,319 Portuguese older adults, ≥65 years old, by sarcopenia categories according to sex (Nutrition UP 65).

The frequency of sarcopenic subjects increased from 65-69 years' category until the age category of 75-79 years, is lower in the 80-84 years' group and increased again afterwards. These tendencies were also observed for severe sarcopenia (Figure 10).

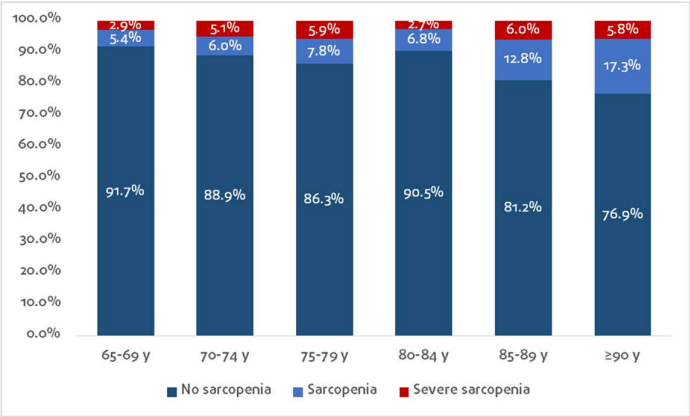

Figure 10. Proportion of 1,319 Portuguese older adults, ≥65 years old, by sarcopenia status according to age (years) categories (Nutrition UP 65).

The higher frequency of sarcopenic participants was observed for those with the second cycle of studies and the highest frequency of severe sarcopenic individuals was observed for those with superior education (Figure 11).

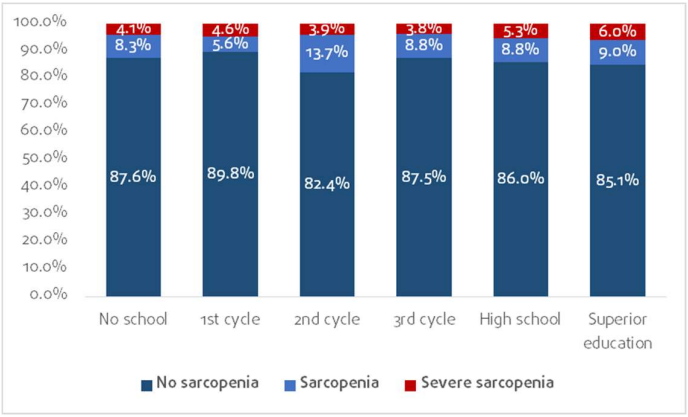

Figure 11. Proportion of 1,319 Portuguese older adults, ≥65 years old, by sarcopenia categories according to education categories (Nutrition UP 65).

It can be observed on Figure 12 that the percentage of sarcopenic older adults with a monthly household income ≤499 € is higher than for those with to 500-999 €, whereas

higher figures were observed for the ≥1,000 € category. For severe sarcopenia, as income increased, the proportion of older adults that presented this condition also augmented.

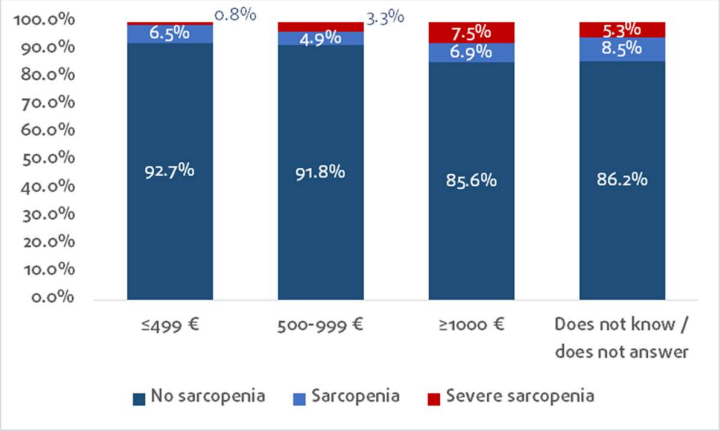

Figure 12. Proportion of 1,319 Portuguese older adults, ≥65 years old, by sarcopenia categories according to monthly household income (euros) categories (Nutrition UP 65).

3.5. Frailty

It was possible to evaluate frailty status for 1,457 participants. The majority, 791 (54.3%) were pre-frail or presented intermediate frailty, 313 (21.5%) were frail and only 353 (24.2%) were not frail.

Compared to men, higher proportion of women were in the frailty categories (Figure 13).

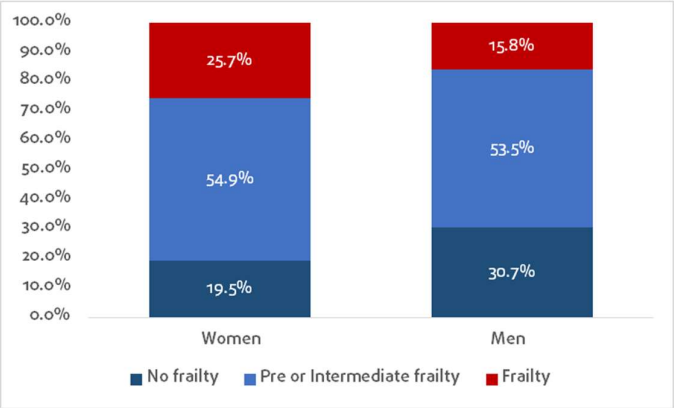

Figure 13. Proportion of 1,457 Portuguese older adults, ≥65 years old, by frailty categories according to sex (Nutrition UP 65).

A clear increase in frailty frequency was observed with increasing age. A marked decline in the proportion of older adults free of frailty was seen from 75 years old and over. The lowest frequency of pre or intermediate frailty was observed for ≥90 years old group but this group showed the highest frequency of frailty (Figure 14).

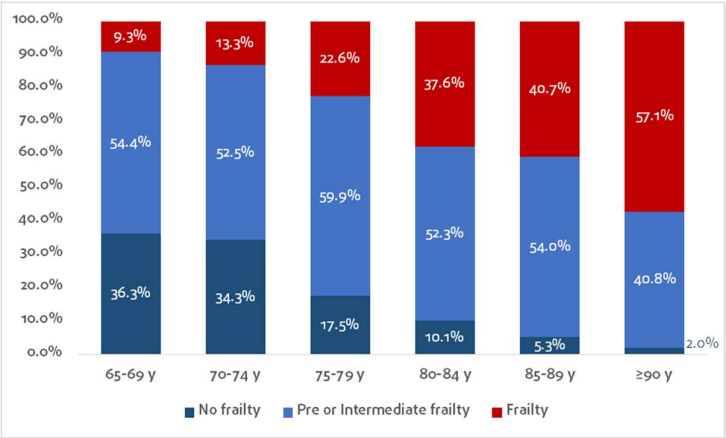

Figure 14. Proportion of 1,457 Portuguese older adults, ≥65 years old, by frailty categories according to age (years) categories (Nutrition UP 65).

The lower frequency of frailty was found for the participants with third cycle of studies and the higher for the older adults with no formal education (Figure 15).

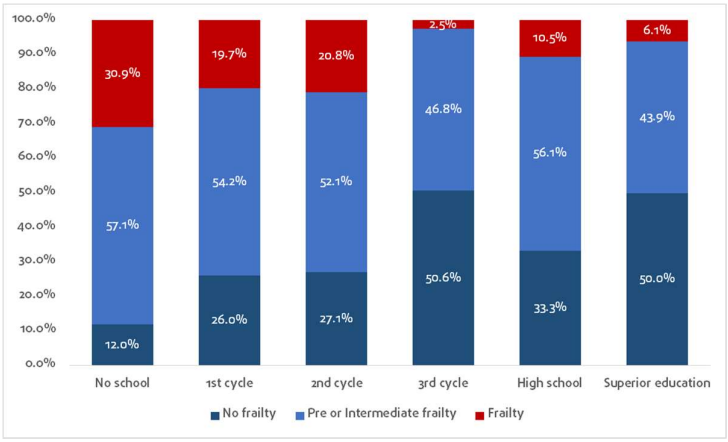

Figure 15. Proportion of 1,457 Portuguese older adults, ≥65 years old, by frailty categories according to education categories (Nutrition UP 65).

Frequencies of pre or intermediate frailty were similar between the different categories of household income. However, for frailty, a clear decrease in the prevalence of this condition was observed with increasing income (Figure 16).

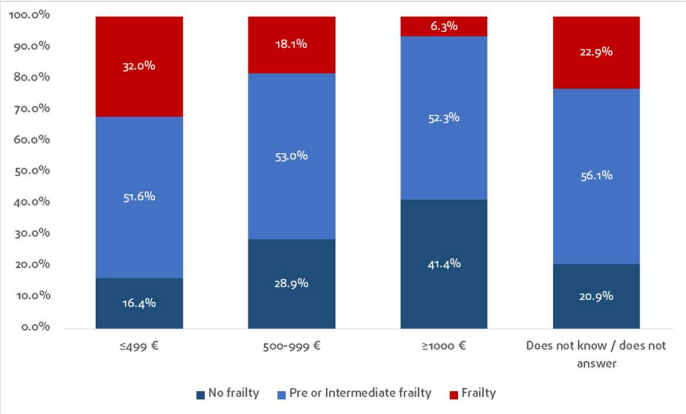

Figure 16. Proportion of 1,457 Portuguese older adults, ≥65 years old, by frailty categories according to monthly household income (euros) categories (Nutrition UP 65).

3.6. Hydration

Hydration status could be assessed for 1,320 participants, 215 older adults presented hypohydration or risk (16.3%), based on the free water reserve method[21,41].

Compared to women, men presented higher frequencies of hypohydration, or risk of hypohydration (Figure 17).

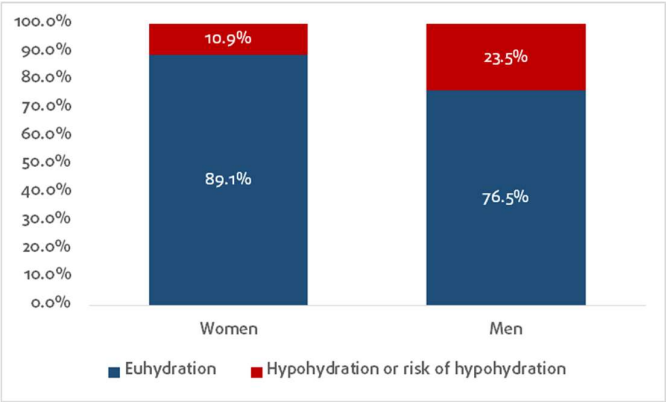

Figure 17. Proportion of 1,320 Portuguese older adults, ≥65 years old, by hydration status according to sex (Nutrition UP 65).

A decrease in hypohydration or risk of hypohydration was observed between the age categories 65-69 years and 80-84 years. Hypohydration or risk of hypohydration then increased in the 85-89 years old group and decreased in the oldest age group. In fact, the subjects aged ≥90 years old presented the lowest frequency of hypohydration or of risk of hypohydration and the youngest group, 65-69 years old, the highest (Figure 18).

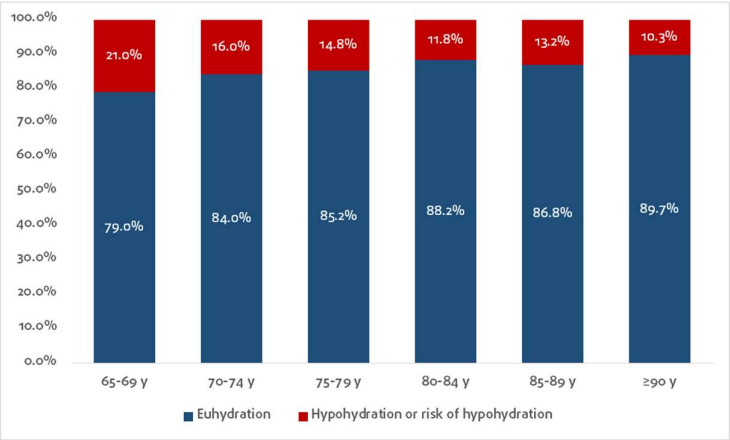

Figure 18. Proportion of 1,320 Portuguese older adults, ≥65 years old, by hydration status according to age (years) categories (Nutrition UP 65).

Regarding education, the subjects that completed the third cycle presented the highest level of hypohydration or risk and those with no formal education presented the lowest frequency (Figure 19).

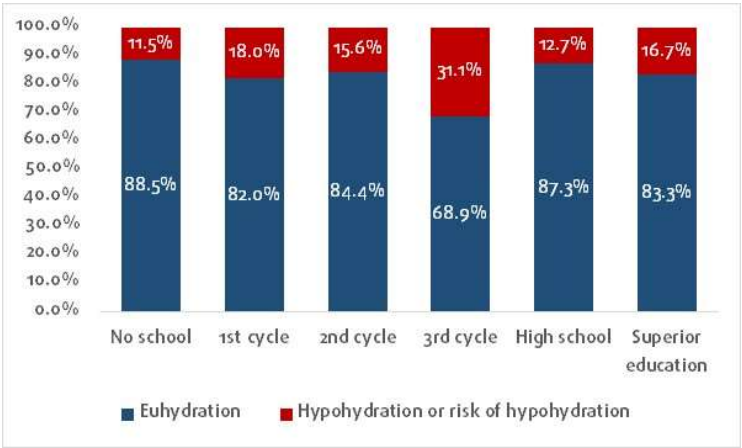

Figure 19. Proportion of 1,320 Portuguese older adults, ≥65 years old, by hydration status according to education categories (Nutrition UP 65).

Older adults in the highest income category were those that presented the highest level of hypohydration or its risk. Participants in the 499€ category and in the 500-999€ category showed similar proportions of hypohydration or its risk (Figure 20).

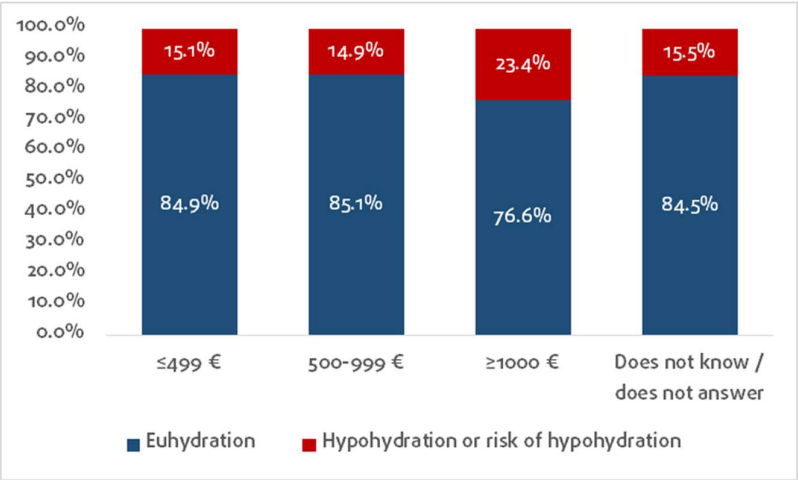

Figure 20. Proportion of 1,320 Portuguese older adults, ≥65 years old, by hydration status according to monthly household income (euros) categories (Nutrition UP 65).

3.7. Salt consumption

From the original sample of 1,500 older adults, it was possible to assess salt consumption for 1,320 participants. Excessive salt intake was defined as ≥2000 mg/day, according to the World Health Organization cut-offs[16]. It is worth noting that the large majority of the older adults presented excessive salt intake, 1,121 (84.9%). There was a higher proportion of men in the excessive salt consumption category (Figure 21).

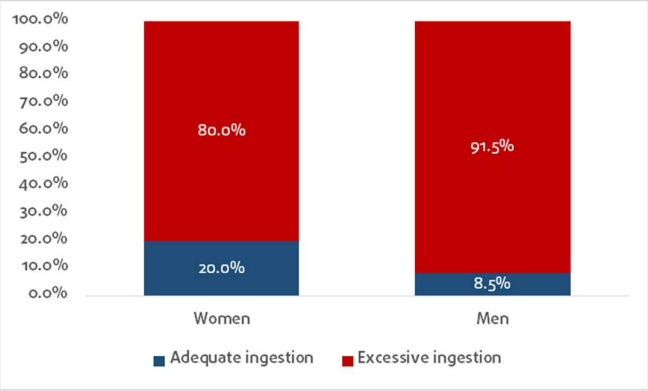

Figure 21. Proportion of 1,320 Portuguese older adults, ≥65 years old, by salt consumption categories according to sex (Nutrition UP 65).

A decrease in the prevalence of excessive salt consumption with increasing age was observed, except for the 80-84 years old group. In fact, the age group with the highest frequency of excessive salt consumption was the youngest, 65-69 years, and the age group with the lowest frequency of excessive salt consumption was the oldest, ≥90 years (Figure 22).

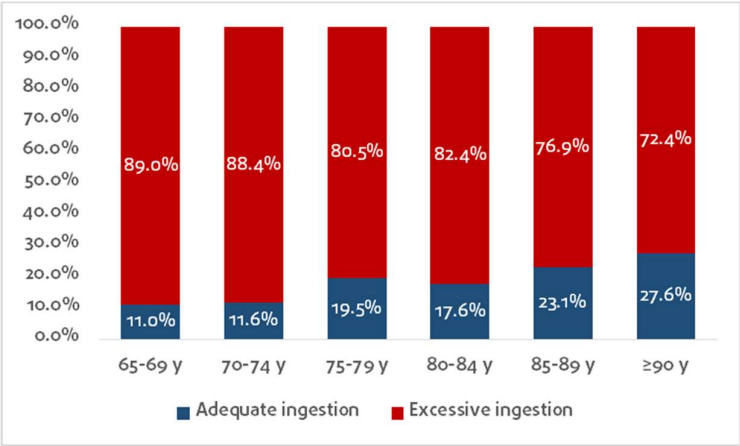

Figure 22. Proportion of 1,320 Portuguese older adults, ≥65 years old, by salt consumption categories according to age (years) categories (Nutrition UP 65).

Considering the relation between educational level and salt consumption, the highest frequency of excessive salt consumption was observed for the subjects in the third cycle and the lowest for the no education group (Figure 23).

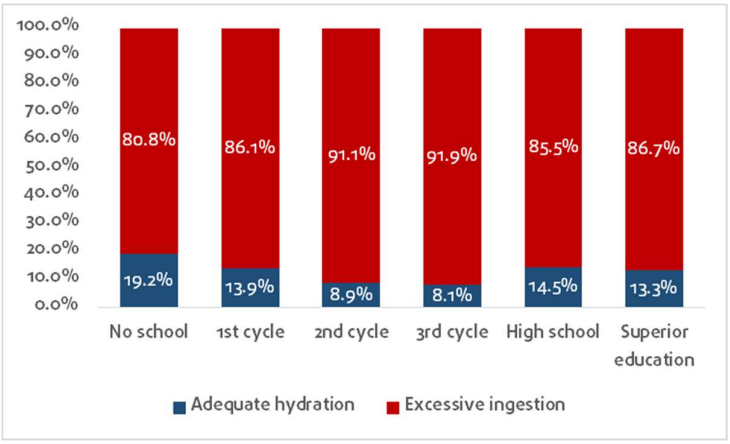

Figure 23. Proportion of 1,320 Portuguese older adults, ≥65 years old, by salt consumption categories according to education categories (Nutrition UP 65).

The frequency of older adults with excessive salt ingestion increased with increasing household income (Figure 24).

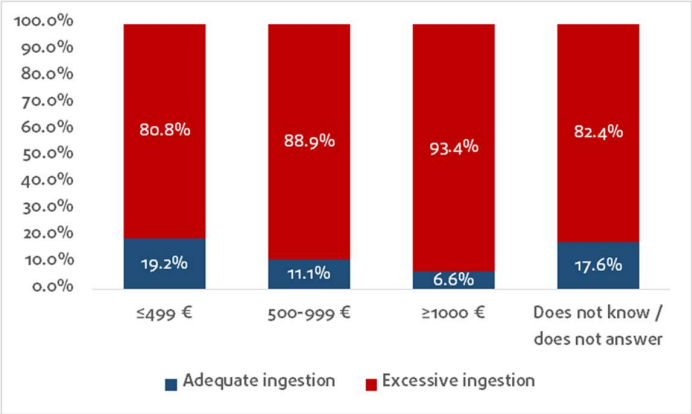

Figure 24. Proportion of 1,320 Portuguese older adults, ≥65 years old, by salt consumption categories according to monthly household income (euros) categories (Nutrition UP 65).

3.8. Vitamin D

For the 1,500 older adults included in the present sample, 441 (29.4%) presented risk of vitamin D inadequacy (30.0–49.9 nmol/L) and 594 (39.6%) presented risk of vitamin D deficiency (< 30.0 nmol/L)[42]. Levels of Vitamin D ≥ 50.0 nmol/L were considered adequate[42].

A higher proportion of men was at risk of vitamin D inadequacy whereas a higher proportion of women was at risk of vitamin D deficiency (Figure 25).

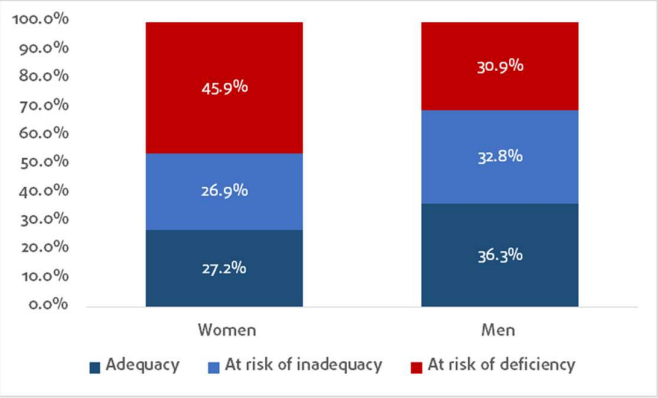

Figure 25. Proportion of 1,500 Portuguese older adults, ≥65 years old, by vitamin D status according to sex (Nutrition UP 65).

As age increased, lower proportions of risk of vitamin D inadequacy were found, except between 80-84 years and 85-89 years. The frequencies of risk of deficiency increased with increasing age. In fact, the highest frequency of risk of vitamin D deficiency was found in the ≥90 years old group and the lowest in the 65-69 years old group (Figure 26).

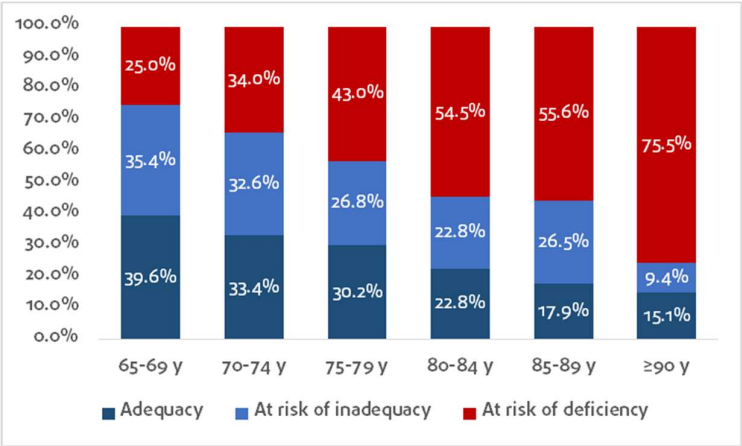

Figure 26. Proportion of 1,500 Portuguese older adults, ≥65 years old, by vitamin D status according to age (years) categories (Nutrition UP 65).

The risk of vitamin D deficiency varied inversely with educational status (Figure 27).

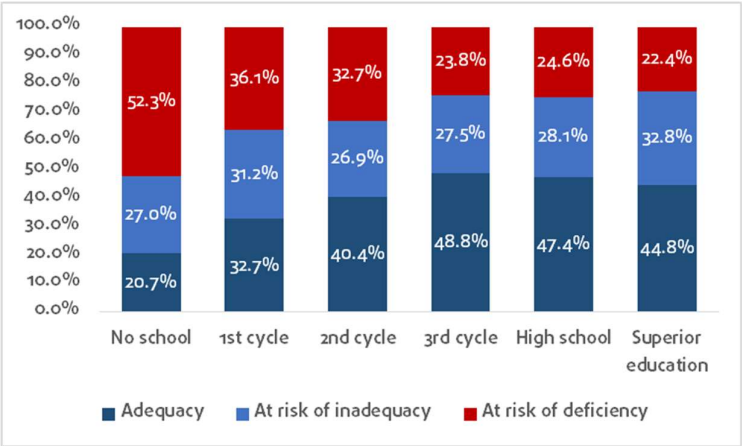

Figure 27. Proportion of 1,500 Portuguese older adults, ≥65 years old, by vitamin D status according to education categories (Nutrition UP 65).

The frequencies of risk of vitamin D inadequacy and risk of vitamin D deficiency were the highest in those older adults with the lowest income (≤499 euros) and decreased with increasing income categories (Figure 28).

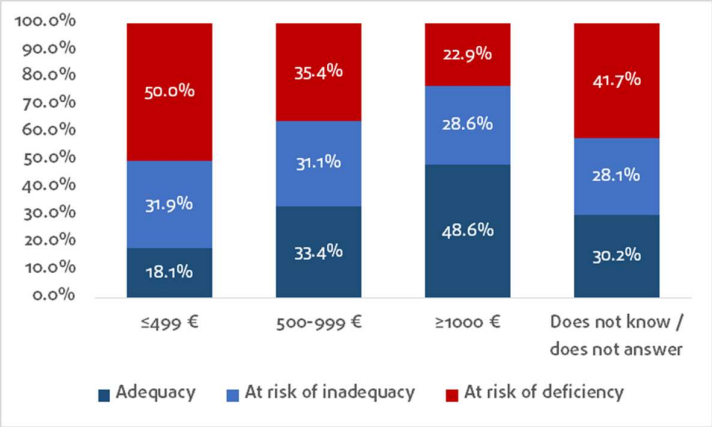

Figure 28. Proportion of 1,500 Portuguese older adults, ≥65 years old by vitamin D status according to monthly household income (euros) categories (Nutrition UP 65).

4. General conclusions

Descriptive analyses of the Nutrition UP 65 data showed that:

Pre-obesity and obesity were identified through body mass index categories classification (n=1,496). Results revealed that 0.2% were underweight, 16.6% presented normal weight, whereas 44.3% had pre-obesity and 38.9% were obese.

Undernutrition evaluation in 1,500 participants using the MNA-SF classification revealed that 14.8% were at undernutrition risk and 1.3% were undernourished.

Sarcopenia status assessment for 1,493 older adults using the EWGSOP consensus showed that 7.2% presented sarcopenia and 4.4% presented severe sarcopenia.

Frailty status was assessed in 1,457 participants by means of Fried criteria. The majority, 54.3% were pre-frail or presented intermediate frailty, 21.5% were frail and only 24.2% were not frail.

Hydration status could be assessed for 1,320 participants using the free water reserve methodology and 16.3% presented hypohydration.

Salt consumption was assessed for 1,320 participants. According to the World Health Organization cut-offs, excessive salt intake was defined as ≥2,000 mg/day (24-hours urine). It is worth noting that the large majority of the older adults presented excessive salt intake, 84.9%.

For the 1,500 older adults, 29.4% presented risk of vitamin D inadequacy (30.0–49.9 nmol/L) and 39.6% presented risk of vitamin D deficiency (<30.0 nmol/L). Levels of Vitamin D ≥50.0 nmol/L were considered adequate.

These Nutrition UP 65 data provided evidence for the design and implementation of effective preventive public health strategies regarding the nutritional status of Portuguese older people.

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