

## Characteristics and Cluster of Lifestyle Factors in Neurological Outpatients

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### Abstract:

**Objective:** Neurological disorders are increasing, because of demographic and epidemiologic changes occurring in both developed and developing countries. This study was aimed at examining and clustering lifestyle factors in an Italian sample of neurological outpatients.

**Material and Methods:** A total of 153 subjects were recruited from the ambulatory Unit Operative Complex of neurology, of S. Eugenio Hospital in Rome. This study was conducted from January, 2017 to May, 2019. Body Mass Index (general obesity) and Waist Circumference (abdominal obesity) were used as outcome measures. Lifestyle behaviours were assessed via questionnaires.

**Results:** The percentage of overweight/obesity was 74.0% (77.0% in males and 70.0% in females); whereas, the percentage of subjects with abdominal obesity (67.0%) was significantly higher in females than in males (76.0% vs 60.0%,  $p$ -value=0.038). Also, among patients suffering from neurological diseases there was a significant prevalence of: (i) males, (ii) subjects with low education levels, (iii) elderly adults (aged over 75), and (iv) people having a significantly lower percentage of appropriate hours of sleep. Three clusters were identified for males and four for females, according to lifestyles. The 'unhealthy habits' cluster, dominant among males (38.4%), was characterized by high prevalence of overweight/obese, and abdominal obese subjects; high prevalence of wine and alcoholic beverages consumers, high prevalence of inactive subjects; especially in females and high prevalence of neurological diseases among males.

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**Conclusion:** The clusters were identified according to lifestyles, and the main, important findings showed a high prevalence of unhealthy lifestyle clustering was dominant among male, elderly people with neurological diseases.

**Keywords:** cluster, lifestyle factors, neurological diseases, overweight/obesity

## Introduction

Neurological and neurodegenerative diseases encompass an array of diseases that do not only imply brain impairments, but also affect patient well-being. These imply progressive, degeneration and/or death of neurons in the Central Nervous System, which can effect body movement and brain function, and thus cause dementia. This disease, is a progressive or chronic decline of cognitive functions; such as, memory, thinking, behaviour, language, calculation, learning and emotion capacity, should never be associated with a normal aging process. Most of these diseases are associated with age, as their incidence increases in the elder.<sup>1,2</sup>

Neurological disorders are increasing, because of demographic and epidemiologic changes occurring in both developed and developing countries<sup>3</sup>. According to the last reports from the World Health Organization (WHO), over 1 billion people are currently affected by neurological disorders.<sup>1</sup>

Neurological disorders account for more than 6.0% of the global burden of diseases, with a higher preponderance of mortality and disability-adjusted life years in low and middle income countries.<sup>4</sup> Stroke, epilepsy and dementia rank among the major causes of death and disability, and often impinge on working-aged adults.<sup>5</sup>

Estimates show an annual incidence of 7.5% and a prevalence of 30.0%, for diseases affecting the nervous system that require the attention of a neurology specialist.<sup>6</sup> Further to these figures, should be added an array of nervous system diseases that are not referred, for various reasons, to a neurologist: headaches, dementia, lower back pain (which represents the principal cause of days

off at work in the western world), and others. In Italy, the prevalence of chronic pain is 27.0%, according to the latest estimates<sup>6</sup>, while accurate data on neuropathic pain are not available. If we consider the same frequency ratio between chronic and neuropathic pain detected in Europe, it can be estimated that the neuropathic pain prevalence should be around 6.0% in the Italian population.

Based on the epidemiological and social importance of these diseases, a number of healthcare policies have thus been developed in Italy, such as: the Decree of 4, October, 2010 for the Distribution of financial resources, assigned to the Fund for Non-self-sufficient subjects and whose beneficiaries also include patients with these symptoms. This is in addition to the creation of a Neuro-muscular Diseases Advisory Centre (Ministerial Decree on the 27, February, 2009).<sup>6</sup>

The aim of the present study was to examine characteristics and cluster of lifestyle factors in an Italian sample of neurological outpatients, in order to contribute to the identification of lifestyles that can improve health and life quality.

## Material and Methods

A cross sectional study was conducted in patients attending the ambulatory Unit Operative Complex of neurology of S. Eugenio Hospital in Rome, from January, 2017 to May, 2019. From the total of 165 patients enrolled in the study, 12 were excluded due to incomplete questionnaires. Overall, 153 subjects (87 males and 66 females) were included in the analysis relative to this paper.

Weight, height and waist circumference measurements were carried out by trained staff; according to WHO recommendations.<sup>7</sup> Standing height was recorded to the nearest 0.1 cm, by a non-elastic measuring tape without shoes. Weight was recorded to the nearest 50 gr, by a digital weighing scale without shoes. Waist Circumference (WC) was measured to the nearest 0.5 cm, in triplicate by a metric tape; the average of three measurements was used. WC was taken midway, between the lowest rib and iliac crest, using a flexible tape applied directly to uncovered skin at the end of normal expiration, and was measured to the nearest millimeter. Body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters ( $\text{kg}/\text{m}^2$ ). It was then categorized according to guidelines (underweight or normal weight  $\leq 24.9 \text{ kg}/\text{m}^2$ , overweight  $24.9\text{--}29.9 \text{ kg}/\text{m}^2$  and obese  $\geq 30 \text{ kg}/\text{m}^2$ ). WC was classified to be an indicator for abdominal obesity when it exceeded 102 centimeters for men and 88 cm for women. These cut-points are associated with a significantly higher risk for metabolic and cardiovascular complications. Waist Circumference/Height ratio (WC/Ht) was calculated, and the subjects were classified using the cut-off of 0.5:  $\text{WC}/\text{Ht} \geq 0.5$  and  $\text{WC}/\text{Ht} < 0.5$ .<sup>8</sup>

A structured questionnaire was administered, consisting of; socio demographic and lifestyle information, details regarding nutritional status, sleep duration, smoking/drinking habits, physical activity and comorbidities.

Informed written consent was obtained from all the study participants before the start of data collection. Data collected were kept confidential and used only for research purposes.

The descriptive analyses are presented as the means  $\pm$  standard deviations for quantitative variables, and as percentages for categorical variables. Student's t-test and Pearson chi-square test for categorical variables were conducted, to investigate the association

between gender and socio-demographic and lifestyle factors and occurrence of neurological disease.

Cluster analysis was used to identify profiles of similar patients regarding lifestyle factors, including nutritional status, abdominal obesity, physical activity, wine and alcohol consumption, smoking status and sleep duration. Cluster analysis was performed separately for males and females, since some of the lifestyle variables significantly differed by gender. All categorical variables, considered in the cluster analysis, were recoded into binary variables, and a combination of different methods was used to obtain the cluster solution.

First, several hierarchical methods were used to explore the clustering structure and to determine the number of existing clusters. A two-step clustering method, which allows for the inclusion of categorical variables, was subsequently used to obtain the final solutions. A new qualitative variable (cluster membership) was created, indicating the cluster to which each patient belonged. The clusters' description was based on analysis of contingency tables between each clustering variables and cluster membership. The relationship between cluster membership along with age class, education and occurrence of neurological disease was also investigated through contingency tables and chi-square test. Statistical Package for the Social Sciences 17.0 (SPSS Inc, Chicago, Illinois, the United State of America) was used for the statistical calculations, values of  $p\text{-value} < 0.05$  were considered to be significant.

## Results

The characteristics of participants are presented in Table 1. The sample comprises of 153 individuals: 87 (57.0%) males and 66 (47.0%) females, aged between 41 and 94. The mean age was 73 years (75 for males and 70 for females). A total of 45.0% declared a level of education from upper secondary to university degree, 49.4% of them were males ( $p\text{-value} = 0.217$ ).

The average BMI was 27.5, with 26.0% of normal obese rate rised to 77.0% in males and dropped to weight and 74.0% of overweight or obese. Overweight/ 70.0% in females (p-value=0.30).

**Table 1** Baseline characteristics, lifestyle and disease for total sample, by gender

Characteristics	Total sample n=153	Males n=87 (56.6%)	Females n=66 (43.4%)	p-value
Age, years $\pm$ S.D.	73.1 $\pm$ 11.5	75.2 $\pm$ 10.4	70.5 $\pm$ 12.4	0.014 <sup>a</sup>
Weight, kg $\pm$ S.D.	74.9 $\pm$ 13.5	80.2 $\pm$ 11.7	67.9 $\pm$ 12.6	$\leq$ 0.000 <sup>a</sup>
Height, cm $\pm$ S.D.	165.1 $\pm$ 9.8	170.5 $\pm$ 7.7	157.9 $\pm$ 7.4	$\leq$ 0.000 <sup>a</sup>
BMI	27.5 $\pm$ 4.3	27.6 $\pm$ 3.7	27.3 $\pm$ 4.9	0.593 <sup>a</sup>
Waist circumference/height ratio (WC/Ht) $\pm$ S.D.	0.6 $\pm$ 0.08	0.6 $\pm$ 0.1	0.6 $\pm$ 0.1	0.355 <sup>a</sup>
Age class				
<65	21.6 (33)	16.1 (14)	28.8 (19)	0.094 <sup>b</sup>
$\geq$ 65–75	25.5 (39)	24.1 (21)	27.3 (18)	
>75	52.9 (81)	59.8 (52)	43.9 (29)	
Education				
No formal education/primary/lower secondary	54.9 (84)	50.6 (44)	60.6 (40)	0.217 <sup>b</sup>
Upper secondary/university degree	45.1 (69)	49.4 (43)	39.4 (26)	
Nutritional status				
Normal weight	26.1 (40)	23.0 (20)	30.3 (20)	0.308 <sup>b</sup>
Overweight or obese	73.9 (113)	77.0 (67)	69.7 (46)	
Abdominal obesity				
Yes	66.7 (102)	59.8 (52)	75.8 (50)	0.038 <sup>b</sup>
No	33.3 (51)	40.2 (35)	24.2 (16)	
Smoking				
Current smoker	15.7 (24)	13.8 (12)	18.2 (12)	0.460 <sup>b</sup>
No smoker/former smoker	84.3 (129)	86.2 (75)	81.8 (54)	
Alcohol consumption				
Yes	32.2 (49)	38.4 (33)	24.2 (16)	0.065 <sup>b</sup>
No	67.8 (103)	61.6 (53)	75.8 (50)	
Wine consumption				
Everyday	20.4 (31)	26.7 (23)	12.1 (8)	0.027 <sup>b</sup>
Not every day/never	79.6 (121)	73.3 (63)	87.9 (58)	
Physical activity				
Yes	34.0 (52)	37.9 (33)	28.8 (19)	0.237 <sup>b</sup>
No	66.0 (101)	62.1 (54)	71.2 (47)	
Sleep duration (hours)				
<6	29.4 (45)	29.9 (26)	28.8 (19)	0.883 <sup>b</sup>
$\geq$ 6	70.6 (108)	70.1 (61)	71.2 (47)	
Neurological disease				
Yes	52.6 (80)	57.0 (49)	47.0 (31)	0.221 <sup>b</sup>
No	47.4 (72)	43.0 (37)	53.0 (35)	
Dementia				
Yes	9.9 (15)	11.6 (10)	7.6 (5)	0.406 <sup>b</sup>
No	90.1 (137)	88.4 (76)	92.4 (61)	

Table 1 (continued)

Characteristics	Total sample n=153	Males n=87 (56.6%)	Females n=66 (43.4%)	p-value
Stroke				
Yes	6.6 (10)	8.1 (7)	4.5 (3)	0.376 <sup>b</sup>
No	93.4 (142)	91.9 (79)	95.5 (63)	
Parkinson				
Yes	19.7 (30)	24.4 (21)	13.6 (9)	0.098 <sup>b</sup>
No	80.3 (122)	75.6 (65)	86.4 (57)	
Diabete				
Yes	14.5 (22)	18.6 (16)	9.1 (6)	0.098 <sup>b</sup>
No	85.5 (130)	81.4 (70)	90.9 (60)	
Hypertension				
Yes	44.1 (67)	40.7 (35)	48.5 (32)	0.338 <sup>b</sup>
No	55.9 (85)	59.3 (51)	51.5 (34)	

<sup>a</sup>Comparison between males and females, based on t-test

<sup>b</sup>Comparison between males and females, based on chi-square test

S.D.=standard deviation, kg=kilograms, cm=centimeters, BMI=body mass index

There was a significantly, higher percentage of patients with abdominal obesity (67.0% in total) among females (76.0%) than among males (60.0%), p-value=0.038. With regard to lifestyle and health factors, examined subjects revealed that: in males there was a higher prevalence of habitual consumers of wine (26.7% vs. 12.1, p-value=0.027) and other alcoholic beverages (38.4% vs. 24.2%, p-value=0.065) with respect to females, and also a higher percentage of people who practiced physical activity (37.9% vs. 28.8%, p-value=0.237). The rate of neurological patients was higher for males than females (57.0% vs. 47.0%, p-value=0.221), in particular they comprised of subjects suffering from dementia (11.6% vs 7.6%, p-value=0.406), stroke (8.1% vs. 4.5%, p-value=0.376) and Parkinson's disease (24.4% vs. 13.6%, p-value=0.098). In males a higher percentage of patients with diabetes was observed (18.6% vs. 9.1%, p-value=0.098). Among females there was a higher prevalence of smokers (18.2% vs. 13.2%, p-value=0.460) and hypertensive patients (48.5% vs. 40.7%, p-value=0.338).

An adequate sleep time concerns 71.0% of the sample, with no difference between genders.

#### Demographic and lifestyle factors in relation to neurological disease (Table 2)

Among patients suffering from neurological disease only, or even in the presence of one more non-neurological disease, there was a higher prevalence of subjects with a low educational level than those who do not suffer from any neurological disease (62.5% vs. 37.5%, p-value=0.039).

Among people with dementia, the percentage of people with a lower education level was higher than among those without dementia (80.0% vs. 51.8%, p-value=0.037), also the percentage of over 75-year-old people was higher (86.7% vs. 49.6%, p-value=0.024). Among stroke patients, a higher percentage of people who regularly practice physical activity was observed (70.0% vs. 31.7%, p-value=0.014). Among neurological patients, particularly those with Parkinson's disease, the prevalence of appropriate hours of sleep was lower ( $\geq 6$  sleep hours,

**Table 2** Demographics and lifestyle by type of disease (mean±S.D. for continuous variables, % (n) for categorical variables)

Characteristics	Neurological disease			Parkinson			Stroke			Dementia		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Age, years	75.4±10.3	70.7±12.4	0.032	75.4±10.0	72.6±11.8	0.265	73.2±9.0	73.2±11.7	0.711	82.3±8.0	72.2±11.4	0.001
Weight, kg	73.9±13.0	75.9±14.1	0.508	74.7±11.7	74.9±14.0	0.553	77.8±15.4	74.7±13.4	0.422	69.6±13.6	75.4±13.5	0.271
Height, cm	164.6±9.9	165.5±9.7	0.640	164.7±8.0	165.1±10.3	0.835	168.5±12.8	164.8±9.6	0.567	162.0±10.0	165.4±9.8	0.495
BMI	27.3±4.2	27.7±4.5	0.616	27.5±4.0	27.5±4.4	0.654	27.3±3.8	27.5±4.4	0.654	26.3±3.6	27.6±4.4	0.415
Waist circumference/ height ratio (WC/Ht)	0.6±0.1	0.6±0.1	0.444	0.6±0.1	0.6±0.1	0.444	0.6±0.1	0.6±0.1	0.225	0.6±0.1	0.6±0.1	0.486
Gender												
Males	61.3 (49)	51.4 (37)	0.221	70.0 (21)	53.3 (65)	0.098	70.0 (7)	55.6 (79)	0.376	66.7 (10)	55.5 (76)	0.406
Females	38.8 (31)	48.6 (35)		30.0 (9)	46.7 (57)		30.0 (3)	44.4 (63)		33.3 (5)	44.5 (61)	
Age class												
<65	18.8 (15)	25.0 (18)	0.217	16.7 (5)	23.0 (28)	0.756	30.0 (3)	21.1 (30)	0.498	6.7 (1)	23.4 (32)	0.024
≥65-75	21.3 (17)	29.2 (21)		26.7 (8)	24.6 (30)		10.0 (1)	26.1 (37)		6.7 (1)	27.0 (37)	
>75	60.0 (48)	45.8 (33)		56.7 (17)	52.5 (64)		60.0 (6)	52.8 (75)		86.7 (13)	49.6 (68)	
Education												
No formal education/ primary/lower	62.5 (50)	45.8 (33)	0.039	53.3 (16)	54.9 (67)	0.876	50.0 (5)	54.9 (78)	0.762	80.0 (12)	51.8 (71)	0.037
Upper secondary/ university degree	37.5 (30)	54.2 (39)		46.7 (14)	45.1 (55)		50.0 (5)	45.1 (64)		20.0 (3)	48.2 (66)	
BMI class												
Normal weight	26.3 (21)	26.4 (19)	0.985	23.3 (7)	27.0 (33)	0.679	20.0 (2)	26.8 (38)	0.639	40.0 (6)	24.8(34)	0.205
Overweight or obese	73.8 (59)	73.6 (53)		76.7 (23)	73.0 (89)		80.0 (8)	73.2 (104)		60.0 (9)	75.2 (103)	
Abdominal obesity												
Yes	63.8 (51)	69.4 (50)	0.548	66.7 (20)	66.4 (81)	0.977	40.0 (4)	68.3 (97)	0.067	46.7 (7)	68.6 (94)	0.087
No	36.3 (29)	30.6 (22)		33.3 (10)	33.6 (41)		60.0 (6)	31.7 (45)		53.3 (8)	31.4 (43)	
Smoking status												
Current smoker	18.8 (15)	11.1 (8)	0.189	13.3 (4)	15.6 (19)	0.759	0.0 (0)	16.2 (23)	0.167	20.0 (3)	14.6 (20)	0.579
No smoker/former smoker	81.3 (65)	88.9 (64)		86.7 (26)	84.4 (103)		100 (10)	83.8 (119)		80.0 (12)	85.4 (117)	
Alcohol consumption												
Yes	30.4 (24)	34.7 (25)	0.569	30.0 (9)	33.1 (40)	0.749	20.0 (2)	33.3 (47)	0.384	46.7 (7)	30.9 (42)	0.215
No	69.6 (55)	65.3 (47)		70.0 (21)	66.9 (81)		80.0 (8)	66.7 (94)		53.3 (8)	69.1 (94)	
Wine consumption												
Everyday	19.0 (15)	22.2 (16)	0.623	16.7 (5)	21.5 (26)	0.558	20.0 (2)	20.6 (29)	0.996	26.7 (4)	19.9 (27)	0.535
Not everyday/never	81.0 (64)	77.8 (56)		83.3 (25)	78.5 (95)		80.0 (8)	79.4 (112)		73.3 (11)	80.1 (109)	
Physical activity												
Yes	37.5 (30)	30.6 (22)	0.368	40.0 (12)	32.8 (40)	0.456	70.0 (7)	31.7 (45)	0.014	26.7 (4)	35.0 (48)	0.517
No	62.5 (50)	69.4 (50)		60.0 (18)	67.2 (82)		30.0 (3)	68.3 (97)		73.3 (11)	65.0 (89)	
Sleep duration (hours)												
<6	36.3 (29)	20.8 (15)	0.036	43.3 (13)	25.4 (31)	0.050	30.0 (3)	28.9 (41)	0.939	46.7 (7)	27.0 (37)	0.111
≥6	63.8 (51)	79.2 (57)		56.7 (17)	74.6 (91)		70.0 (7)	71.1 (101)		53.3 (8)	73.0 (100)	

BMI=body mass index, kg=kilograms, cm=centimeters

63.8% in neurological patients vs. 79.2% in non-neurological patients,  $p$ -value=0.036;  $\geq 6$  sleep hours, 56.7% in Parkinson patients vs. 74.6% in non-Parkinson patients,  $p$ -value=0.05).

### **Description of clusters of lifestyle factors, and their associations with age class, education and neurological disease.**

Figure 1 and Figure 2 show the clusters of lifestyle factors obtained for males and females, respectively. In these figures, each estimated cluster is named reporting its dimension. In each cluster the prevalence of clustering variables, as well as prevalence of the three evaluation variables (for example; age class, education and presence of neurological disease) is reported as percentage. Three clusters were identified for males:

Cluster 1=Unhealthy habits, consisting of 33 subjects (38.4%)

Cluster 2=Active, consisting of 30 subjects (34.9%)

Cluster 3=Sedentary, consisting of 23 subjects (26.7%)

Four clusters were identified for females:

Cluster 1=Unhealthy habits, consisting of 8 subjects (11.8%)

Cluster 2=Active overweight, consisting of 34 subjects (35.3%)

Cluster 3=Sedentary, consisting of 18 subjects (26.5%)

Cluster 4=Normal weight, consisting of 18 subjects (26.5%)

The “Unhealthy habits” cluster was identified in both groups, which was dominant among males; whereas, it was the smallest cluster in females. In both genders the “Unhealthy habits” cluster was characterized by a high prevalence of overweight/obese and abdominal

obese subjects, a high prevalence of wine and alcoholic beverages consumers and a high prevalence of inactive subjects; especially in females. In males, the “Unhealthy habits” cluster was characterized by a higher prevalence of neurological patients (60.6%), although no statistical significance was observed, patients with low education levels (54.0%) and older patients (87.8%). In females, the “Unhealthy habits” cluster registered the lowest prevalence in neurological patients (13.0%) and the highest prevalence in people with low education levels (75.0%).

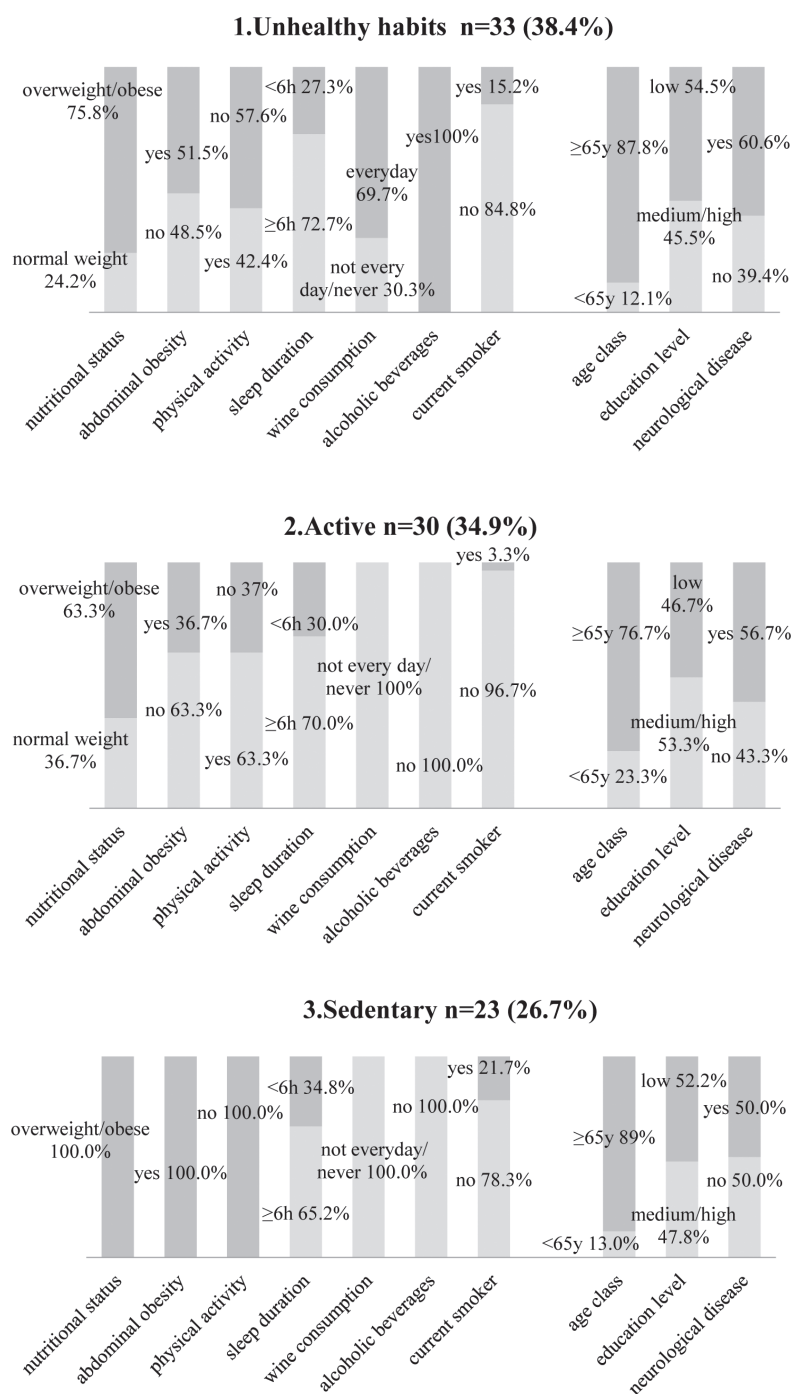
The “Active” cluster in males was determined by the highest prevalence of physically active patients, a reduced prevalence of both obesity and abdominal obesity, absence of wine and alcohol consumers, a high prevalence of no-smokers; a medium/high education level also prevailed (53.3%).

The “Active Overweight” cluster, observed in females, was still characterized by the highest prevalence of physically active subjects, absence or very low prevalence of alcohol consumers. Also, it comprised, prevalently of neurological patients (71.0%), but with respect to the “Active” cluster it was prevalently formed by overweight or obese subjects.

The “Sedentary” cluster, identified in both males and females, was determined by inactive, overweight or obese subjects, also affected by abdominal obesity and non alcohol consumers. In addition, the “Sedentary” cluster was prevalently formed by older patients, both in males (89.0%) and in females (94.0%), and by low education levels (72.0%) in females.

The “Normal Weight” cluster was observed in females only. It comprised of normal weight females, with adequate sleep duration, prevalently inactive and characterized by reduced prevalence of abdominal obesity and alcohol consumption.





**Figure 1** Cluster of lifestyle factors for males



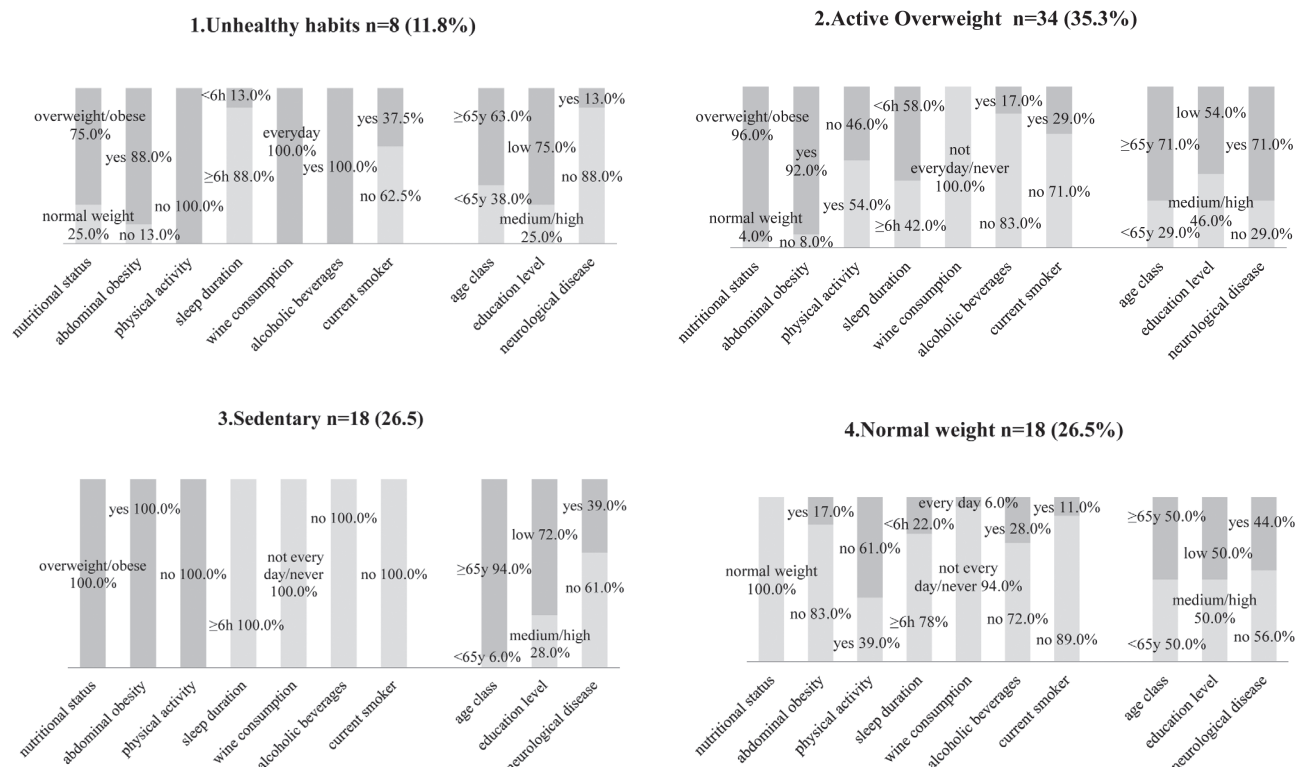


Figure 2 Cluster of lifestyle factors for females

## Discussion

This study was designed to examine characteristics and cluster of lifestyle factors in a small Italian sample of neurological outpatients. The results of this study showed a high prevalence of overweight/obesity and an abdominal obesity that was significantly higher among females.

Obesity and being overweight are considered as high-risk factors for the development of mental health disorders as well as neurodegenerative diseases, such as anxiety, depression, body image disorders, Alzheimer's and Parkinson's disease.<sup>9-12</sup>

Also in our study, it emerged that neurological diseases have a significant prevalence in male subjects (in particular for Parkinson's disease, but also for dementia and stroke), in subjects with a low education level

(particularly for dementia), in elderly people (over age 75) and in people getting a significantly lower percentage of appropriate hours of sleep (mainly in Parkinson's disease).

These findings are in accordance with other studies, available in literature, where it was observed that neurological diseases are frequent in older adults and affect 5.0% to 55.0% of people aged 55 or older.<sup>13,14</sup> Additionally, the prevalence of dementia increases with advancing age, affecting nearly 50.0% of the population over 85 years of age.<sup>15</sup> Regarding gender, many studies reported it as a significant variable in neurological diseases<sup>16-22</sup>, and in particular it was observed that those of the male gender have a significant risk factor for Parkinson's disease<sup>23-25</sup>; whilst females are more susceptible to Alzheimer's disease.<sup>26,27</sup>

Other studies, reporting similar data to our research, showed that a higher education level is associated with a lower risk of dementia, which is thought to be explained by a higher cognitive reserve.<sup>28,29</sup> In fact, a higher cognitive reserve allows people to endure neurodegenerative diseases, and maintain brain function for a longer extent than people with a low reserve, before the damage manifests clinically as dementia.<sup>30-32</sup>

The results of our study indicated a lower percentage of appropriate hours of sleep, mainly in Parkinson's disease. Sleep disturbance is a common problem in elderly people, as well as in patients affected by mild cognitive impairment and dementia. Some studies reported that shorter as well as longer sleep duration may be important risk factors for future cognitive impairment.<sup>33-37</sup> One prospective study of the relationship between sleep duration, and risk of dementia also reported that the latter was higher in individuals with long sleep durations, around 8–9 hours and more, with respect to people having normal sleep durations of 6 and 7 hours. It can be thus be assumed that longer sleep duration might be a risk factor for cognitive impairment among older people.<sup>38</sup>

In this study, cluster analysis allowed for the identifying of similar profiles in the sample, depending on lifestyle factors. Three clusters were thus identified for males: (1. Unhealthy habits; 2. Active and 3. Sedentary); and four for females: (1. Unhealthy habits; 2. Active overweight; 3. Sedentary and 4. Normal weight).

The “Unhealthy habits” cluster, dominant among males, had the least favorable health parameters. It was in fact characterized by a high prevalence of overweight/obese and abdominal obese subjects, a high prevalence of wine and alcoholic beverage consumers, a high prevalence of inactive subjects; especially in females, and by a high prevalence of neurological disease

among males. In our research, the proportion of women with unhealthy lifestyle clustering was approximately lower than in men, while those of the male gender were confirmed as an independent risk factor for unhealthy lifestyle clustering.

WHO reported that behaviours; such as, smoking, an unbalanced diet, excessive alcohol consumption and physical inactivity, are the main, modifiable risk factors for the prevention of chronic diseases. These currently account for over 70.0% of the overall global burden of disease, and which are expected to rise to 80.0% by the end of 2020.<sup>39</sup>

One more survey evidenced the cluster of unhealthy habits in elderly people. A cross-sectional study, carried out in China, explored the influencing factors of unhealthy lifestyle clustering (for example; unreasonable diets, physical inactivity, smoking, excessive drinking and low health literacy on diabete outcomes) in rural, elderly adults with prediabetes. It found a significant clustering of unhealthy (76.5%), among the elderly participants, with prediabetes; this clustering was more obvious among the elders aged between 60 and 69.<sup>40</sup>

Our study has, nevertheless, some limitations. First, this survey had a hospital-based design, and patients were seen only one time by the neurologist; as a consequence, follow up data were unavailable. Second, this study, being of a cross-sectional nature, was conducted on a small sample size, which is not representative. In addition, it is possible that other metrics can identify subgroups. This means that the lack of clustering in our analyses does not imply that clusters do not exist. However, if clusters exist they cannot be identified with the variables that were cons.

The strengths of our research lie in its anthropometric variables, which were measured and not self-reported by the subjects. In addition, two indicators of obesity, namely cut-off for BMI and WC/Ht, were used.

## Conclusion

In conclusion; three clusters were identified for males and four for females according to lifestyles. The main, important findings showed a high prevalence of unhealthy lifestyle clustering dominant among male, elderly people with neurological diseases. These data, characterizing the profile of our sample, can be used as a basis for the development of efficient strategies aimed at improving the quality of life. However, due to the limited number of participants in this study these findings require confirmation by further studies, with larger samples.

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## Conflict of interest

The authors have no conflicts of interest to declare.

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