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Lifestyle and dietary habits of patients with gout followed in rheumatology settings

M. Manara[1,2], G. Carrara[2], C.A. Scirè[2], M.A. Cimmino[3], M. Govoni[4], C. Montecucco[5], M. Matucci-Cerinic[6], G. Minisola[7] and the KING study group

[1]Gaetano Pini Institute, Milano, Italy;
[2]Epidemiology Unit, Italian Society for Rheumatology, Milano, Italy;
[3]Research Laboratory and Academic Unit of Clinical Rheumatology, Department of Internal Medicine, University of Genoa, Italy;
[4]Department of Medical Sciences, University of Ferrara, Italy;
[5]Division of Rheumatology, IRCCS San Matteo Foundation, Pavia, Italy;
[6]Department of Internal Medicine, University of Florence, Italy;
[7]Department of Rheumatology, San Camillo Hospital, Rome, Italy

SUMMARY

Diet and lifestyles modification are core aspects of the non-pharmacological management of gout, but a poor consistency with suggested guidelines is reported. This study aimed to investigate dietary and lifestyle habits of patients with gout followed in rheumatology settings.

Data were retrieved from the baseline dataset of the KING study, a multicentre cohort study of patients with gout followed in rheumatology settings. Dietary habits were assessed with the Italian National Institute of Statistics (ISTAT) food-frequency questionnaire and compared with reported data about general population. The relative increase of exposure was estimated by standardized prevalence ratios adjusted for gender, age and geographical distribution.

The study population included 446 patients, with a mean age of 63.9 years and a M/F ratio of 9:1. Compared to the Italian population, gouty patients showed a higher prevalence of obesity [1.82 (1.52-2.18)] and a higher consumption of wine [1.85 (1.48-2.32)] and beer [2.21 (1.68-2.90)], but a lower prevalence of smoking and a lower intake of liquor. They showed a lower intake of red meat [0.80 (0.71-0.91)], but a similar intake of other tested dietary factors.

Gouty patients' lifestyle is still partially different from the recommended.

Key words: *Gout; diet; lifestyle.*

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INTRODUCTION

Gout is the most common inflammatory arthritis in men and its prevalence has been increasing in the last years due to progressive aging of the population, increased use of drug, and changes in lifestyles and dietary habits (1).

Dietary and lifestyle factors have been reported to be implicated in the manifestation of gout, being associated with an increased risk of hyperuricemia and incident gout in general population (2). Many of these risk factors have been also identified as triggers for acute flares in patients with prevalent gout (2). Based on these findings, international recommendations for the management of gout recognise dietary intervention and lifestyle modification as core aspects of the non-pharmacological management of gout (3, 4).

Nevertheless, since pharmacological management and drug adherence are largely suboptimal (5), we expect dietary habits very different from those recommended for gout. A recent study investigated dietary habits of a small sample of patients with gout, followed in a rheumatologic setting, and it has provided preliminary evidence of poor consistency with suggested guidelines (6).

Therefore, the aim of the present study was to obtain relative measures of exposure to dietary and lifestyle risk factors in patients with prevalent gout followed in rheumatologic settings compared with general population, in order to identify needs for intervention in these patients. For this purpose, a random sample of Italian patients with gout

Corresponding author
Maria Manara
Rheumatology Department,
Gaetano Pini Institute
Via Pini, 9 - 20122 Milano, Italy
E-mail: maria.manara@gmail.com

from rheumatology centres was drawn and lifestyles and dietary habits were compared with official data from general population.

MATERIALS AND METHODS

A cross-sectional analysis of data retrieved from the baseline dataset of the KING study (Kick-off of the Italian Network for Gout, NCT01549210) was done. The KING study is a multicentre cohort study including patients with a previous clinical diagnosis of gout formulated by rheumatologists. Patients were recruited between June 2011 and January 2012 from 30 rheumatology centres across Italy. Participants were selected from clinical registries of all patients with gout evaluated in the previous two years in each centre by random cluster sampling.

A rheumatologist interviewed patients about demographics, level of education and employment status. Dietary habits were assessed using the food-frequency questionnaire created by the Italian National Institute of Statistics (ISTAT) for national surveys (www.istat.it/it/archivio/14562).

Data about the Italian population were collected from the last available national survey reported by ISTAT in the 2010 release of the Health for All, stratified for the maximum level of detail in terms of gender, classes of age and geographic region (7).

Statistical analysis

Lifestyle and dietary variables were categorized according to ISTAT definitions or, for dietary factors, to cut-offs reported to be significantly associated with an increased risk of gout. Obesity was defined as a body mass index (BMI) ≥30. Smoking was considered for current smokers, while ex-smokers were assessed as non-smokers. The cut-off for a high wine consumption was established at ≥0.5 litres per day, while a high beer consumption was defined for usual drinkers (daily consumers). Liquor consumption was defined for any amount of spirits consumed. The intake of beef meat, sausages, pork meat and fish was considered high when subjects consumed these foods more than once a week, while a high intake of carbohydrates, milk, dairy products, fruit or vegetables was defined for ≥1 servings per day. Employment rate was defined as the percentage of employed subjects in the reference population aged 15 and older. A low educational level was assigned to illiterates and subjects who got only a primary school licence.

The relative increase of exposure in gouty patients was estimated by standardized prevalence ratios (SPR), calculated as the ratio between the observed number of exposed subjects and the expected number, based on data derived from the reference population, stratifying by gender, age and geographical distribution (8). For each variable, confounding was systematically explored by stratification for principal comorbidities, which could explain lifestyle or dietary changes in gouty patients. Analyses were performed using STATA (Stata Corp, 2009, release 11, TX, USA).

RESULTS

The analysis includes 446 patients, with a median disease duration of 3.7 years, higher prevalence of male subjects (90.4%), mean

Table I - Characteristics of the study population (n=446).

Age [mean (SD)]	63.9 (11.6)
Gender (male) [number (%)]	403 (90.36%)
BMI [mean (SD)]	28.0 (4.07)
Disease duration (years) [median (IQR)]	3.7 (1.4-10.2)
Joint involvement [number (%)]: – Monoarticular – Oligoarticular – Polyarticular	 97 (21.95%) 262 (59.28%) 83 (18.78%)
Tophaceous gout [number (%)]	87 (19.91%)
Serum urate level (mg/dL) [mean (SD)]	6.3 (1.75)
Allopurinol [number (%)]	304 (68.16%)
Febuxostat [number (%)]	59 (13.23%)
Comorbidities [number (%)]: – Hypertension – Diabetes – Dyslipidemia – Ischemic heart disease – Cerebral vascular disease – Nephrolithiasis – Renal failure	 306 (68.76%) 62 (13.90%) 184 (41.91%) 58 (13.09%) 24 (5.39%) 96 (21.52%) 54 (12.16%)

SD, standard deviation; BMI, body mass index; IQR, interquartile range.

Table II - Observed and expected exposure to dietary and lifestyle factors in the study population, with standardized prevalence ratios (n=446).

	Observed N (%)	Expected N (%)	SPR (95% CI)
Obesity (BMI ≥30)	114 (25.56%)	63 (14.12%)	1.82 (1.52-2.18)
Smoking (current smokers)	72 (16.22%)	96 (21.52%)	0.75 (0.60-0.95)
Wine (≥0.5 l/day)	73 (16.52%)	39 (8.74%)	1.85 (1.48-2.32)
Beer (daily consumption)	49 (11.06%)	22 (4.93%)	2.21 (1.68-2.90)
Spirit (any amount)	72 (16.25%)	125 (28.03%)	0.57 (0.48-0.72)
Beef meat (≥1 serving/week)	249 (56.21%)	313 (70.18%)	0.80 (0.71-0.91)
Sausages (≥1 serving/week)	278 (62.61%)	264 (59.19%)	1.05 (0.94-1.18)
Pork meat (≥1 serving/week)	158 (35.75%)	206 (46.19%)	0.77 (0.66-0.90)
Fish (≥1 serving/week)	264 (59.50%)	267 (59.86%)	0.98 (0.87-1.11)
Carbohydrates (≥1 serving/day)	391 (87.67%)	389 (87.22%)	1.00 (0.91-1.11)
Milk (≥1 serving /day)	194 (43.60%)	238 (53.36%)	0.81 (0.71-0.94)
Dairy products (≥1 serving/day)	109 (24.60%)	108 (24.21%)	1.01 (0.83-1.21)
Vegetables (≥1 serving/day)	249 (56.33%)	251 (56.28%)	0.99 (0.87-1.12)
Fruit (≥1 serving/day)	366 (82.25%)	366 (82.25%)	1.00 (0.90-1.11)
Employment rate	137 (32.54%)	278 (62.33%)	0.47 (0.40-0.56)
Illiteracy or primary school education	147 (32.96%)	86 (19.28%)	1.71 (1.45-2.00)

SPR, standardized prevalence ratios; CI, confidence interval; BMI, body mass index.

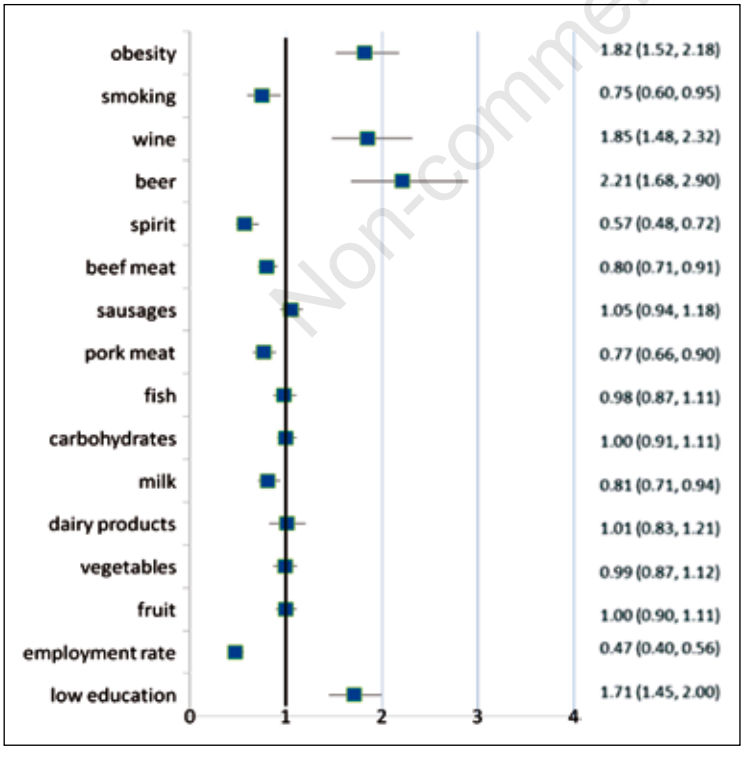

Figure 1 - Relative exposure to lifestyle and dietary risk factors in gouty patients compared to the general population [standardized prevalence ratios, SPR (95% confidence intervals)].

age of 63.9 years and an average BMI of 28. Physical examination revealed the presence of tophi in almost 20% of patients and a polyarticular involvement in 83 (18.8%) subjects. Although most of patients where on urate-lowering treatment (81.4%), mean serum uric acid was above recommended levels (6.3 mg/dL). A high proportion of subjects reported comorbidities, especially in the spectrum of the metabolic syndrome (Table I).

Compared to the Italian population, gouty patients showed a higher prevalence of obesity (SPR: 1.82, 95%CI: 1.52-2.18) (Table II and Figure 1). Analysis of lifestyle habits revealed a slightly lower prevalence of smoking and a lower consumption of spirits, but a significant higher consumption of wine (SPR: 1.85, 95%CI: 1.48-2.32) and beer (SPR: 2.21, 95%CI: 1.68-2.90) in patients with gout. By considering purine-rich food consumption, gouty patients showed a lower intake of beef meat (SPR: 0.80, 95%CI: 0.71-0.91) and pork meat (SPR: 0.77, 95%CI: 0.66-0.90), but a similar amount of sausages and fish than Italian general population. Among other tested dietary factors, we observed a lower con-

sumption of milk but no significant differences in the amount of dairy products, carbohydrates, vegetables and fruit consumed. In the end, we found that gouty patients had a lower employment rate and a lower educational level compared to the Italian population, suggesting a lower socio-economic status.
Results from stratified analyses are reported as supplementary material (Appendix 1).

DISCUSSION

This survey on lifestyle and dietary habits of a large random sample of patients with gout followed in rheumatology practices confirmed previous reported data about unhealthy lifestyles in gouty patients.
The cross-sectional design of the study did not allow us to establish a causal relationship between lifestyle habits and gout occurrence, but we could only verify if gouty patients had current habits consistent with optimal lifestyles. Furthermore, we could not assess if patients had modified their lifestyles and dietary behavior after the diagnosis.
Dietary habits were measured with the same instrument for the studied population and the reference population, and this is the principal strength of our study, leading to an optimal comparability of the two groups. Nevertheless, some dietary factors which have been reported to influence the risk of gout were not included in the ISTAT food-frequency questionnaire.
Weight loss is a key aspect of the non-pharmacological management of gout (3). A high prevalence of overweight and obesity in patients with gout has been reported in several cross-sectional studies, and obesity was associated with an increased risk of incident gout in prospective studies (9, 10). Gouty patients included in our study population showed a higher prevalence of obesity compared to the Italian general population. Moreover, the prevalence of obesity was even higher in patients affected by heart

APPENDIX 1: SUPPLEMENTARY DATA

Standardized prevalence ratios (SPR) of observed and expected exposure to dietary and lifestyle factors in the study population stratified for principal comorbidities.

Obesity

	n.	SPR	95% IC
Non-stratified	446	1.82	1.52-2.18
Ischemic heart disease (yes)	58	2.38	1.56-3.65
Ischemic heart disease (no)	388	1.76	1.44-2.14
Diabetes (yes)	62	2.32	1.53-3.52
Diabetes (no)	384	1.73	1.42-2.12
Cerebral vascular disease (yes)	24	1.34	0.56-3.20
Cerebral vascular disease (no)	422	1.85	1.53-2.22
Dyslipidemia (yes)	184	1.84	1.40-2.42
Dyslipidemia (no)	262	1.84	1.46-2.33
Renal failure (yes)	54	1.45	0.83-2.55
Renal failure (no)	392	1.88	1.56-2.28
ASA (yes)	104	2.52	1.85-3.43
ASA (no)	342	1.69	1.36-2.08
Anticoagulant (yes)	44	1.97	1.13-3.43
Anticoagulant (no)	402	1.86	1.55-2.24
Comorbidities ≥3	231	1.93	1.52-2.45
Comorbidities <3	215	1.69	1.28-2.23

Smoking

	n	SPR	95% IC
Non-stratified	446	0.75	0.60-0.95
Ischemic heart disease (yes)	58	0.56	0.25-1.23
Ischemic heart disease (no)	388	0.77	0.60-0.97
Obesity (yes)	114	0.61	0.37-1.01
Obesity (no)	332	0.78	0.60-1.01
Diabetes (yes)	62	0.84	0.45-1.55
Diabetes (no)	384	0.74	0.58-0.95
Cerebral vascular disease (yes)	24	0.85	0.31-2.26
Cerebral vascular disease (no)	422	0.74	0.59-0.94
Dyslipidemia (yes)	184	0.75	0.53-1.08
Dyslipidemia (no)	262	0.75	0.55-1.00
Renal failure (yes)	54	0.80	0.40-1.60
Renal failure (no)	392	0.74	0.58-0.94
ASA (yes)	104	0.47	0.25-0.88
ASA (no)	342	0.78	0.61-1.00
Anticoagulant (yes)	44	0.35	0.12-1.02
Anticoagulant (no)	402	0.77	0.61-0.97
Comorbidities ≥3	231	0.69	0.48-0.98
Comorbidities <3	215	0.80	0.59-1.08

Beef consumption

	n	SPR	95% IC
Non-stratified	446	0.80	0.70-0.90
Ischemic heart disease (yes)	58	0.89	0.64-1.23
Ischemic heart disease (no)	388	0.78	0.69-0.89
Obesity (yes)	114	0.80	0.62-1.04
Obesity (no)	332	0.79	0.69-0.91
Diabetes (yes)	62	0.90	0.66-1.23
Diabetes (no)	384	0.78	0.68-0.89
Cerebral vascular disease (yes)	24	0.69	0.40-1.22
Cerebral vascular disease (no)	422	0.80	0.71-0.91
Dyslipidemia (yes)	184	0.76	0.63-0.92
Dyslipidemia (no)	262	0.83	0.71-0.97
Renal failure (yes)	54	0.65	0.44-0.96
Renal failure (no)	392	0.82	0.72-0.93
ASA (yes)	104	0.71	0.54-0.93
ASA (no)	342	0.82	0.71-0.94
Anticoagulant (yes)	44	0.57	0.35-0.91
Anticoagulant (no)	402	0.81	0.72-0.92
Comorbidities ≥3	231	0.78	0.66-0.93
Comorbidities <3	215	0.81	0.68-0.96

Sausage meat consumption

	n	SPR	95% IC
Non-stratified	446	1.05	0.94-1.18
Ischemic heart disease (yes)	58	1.06	0.76-1.47
Ischemic heart disease (no)	388	1.05	0.93-1.19
Obesity (yes)	114	1.10	0.86-1.39
Obesity (no)	332	1.04	0.91-1.19
Diabetes (yes)	62	1.26	0.94-1.69
Diabetes (no)	384	1.02	0.90-1.16
Cerebral vascular disease (yes)	24	0.70	0.38-1.30
Cerebral vascular disease (no)	422	1.07	0.95-1.21
Dyslipidemia (yes)	184	1.03	0.85-1.23
Dyslipidemia (no)	262	1.07	0.92-1.25
Renal failure (yes)	54	0.93	0.64-1.33
Renal failure (no)	392	1.07	0.95-1.21
ASA (yes)	104	1.03	0.80-1.31
ASA (no)	342	1.05	0.92-1.20
Anticoagulant (yes)	44	0.94	0.63-1.41
Anticoagulant (no)	402	1.05	0.93-1.19
Comorbidities ≥3	231	1.07	0.91-1.26
Comorbidities <3	215	1.03	0.87-1.22

Pork consumption

	n	SPR	95% IC
Non-stratified	446	0.77	0.66-0.90
Ischemic heart disease (yes)	58	0.77	0.50-1.18
Ischemic heart disease (no)	388	0.76	0.65-0.90
Obesity (yes)	114	0.75	0.54-1.03
Obesity (no)	332	0.77	0.65-0.92
Diabetes (yes)	62	0.88	0.59-1.30
Diabetes (no)	384	0.75	0.63-0.89
Cerebral vascular disease (yes)	24	0.96	0.53-1.74
Cerebral vascular disease (no)	422	0.75	0.64-0.88
Dyslipidemia (yes)	184	0.78	0.61-0.98
Dyslipidemia (no)	262	0.77	0.63-0.94
Renal failure (yes)	54	0.71	0.45-1.13
Renal failure (no)	392	0.77	0.65-0.91
ASA (yes)	104	0.77	0.55-1.06
ASA (no)	342	0.77	0.65-0.91
Anticoagulant (yes)	44	0.56	0.31-0.99
Anticoagulant (no)	402	0.79	0.67-0.92
Comorbidities ≥3	231	0.76	0.61-0.95
Comorbidities <3	215	0.77	0.62-0.96

Fish consumption

	n	SPR	95% IC
Non-stratified	446	0.98	0.87-1.11
Ischemic heart disease (yes)	58	1.24	0.92-1.67
Ischemic heart disease (no)	388	0.95	0.83-1.08
Obesity (yes)	114	0.98	0.77-1.26
Obesity (no)	332	0.98	0.85-1.12
Diabetes (yes)	62	0.93	0.67-1.29
Diabetes (no)	384	0.99	0.87-1.13
Cerebral vascular disease (yes)	24	1.14	0.71-1.84
Cerebral vascular disease (no)	422	0.98	0.86-1.10
Dyslipidemia (yes)	184	1.00	0.83-1.20
Dyslipidemia (no)	262	0.97	0.83-1.14
Renal failure (yes)	54	0.96	0.67-1.36
Renal failure (no)	392	0.99	0.87-1.12
ASA (yes)	104	1.09	0.86-1.38
ASA (no)	342	0.96	0.83-1.10
Anticoagulant (yes)	44	1.00	0.68-1.47
Anticoagulant (no)	402	0.99	0.87-1.12
Comorbidities ≥3	231	0.98	0.83-1.16
Comorbidities <3	215	0.98	0.83-1.17

Vegetable consumption

	n	SPR	95% IC
Non-stratified	446	0.99	0.87-1.12
Ischemic heart disease (yes)	58	1.07	0.77-1.48
Ischemic heart disease (no)	388	0.98	0.86-1.12
Obesity (yes)	114	1.04	0.80-1.34
Obesity (no)	332	0.99	0.86-1.13
Diabetes (yes)	62	1.10	0.80-1.51
Diabetes (no)	384	0.97	0.85-1.12
Cerebral vascular disease (yes)	24	1.13	0.69-1.84
Cerebral vascular disease (no)	422	0.98	0.87-1.12
Dyslipidemia (yes)	184	1.03	0.85-1.24
Dyslipidemia (no)	262	0.96	0.82-1.14
Renal failure (yes)	54	1.05	0.75-1.47
Renal failure (no)	392	0.99	0.86-1.13
ASA (yes)	104	1.02	0.79-1.32
ASA (no)	342	0.98	0.85-1.12
Anticoagulant (yes)	44	0.95	0.64-1.41
Anticoagulant (no)	402	0.99	0.87-1.13
Comorbidities ≥3	231	1.05	0.89-1.24
Comorbidities <3	215	0.93	0.77-1.12

Carbohydrate intake

	n	SPR	95% IC
Non-stratified	446	1.00	0.91-1.11
Ischemic heart disease (yes)	58	1.03	0.79-1.34
Ischemic heart disease (no)	388	1.00	0.90-1.11
Obesity (yes)	114	1.00	0.81-1.23
Obesity (no)	332	1.00	0.89-1.12
Diabetes (yes)	62	0.98	0.74-1.28
Diabetes (no)	384	1.00	0.91-1.12
Cerebral vascular disease (yes)	24	1.10	0.73-1.64
Cerebral vascular disease (no)	422	1.00	0.90-1.11
Dyslipidemia (yes)	184	1.01	0.85-1.17
Dyslipidemia (no)	262	1.00	0.88-1.14
Renal failure (yes)	54	1.06	0.81-1.39
Renal failure (no)	392	1.00	0.90– 1.11
ASA (yes)	104	1.01	0.82-1.24
ASA (no)	342	1.00	0.89-1.12
Anticoagulant (yes)	44	1.04	0.76-1.41
Anticoagulant (no)	402	1.00	0.90-1.11
Comorbidities ≥3	231	1.01	0.88-1.16
Comorbidities <3	215	0.99	0.86-1.15

Milk consumption

	n	SPR	95% IC
Non-stratified	446	0.81	0.71-0.94
Ischemic heart disease (yes)	58	0.88	0.62-1.26
Ischemic heart disease (no)	388	0.81	0.69-0.94
Obesity (yes)	114	0.67	0.48-0.92
Obesity (no)	332	0.85	0.73-0.99
Diabetes (yes)	62	0.97	0.69-1.37
Diabetes (no)	384	0.79	0.67-0.92
Cerebral vascular disease (yes)	24	0.93	0.54-1.60
Cerebral vascular disease (no)	422	0.81	0.70-0.93
Dyslipidemia (yes)	184	0.75	0.60-0.94
Dyslipidemia (no)	262	0.87	0.73-1.04
Renal failure (yes)	54	1.01	0.71-1.43
Renal failure (no)	392	0.78	0.67-0.91
ASA (yes)	104	0.81	0.61-1.08
ASA (no)	342	0.82	0.71-0.96
Anticoagulant (yes)	44	1.08	0.73-1.59
Anticoagulant (no)	402	0.79	0.68-0.91
Comorbidities ≥3	231	0.86	0.71-1.04
Comorbidities <3	215	0.76	0.62-0.94

Dairy products consumption

	n	SPR	95% IC
Non-stratified	446	1.01	0.83-1.21
Ischemic heart disease (yes)	58	1.36	0.88-2.11
Ischemic heart disease (no)	388	0.94	0.77-1.16
Obesity (yes)	114	0.93	0.62-1.40
Obesity (no)	332	1.03	0.83-1.27
Diabetes (yes)	62	0.85	0.49-1.46
Diabetes (no)	384	1.03	0.84-1.26
Cerebral vascular disease (yes)	24	1.35	0.68-2.71
Cerebral vascular disease (no)	422	0.98	0.81-1.20
Dyslipidemia (yes)	184	0.95	0.70-1.27
Dyslipidemia (no)	262	1.07	0.84-1.36
Renal failure (yes)	54	1.32	0.83-2.09
Renal failure (no)	392	0.96	0.78– 1.17
ASA (yes)	104	0.89	0.59-1.35
ASA (no)	342	1.06	0.87-1.30
Anticoagulant (yes)	44	1.06	0.59-1.91
Anticoagulant (no)	402	1.00	0.82-1.22
Comorbidities ≥3	231	1.02	0.79-1.31
Comorbidities <3	215	0.99	0.75-1.31

Fruit consumption

	n	SPR	95% IC
Non-stratified	446	1.00	0.90-1.11
Ischemic heart disease (yes)	58	0.97	0.74-1.28
Ischemic heart disease (no)	388	1.00	0.90-1.12
Obesity (yes)	114	0.97	0.78-1.21
Obesity (no)	332	1.01	0.89-1.13
Diabetes (yes)	62	1.02	0.78-1.34
Diabetes (no)	384	1.00	0.89-1.12
Cerebral vascular disease (yes)	24	0.96	0.62-1.48
Cerebral vascular disease (no)	422	1.00	0.90-1.11
Dyslipidemia (yes)	184	0.98	0.84-1.15
Dyslipidemia (no)	262	1.02	0.89-1.16
Renal failure (yes)	54	1.06	0.80-1.40
Renal failure (no)	392	0.99	0.89– 1.11
ASA (yes)	104	1.03	0.84-1.27
ASA (no)	342	0.99	0.88-1.12
Anticoagulant (yes)	44	1.06	0.78-1.45
Anticoagulant (no)	402	0.99	0.89-1.10
Comorbidities ≥3	231	1.02	0.88-1.17
Comorbidities <3	215	0.98	0.84-1.14

Wine consumption

	n	SPR	95% IC
Non-stratified	446	1.85	1.48-2.32
Ischemic heart disease (yes)	58	1.62	0.84-3.09
Ischemic heart disease (no)	388	1.88	1.47-2.39
Obesity (yes)	114	2.26	1.47-3.46
Obesity (no)	332	1.78	1.37-2.31
Diabetes (yes)	62	0.90	0.37-2.16
Diabetes (no)	384	2.00	1.59-2.53
Cerebral vascular disease (yes)	24	3.01	1.49-6.09
Cerebral vascular disease (no)	422	1.77	1.40-2.25
Dyslipidemia (yes)	184	2.42	1.80-3.25
Dyslipidemia (no)	262	1.48	1.06-2.07
Renal failure (yes)	54	1.55	0.78-3.09
Renal failure (no)	392	1.91	1.51-2.43
ASA (yes)	104	1.37	0.80-2.37
ASA (no)	342	1.99	1.56-2.54
Anticoagulant (yes)	44	1.69	0.81-3.51
Anticoagulant (no)	402	1.87	1.48-2.37
Comorbidities ≥3	231	1.56	1.10-2.20
Comorbidities <3	215	2.17	1.61-2.92

Beer consumption

	n	SPR	95% IC
Non-stratified	446	2.21	1.68-2.90
Ischemic heart disease (yes)	58	2.77	1.36-5.62
Ischemic heart disease (no)	388	2.11	1.57-2.83
Obesity (yes)	114	3.11	1.98-4.87
Obesity (no)	332	1.86	1.32– 2.62
Diabetes (yes)	62	1.88	0.79-7.59
Diabetes (no)	384	2.25	1.69-3.00
Cerebral vascular disease (yes)	24	1.95	0.50-6.09
Cerebral vascular disease (no)	422	2.21	1.68– 2.92
Dyslipidemia (yes)	184	2.07	1.33-3.21
Dyslipidemia (no)	262	2.38	1.70-3.33
Renal failure (yes)	54	2.36	1.01-5.52
Renal failure (no)	392	2.17	1.63-2.90
ASA (yes)	104	0.90	0.34-2.40
ASA (no)	342	2.45	1.85-3.24
Anticoagulant (yes)	44	1.94	0.74-5.09
Anticoagulant (no)	402	2.18	1.64-2.89
Comorbidities ≥3	231	2.33	1.55-3.49
Comorbidities <3	215	2.12	1.46-3.06

Spirit consumption

	n	SPR	95% IC
Non-stratified	446	0.57	0.46-0.72
Ischemic heart disease (yes)	58	0.55	0.28-1.10
Ischemic heart disease (no)	388	0.58	0.46-0.74
Obesity (yes)	114	0.39	0.23-0.68
Obesity (no)	332	0.64	0.50– 0.82
Diabetes (yes)	62	0.63	0.34-1.17
Diabetes (no)	384	0.56	0.44-0.72
Cerebral vascular disease (yes)	24	0.67	0.25-1.76
Cerebral vascular disease (no)	422	0.57	0.45-0.72
Dyslipidemia (yes)	184	0.59	0.42-0.83
Dyslipidemia (no)	262	0.56	0.42- 0.76
Renal failure (yes)	54	0.55	0.27-1.15
Renal failure (no)	392	0.57	0.45-0.73
ASA (yes)	104	0.34	0.18-0.63
ASA (no)	342	0.62	0.49-0.79
Anticoagulant (yes)	44	0.91	0.49-1.69
Anticoagulant (no)	402	0.53	0.42-0.68
Comorbidities ≥3	231	0.56	0.40-0.79
Comorbidities <3	215	0.58	0.43-0.79

Employment rate

	n	SPR	95% IC
Non-stratified	446	0.47	0.40-0.56
Ischemic heart disease (yes) Ischemic heart disease (no)	58 388	0.24 0.51	0.13-0.43 0.43-0.61
Obesity (yes) Obesity (no)	114 332	0.62 0.44	0.45-0.85 0.36-0.53
Diabetes (yes) Diabetes (no)	62 384	0.24 0.51	0.13-0.44 0.43-0.61
Cerebral vascular disease (yes) Cerebral vascular disease (no)	24 422	0.06 0.50	0.01-0.28 0.42-0.59
Dyslipidemia (yes) Dyslipidemia (no)	184 262	0.42 0.51	0.32-0.55 0.42-0.64
Renal failure (yes) Renal failure (no)	54 392	0.16 0.53	0.08-0.33 0.44-0.62
ASA (yes) ASA (no)	104 342	0.35 0.52	0.23-0.51 0.44-0.63
Anticoagulant (yes) Anticoagulant (no)	44 402	0.27 0.50	0.14-0.52 0.43-0.60
Comorbidities ≥3 Comorbidities <3	231 215	0.30 0.67	0.23-0.40 0.54-0.82

Low education

	n	SPR	95% IC
Non-stratified	446	1.71	1.45-2.00
Ischemic heart disease (yes) Ischemic heart disease (no)	58 388	2.13 1.64	1.46-3.10 1.37-1.95
Obesity (yes) Obesity (no)	114 332	1.89 1.63	1.38-2.60 1.35-1.96
Diabetes (yes) Diabetes (no)	62 384	2.37 1.59	1.67-3.38 1.33-1.91
Cerebral vascular disease (yes) Cerebral vascular disease (no)	24 422	2.62 1.65	1.55-4.42 1.39-1.95
Dyslipidemia (yes) Dyslipidemia (no)	184 262	1.89 1.56	1.50-2.38 1.27-1.95
Renal failure (yes) Renal failure (no)	54 392	1.91 1.67	1.26-2.91 1.40-1.98
ASA (yes) ASA (no)	104 342	2.23 1.53	1.68-2.96 1.27-1.85
Anticoagulant (yes) Anticoagulant (no)	44 402	2.02 1.67	1.27-3.22 1.41-1.97
Comorbidities ≥3 Comorbidities <3	231 215	2.25 1.08	1.87-2.72 0.81-1.46

disease or diabetes, accordingly to reported data about a possible association of gout with features of the metabolic syndrome. We do not know if patients have changed their weight after gout diagnosis, but our data show that a high proportion of subjects still haven't gained a healthy physical status. On the contrary, in our study sample we observed a prevalence of smokers lower than the expected. The role of smoking as a risk factor for gout is still debated because of controversial results from epidemiological studies evaluating the relationship between smoking and serum uric acid levels or gout incidence (11, 12). However, smoking cessation is recommended in current guidelines for gout management (4). Stratified analyses identified obesity, ischemic heart disease and related therapies as possible confounders, being associated with a significant lower prevalence of smoking. Therefore, a possible explanation for our study should be that a number of subjects have been forced to reduce smoking because of the associated diseases.

Alcohol consumption is a well-recognized risk factor for hyperuricemia and gout (13-15). Recent studies have clarified that the impact on the risk of gout varies depending on the type and amount of alcoholic beverage consumed (14). A moderate consumption of wine seems not to increase the risk of gout, while consumption of beer and hard liquor is associated with increased risk of incident gout at any amount. Furthermore, beer is known to have an alcohol-independent effect on serum urate concentration related to its high content of guanosine. Relying on those findings, we chose a different cut-off for defining a high consumption of wine, beer and spirits. Our patients showed a higher consumption of wine and beer compared to the general population, but a lower consumption of spirits. This point reflect a still inadequate awareness of the impact of alcoholic beverages on gout, so that only the intake of drinks with a higher content of alcohol is reduced in our patients, but the overall alcohol intake is still higher than the expected.

A high red meat and seafood intake has been extensively reported to be associated with hyperuricemia and an increased risk of gout, and a diet characterized by a low purine intake is one of the best-known dietary interventions for gout (16). On this basis, the finding of a lower consumption of red meat in our study population suggests that reducing red meat intake is widely stressed among gouty patients, even if recent approaches prefer not to suggest a rigid purine restricted diet (17). However, among our patients we did not find a higher consumption of carbohydrates as a compensation for the reduced intake of meat.

The role of milk and dairy products on the risk of gout has only recently been investigated. A higher consumption of low-fat dairy products have been related to a lower incidence of gout (16) and specific milk components have been studied as possible determinants of the protective effect of milk on gout flares (18). In our study population we observed a lower consumption of milk, suggesting that the role of milk and derivates in dietary intervention for gout has not adequately underlined yet. Only in patients affected by renal failure we found a higher intake of milk and dairy foods, as a possible compensation for a rigid purine restricted diet.

We did not find any significant difference from the general population concerning fruit and vegetables consumption. At present, even if the negative effect of fructose on hyperuricemia and gout is well established for sweetened beverages (19, 20), the role of fruit consumption is still debated because of contradictory results from different studies (21). Conversely, vegetables consumption is recommended as it seems to reduce the risk of gout (16, 17).

Lastly, we observed a lower employment rate and a lower level of education in patients with gout. Even if gout was known in the past as *the kings' disease* because of its high prevalence among men with a higher socio-economic status, our finding suggests that gout should no longer be considered peculiar of the higher social classes. This finding could reflect significant changes in dietary and lifestyle habits in the general population (22). Moreover, results from stratified analysis suggest that the presence of comorbidities should significantly account for the lower employment rate, especially in relationship with more disabling diseases such as stroke or renal failure.

CONCLUSIONS

In conclusion, our results suggest that gouty patients' lifestyle is still partially different from the recommended. There is a good awareness of some traditional risk factors for gout, such as a purine-rich diet or hard liquor consumption, but many other dietary and lifestyle interventions are still far from an optimal enforcement. The presence of comorbidities could also significantly affect patients' behaviour. Further efforts should be made to sensitize gouty patients to the importance of lifestyles modification.

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