

RESEARCH ARTICLE

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Development of home artificial nutrition in Italy over a seven year period: 2005–2012

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Abstract

Background: In 2005, the Italian Society for Artificial Nutrition and Metabolism carried out a national survey on the prevalence of home artificial nutrition (HAN), enteral (HEN) and parenteral (HPN). A second survey was carried out in 2012 to investigate the development of HAN in Italy.

Methods: The Local Health Care Units (LHCUs) were required to record the ongoing cases of HAN using a structured questionnaire. The point prevalence (n./million inhabitants) was analysed according to patient age and disease categories. Data were compared with those obtained in 2005.

Results: Data were obtained from 65% of the LHCUs, representing 73% of the Italian population. The prevalence of HAN was 325.5 (90.3% adults, 84.6% HEN). As in 2005, a wide range of prevalence was observed among the administrative regions. The most frequent disease category for HPN was oncological in adults and intestinal failure in children; for HEN, it was neurological in both age groups. A positive correlation was observed between the regional prevalence of HAN and the regional population aging index ($p = 0.018$). The prevalence of HAN in 2012 was 66% higher than that in 2005. In the individual regions, a negative association was observed between the 2012% prevalence increase of HAN (2012:2005 ratio) and the HAN prevalence in 2005 ($p = 0.020$).

Conclusions: A two-thirds increase in HAN prevalence was observed over seven years, probably due to improved HAN organisation and management in those regions which showed a low prevalence in 2005. Population aging seemed to be one of the main factors necessitating HAN.

Keywords: Epidemiology, Enteral nutrition, Parenteral nutrition, Home, Home care

Background

In 2005, the Italian Society for Artificial Nutrition and Metabolism (SINPE) carried out the first national survey regarding the prevalence of home artificial nutrition (HAN), both enteral (HEN) and parenteral (HPN) [1]. The national point prevalence of HAN was 195.6 cases per million inhabitants. Of the total cases of HAN, approximately 84% were HEN (16% HPN) and approximately 94% were adults (6% children). The primary disease category for HPN was oncological in adults (60%) and intestinal failure in children (58%). For HEN, the primary disease category was neurological in both age groups (73% in adults and 50% in children).

The Italian National Health Care System (NHCS) is regulated by legislation which defines the general rules for providing health care. The Italian territory is divided into 20 administrative regions which are responsible for providing health care to their residents. In the individual regions, the territory is divided into local health care units (LHCUs) which are the operative arms of the Regional Health Care System. The LHCUs are empowered by national legislation to give HAN to patients in need. However, in the majority of the regions, a regional regulation for HAN has been issued in order to facilitate the implementation of HAN activity at the LCU level. In 2005, a broad range of prevalence was found among the administrative regions for both total HAN and disease category distribution. The prevalence was related to the percentage of elderly people in the individual regions. Furthermore, a trend was observed toward a higher prevalence of HAN in those regions with a HAN regulation, but it was also

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suggested that HAN use ultimately depended on factors related to LHCU organisation since the latter has the task of implementing the regulation.

Home artificial nutrition activity plays a key role in shortening the hospital length of stay of clinically stable hospitalised patients who are ready to be discharged but who are in need of artificial nutrition. To investigate the development of HAN activity throughout the country is valuable in the organisation and funding of health care activities. For this purpose, in 2012, SINPE carried out a second survey regarding the prevalence of HAN in Italy. The data were compared with those obtained in 2005 [1].

Methods

Data collection

This was a cross sectional survey aimed at investigating the point prevalence of HAN, carried out with the same methodology used in the 2005 survey [1]. The data were collected in April 2012 by the SINPE Coordinators of the Italian administrative regions.


Using a structured questionnaire (Fig. 1), the LHCUs were asked to record the ongoing number of cases of HPN, HEN and mixed HAN (HPN + HEN). Home parenteral

nutrition was defined as nutrition via a central or peripheral vein using all-in-one nutritional bags. Home enteral nutrition was defined as the administration of an enteral feeding formula by a nasogastric (or jejunal) tube, a percutaneous endoscopic gastrostomy or a jejunostomy. The patient age category was classified as adult (>18 years) or paediatric.

The primary disease was classified as oncological, neurological, benign (non malignant) chronic intestinal failure (CIF) or other diseases. However, the recently published European Society for Clinical Nutrition and Metabolism (ESPEN) recommendations regarding the definition and classification of intestinal failure has defined “intestinal failure” as a condition requiring intravenous feeding and “intestinal insufficiency” as a condition requiring enteral or oral supplementation [2]. In order to adapt the results of the Italian survey to the ESPEN definitions, in the present paper, the disease category “benign CIF” has been replaced with the term “gastrointestinal disease” (GI disease).

Ethical rules

The study exclusively records and elaborates data concerning the HAN activity of the Italian LHCUs. The research was based on the count of the number of patients receiving



SINPE EPIDEMIOLOGICAL SURVEY - PREVALENCE OF HAN IN ITALY 2012 – APRIL 2012

LHCU: _____ REGION: _____

Inhabitants (n.) _____ Territorial extent (Km²) _____

DEFINITIONS

- **Home Artificial Nutrition:** patient receiving HAN at home; patients in nursing or residential home care are excluded
- **Home Parenteral Nutrition:** patients receiving nutritional admixture bags; patients receiving intravenous infusion with separate solutions or emulsions are excluded (electrolyte, glucose, amino acid solutions or lipid emulsions)
- **Home Enteral Nutrition:** patients receiving tube feeding; patients receiving oral supplementation are excluded
- **Mixed HAN (HPN + HEN):** patients receiving both HPN and HEN as above described
- **Age categories:** adult > 18 years, pediatric ≤ 18 years
- **Disease categories:**
 - **oncological:** patients with active cancer
 - **neurological:** patients with chronic neurological disease or with consequences of an acute neurological disease
 - **gastrointestinal disease:** patients with benign gastrointestinal disease or with gastrointestinal involvement of a benign systemic disease; patients with active cancer or with AIDS are excluded
 - **other:** patients with disease not included in the above definitions

Include the NUMBER of patients on HAN in the day of filling in the questionnaire

Disease	HPN Adult	HPN Pediatric	HEN Adult	HEN Pediatric	HEN + HPN Adult	HEN + HPN Pediatric
ONCOLOGICAL						
NEUROLOGICAL						
GASTROINTESTINAL DISEASE						
OTHER						

Date of filling in: _____ Corresponding Name: _____ Phone/fax/email _____

Fig. 1 Structured questionnaire used for the survey regarding the point prevalence of home artificial nutrition in Italy in 2005 and 2012

HAN in the day of data collection (Fig. 1). No demographic or sensitive data that could allow individual patient recognition and tracking was collected. Nevertheless, the study protocol was submitted to the Ethical Committee (EC) of the S. Orsola-Malpighi University Hospital of Bologna, Italy. The EC replied that considering the administrative type of the investigation without treatment of personal data of patients, neither the prior acquisition of the opinion of the EC nor the informed consent of patients were necessary.

Statistical analysis

The completed questionnaires were collected and analysed by the study coordinator (LP).

The representativeness of the survey was calculated as the percentage of the regional and the national population, and of the territorial extension represented by the LHCUs which contributed to the study (<http://www.salute.gov.it>, accessed September 14th 2012).

Point prevalence was defined as the number of HAN cases actually recorded per million inhabitants. When required for statistical analyses, mixed HAN cases (HPN + HEN) were considered as HPN.

The regional population aging index, represented by the ratio “% population \geq 65 years/% population $<$ 15 years” was that calculated by the Italian National Institute of Statistics (<http://noi-italia.istat.it/>, accessed September 14th 2012).

Comparison between the groups was carried out using the Mann–Whitney U test, and the associations between the variables were analysed using the Spearman rank correlation coefficient. The Statgraphics 5 Plus statistical package (Manugistic, Inc., Rockville, Maryland, USA) was used for the analyses.

Results

Representativeness of the survey

Eighteen of the 20 Italian administrative regions participated in the survey. Ninety-five of the 146 national LHCUs (65.5%) contributed, representing a territorial extent of 204,160 km² (67.8% of total) and 44.36 million inhabitants (73.2% of total). On a regional basis, the representativeness of the population of the LHCUs which contributed to the survey ranged from 31 to 100% of the total regional population (Fig. 2).

National point prevalence of HAN

The number of recorded cases of HAN was 14,441 (90.3% adult and 9.7% paediatric patients). The prevalence of HAN was 325.5/per million inhabitants (84.6% HEN, 14.6% HPN and 0.8% HPN + HEN).

The prevalence of HPN (including the HPN + HEN cases) was 50.2 per million inhabitants and that of HEN was 275.3 per million inhabitants (Table 1 and Fig. 3).

Of the disease categories, oncological diseases accounted for 19.4% of the total HAN, neurological diseases for 64.8%, GI disease for 6.5% and other diseases for 9.3%. In adult patients, HPN and HEN were 15.7% and 84.3% of total HAN, respectively; the main disease category was oncological (60.3%) for HPN and neurological (75.6%) for HEN. In paediatric patients, HPN and HEN were 13.0% and 87.0% of the total HAN, respectively; the main disease category distribution was GI disease (49.7%) for HPN and neurological (63.4%) for HEN (Table 2 and Fig. 4).

Regional point prevalence of HAN

A wide range of HAN prevalence (from 100.9 per million inhabitants in Calabria to 828.4 per million inhabitants in Umbria), as well as of the use of HAN in the age and disease categories were reported among the regions (Table 3).

A positive association was observed between the regional aging index and the regional prevalence of HAN ($r = 0.572$; $p = 0.018$) (Fig. 5). When the association was analysed for each disease category, only the association with HAN for neurological diseases remained statistically significant (neurological: $r = 0.624$, $p = 0.010$; oncological: $r = 0.310$, $p = 0.200$; GI disease: $r = -0.019$, $p = 0.935$; other diseases: $r = -0.005$, $p = 0.982$).

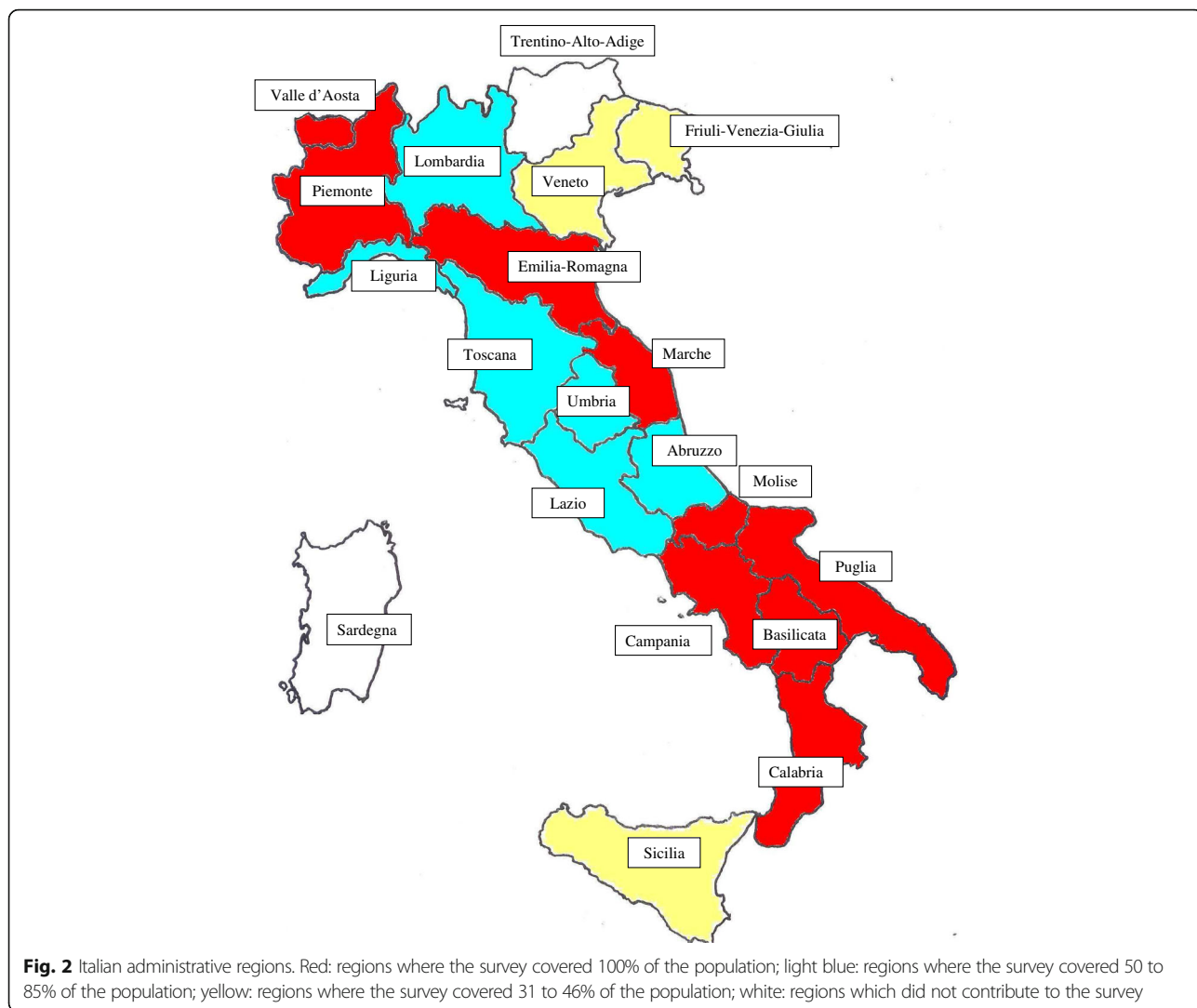
Comparison with the 2005 survey

The comparison between HAN use in 2005 and in 2012 was calculated as a 2012 to 2005 ratio of the observed prevalence (Tables 3 and 4).

On a national basis, the HAN prevalence showed a 66% increase. The increase in HEN prevalence was slightly greater than that of HPN, 68% and 58%, respectively. The increase in paediatric patients was 2-fold greater than the increase in adult patients. Concerning the disease categories, the greatest increase was observed in the GI disease group which, however, remained the smallest group by far (Table 4).

Comparison on a regional basis was possible for only 15 regions (Table 3). A wide range of increase in HAN prevalence was observed. A statistically significant negative association was observed between the regional prevalence of HAN observed in 2005 and the percentage increase of HAN regional prevalence observed in 2012 ($r = -0.617$, $p = 0.020$) (Fig. 6). This association was also present in the single disease categories (neurological: $r = -0.425$, $p = 0.111$; oncological: $r = -0.675$, $p = 0.011$; GI disease: $r = -0.550$, $p = 0.029$; other diseases: $r = -0.293$, $p = 0.272$).

Six regions issued or modified an existing regulation after the 2005 survey (Table 3). In this group of regions, the median increase in HAN prevalence between 2005 and 2012 was 121% which, even though not statistically significant, was 2-fold that of the median increase (64%) observed in the group of the 9 regions which did not change their HAN regulation after 2005 (67%; $p = 0.516$).



Discussion

This second epidemiological survey regarding HAN in Italy showed a 66% increase in the point prevalence of HAN over seven years, but no variations occurred concerning the characteristics of the HAN usage investigated by the survey. In 2012, the heterogeneity of HAN prevalence among the administrative regions, the HEN

to HPN use ratio as well as the HAN distribution between the patient age categories and among the disease categories were similar to those observed in 2005 [1]. The representativeness of the survey was good because it covered more than two-thirds of both the national population and territory.

Table 1 National point prevalence (n./million of inhabitants) of home artificial nutrition (HAN), both parenteral (HPN) and enteral (HEN), in Italy in 2012. Total cases and cases by age category

	HAN	HPN ^a	HEN
Total cases (n. 14,441)	325.5	50.2	275.3
Adult (n. 13,046)	294.0	46.1	247.9
Pediatric (n. 1,395)	31.4	4.1	27.3

^apatients receiving both HPN and HEN were included in the HPN group; the HPN + HEN cases were 3.7% of total HPN in adults and 21.9% of total HPN in children
Population sample: 44.36 million inhabitants (73.2% of total Italian population)

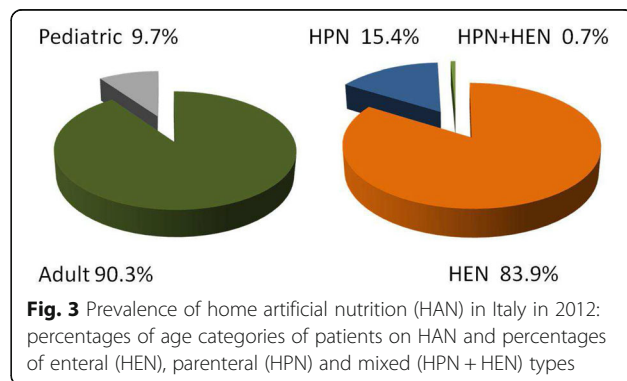


Table 2 Point prevalence (n./million of inhabitants) of home artificial nutrition (HAN), both parenteral (HPN) and enteral (HEN) by disease category, in Italy in 2012

	Total cases			Adult			Paediatric		
	HAN	HPN ^a	HEN	HAN	HPN ^a	HEN	HAN	HPN ^a	HEN
Oncological	63.5	28.8	34.7	61.6	28.2	33.4	1.9	0.6	1.3
Neurological	212.2	7.1	205.1	193.3	5.7	187.5	18.9	1.3	17.6
GI disease	21.3	11.7	9.6	15.8	9.4	6.4	5.5	2.3	3.1
Other	30.4	3.8	26.5	24.2	3.4	20.8	6.1	0.4	5.7

^apatients receiving both HPN and HEN were included in the HPN group
Population sample: 44.36 million inhabitants (73.2% of total Italian population)

The observed increase in HAN prevalence may have been due to several causes. The main factor could have been the increased awareness of the role of HAN among health care professionals as well as the improvement of HAN organisation and management at the LHCU level. This hypothesis was supported by the observed inverse association between the regional prevalence of HAN reported in 2005 and its percentage of increase in 2012, indicating a greater increase in those regions where HAN practice was less developed in 2005. The greater percentage increase of HAN prevalence observed in those regions which have issued or modified an existing HAN regulation since 2005 may also have contributed. Indeed, as observed in 2005 [1], a regional regulation could have fostered HAN for patients in need since it defines the indications, the organisation and the management of HAN at the LHCU level. The increase in the Italian population aging

index, which was 138.1 in 2005, 148.6 in 2012 and 157.7 in 2015 (noi-italia-istat.it) may also have played a role. The incidence of stroke as well as that of chronic neurological diseases, such as dementia and Parkinson's disease which may permanently impair the patient's ability of oral feeding, increase with aging. As we have observed, a positive relationship between the prevalence of HAN for neurological disease and the regional population aging index, a further progressive increase in the need for HAN in neurological disease could be expected in the near future. Another factor could be the NHCS policy aimed at reducing the hospitalisation rate and the length of stay of patients with chronic diseases, and at facilitating home and residential care. Furthermore, increased efficacy of data collection may have played a role, even though the representativeness of the sample population in 2012 (74% of total Italian population) was similar to that of the 2005 investigation (78%).

In comparison with 2005, the increase in HEN prevalence was slightly greater than that of HPN, and the increase in paediatric cases (9.7% in 2012 vs. 6.5% in 2005) was greater than that of adult cases. The HEN to HPN ratio did not substantially change (5.4 in 2012 vs. 5.2 in 2005). The distribution of HAN among the disease categories did not differ, with neurological disease representing the greatest percentage of cases (61.7% in 2005 and 64.8% in 2012) and GI disease the least (4.0% in 2005 and 6.5% in 2012). As in 2005, oncological diseases accounted for 60% of HPN in adults, and neurological diseases represented more than two-thirds of HEN in both adults and children. According to the ESPEN definition of intestinal failure [2], on the basis of patients on HPN for GI disease, the total prevalence of benign CIF in 2012 was 11.7 (9.4 in adults and 2.3 in children), representing a 2-fold increase with respect to 2005 (prevalence 4.4). Unfortunately, there are very few data to be compared with those which were observed in this study. In the European countries, the point prevalence of HPN has been reported to range between 5 and 49 cases per million inhabitants [3], with a percentage of patients having a malignant disease ranging from 5 to 60% [4]. Therefore, the prevalence of HPN for CIF due to benign disease has been estimated to range from 5 to 20

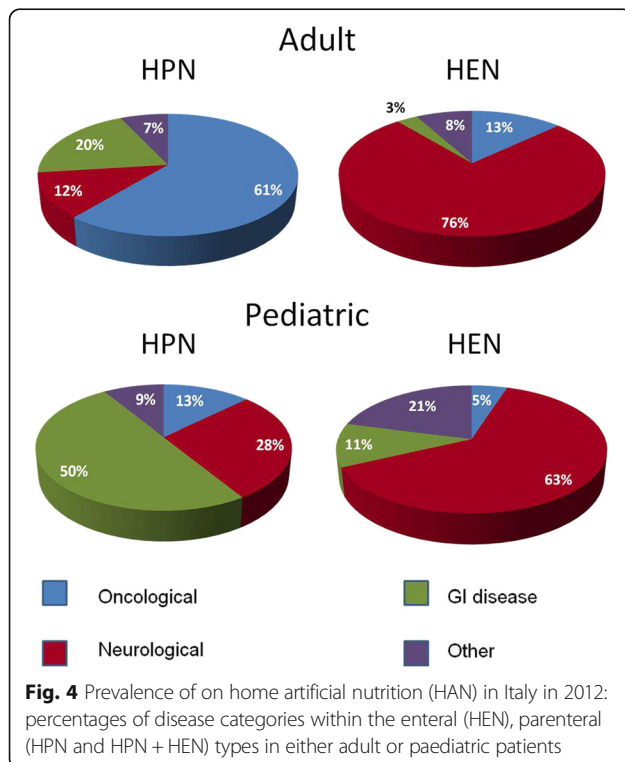


Table 3 Point prevalence (n./million of inhabitants) of home artificial nutrition (HAN), both parenteral (HPN) and enteral (HE), in the individual administrative regions in Italy in 2012. Cases for age and disease categories, and total cases. Comparison with the HAN prevalence observed in the survey carried out in 2005 was calculated as the 2012 to 2005 ratio

	Regional Aging Index	Adult		Paediatric		Total HAN (HPN + HEN) by disease category				Total HAN	2012/2005 HAN Ratio
		HPN ^a	HEN	HPN ^a	HEN	Onco	Neuro	GI-dis	Other		
Valle d'Aosta	149.7	31.2	226.2	0	0	85.7	155.9	23.4	0	257.3	
Piemonte	177.7	50.0	222.1	2.7	38.6	66.4	189.3	24.9	32.7	313.4	1.35 ^b
Lombardia	141.1	28.9	315.5	4.4	30.1	71.9	232.1	34.1	58.3	378.8	
Veneto	139.8	47.2	413.2	1.9	36.2	92.4	361.4	11.7	32.9	498.5	1.67
Friuli-Ven-Giulia	186.2	15.8	227.0	2.6	168.9	58.0	319.2	11.1	26.3	414.2	1.60
Liguria	232.0	43.4	242.7	6.0	40.9	76.6	224.8	31.3	0	333.0	
Emilia-Romagna	167.2	37.0	321.7	2.7	22.3	53.5	282.1	18.8	24.8	383.7	1.14
Toscana	182.9	79.3	449.3	6.3	40.3	84.1	429.8	15.8	44.8	575.2	2.68 ^b
Umbria	178.8	40.2	770.1	5.2	13.0	75.1	735.0	12.1	5.1	828.4	2.30
Marche	168.7	73.5	689.3	1.2	23.0	106.0	554.5	26.8	100.3	787.6	1.06
Lazio	142.0	28.4	205.8	3.4	32.3	47.8	158.1	29.0	42.2	279.9	1.70
Abruzzo	163.2	8.3	136.0	2.8	1.4	16.6	105.5	3.7	22.2	148.5	0.63
Molise	175.8	28.1	315.8	0	25.0	75.0	293.9	0	0	369.0	2.64
Campania	98.7	52.1	84.0	4.1	21.0	59.3	75.2	16.6	12.6	161.2	2.52 ^b
Basilicata	150.6	78.3	32.3	1.7	11.9	59.5	61.2	3.4	0	124.2	0.80 ^b
Puglia	125.2	69.4	85.5	3.4	5.9	45.4	90.1	17.8	12.2	164.2	1.91 ^b
Calabria	132.0	19.4	58.2	5.0	18.4	42.7	38.7	10.4	8.9	100.9	3.06 ^b
Sicilia	122.2	61.0	145.8	11.1	29.0	69.9	148.3	19.7	8.9	246.8	4.41

Regional aging index: %population ≥ 65 yrs/%population < 15 yrs; ^apatients receiving both HPN and HEN were included in the HPN group

Abbreviations: *Onco* oncological; *neuro*: neurological; *GI-dis* gastrointestinal disease

^badministrative regions which issued or modified their HAN regulation after the 2005 survey

cases per million inhabitants [2, 5–7], a figure which fits well with the data observed in Italy in 2012.

A wide range of HAN prevalence and distribution among the disease categories persisted among the administrative regions and confirmed the non-homogeneous HAN activity throughout the national territory. The positive relationship observed between the prevalence of HAN for neurological disease and the regional population aging index agrees with that observed in 2005 between the

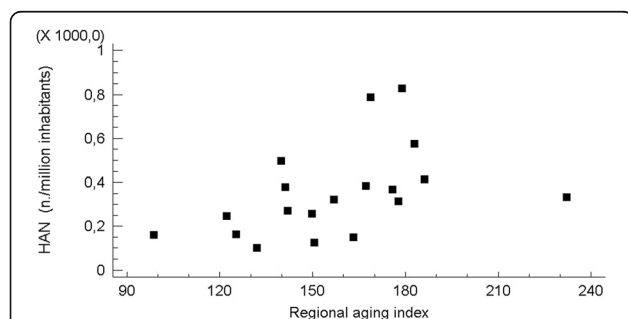
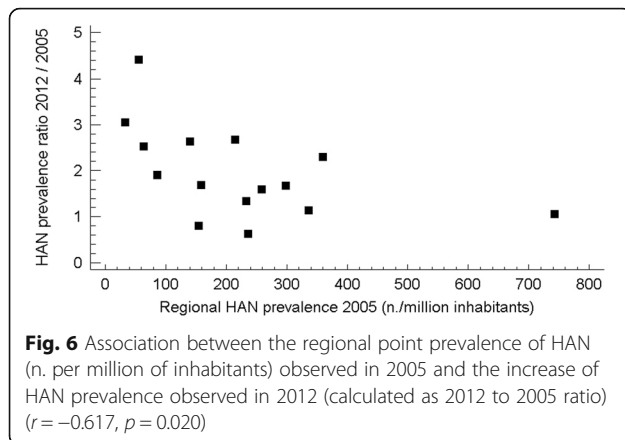


Fig. 5 Association between the regional population aging index ratio (% population ≥ 65 years of age to % population < 15 years of age ratio) and the regional point prevalence of HAN (n./million of inhabitants) ($r = 0.572$, $p = 0.018$)

Table 4 Comparison between 2005 and 2012 point prevalence (n. per million inhabitants) of home artificial nutrition (HAN), both parenteral (HPN) and enteral (HEN), in Italy, calculated as the 2012 to 2005 ratio

	2012: 2005 prevalence ratio				
	Total cases	Oncological	Neurological	GI disease	Other
National					
HAN	1.66	1.34	1.76	2.67	1.54
HPN ^a	1.58	1.57	1.88	2.07	1.14
HEN	1.68	1.20	1.74	4.36	1.67
Adult					
HAN	1.61	1.32	1.67	2.62	1.60
HPN ^a	1.55	1.55	1.59	1.98	1.11
HEN	1.62	1.18	1.67	4.99	1.73
Paediatric					
HAN	3.29	2.47	3.43	2.81	0.48
HPN ^a	2.16	4.68	10.14	2.24	0.21
HEN	2.55	2.03	3.27	3.45	0.53

^apatients receiving both HPN and HEN were included in the HPN group
Total cases and cases by age and disease categories



HAN prevalence and the percentage of regional population over 75 years of age. As neurological disease accounted for two-thirds of the HAN cases, the regional differences for HAN prevalence may in part be justified by the demographic characteristics of the regional populations. Another explanation is the difference in HAN regulation and organisation among the administrative regions which would represent a risk for patients in terms of the opportunity of receiving HAN when needed as well as receiving appropriate HAN management. Additional investigation is required to compare the regulations of HAN issued by the individual regional health care services concerning indications, organisation, management and economical resources. In Europe, the only available prospective survey regarding the use of HAN which could be compared with the 2005 and 2012 surveys in Italy is a report by the British Artificial Nutrition Survey (BANS), a committee of the British Association for Parenteral and Enteral Nutrition (BAPEN), carried out yearly from 2000 to 2010 [5]. Overall, a significant rise in HAN was observed in both countries at a rate of 20–30% per year, but differences in the use of both HEN and HPN were present. The prevalence of HPN was approximately 2.5-fold greater in Italy, in both adult and paediatric patients whereas the prevalence of HEN was greater in the UK, approximately 1.4-fold in adults and 10-fold in children. Concerning the disease categories, the greatest difference was the use of HPN in adult patients with oncological disease. They represented 60% of total HPN in Italy and 10–20% in the UK. On the contrary, the use of HEN in oncological patients was approximately twice that of the UK. The Italian attitude towards the use of HPN in the context of palliative care for cancer patients has been well recognised since the first European survey on HPN in 1993 [4]. Another reason could be the more frequent use of a central venous catheter previously positioned for chemotherapy for HPN instead of activating enteral tube feeding. This may also justify the lower percentage of HEN for oncological patients in Italy.

The Spanish Society for Parenteral and Enteral Nutrition has also implemented a registry for HAN since 2000. However, as the methodology of data recording greatly differs from that of the Italian and the UK surveys, a comparison with the epidemiology of HAN in Spain would not give reliable figures [6, 8]. Overall, the difficulty in comparing data among various countries indicates the need for developing a standard method of evaluating the epidemiology of HAN.

Conclusions

In conclusion, this second survey regarding the prevalence of HAN in Italy showed that over seven years: a) HAN usage has progressively grown at a rate of 20–30% per year; b) the use of HAN in the age and disease categories was substantially stable; c) population aging was confirmed to be a major factor in determining the need for HAN; d) HAN diffusion and usage differed greatly throughout the country; e) a regional regulation of HAN activity may have favoured its development but did not reduce the differences among the regions and f) comparison with the UK surveys carried out in the same time frame would indicate a lower use of HEN and a higher use of HPN in Italy, the latter probably due to the Italian attitude towards treatment of patients with active cancer. Strategies to make HAN activity more homogenous throughout the country and clinical research to evaluate the appropriateness of the different models of providing HAN are still required. Studies to compare the HAN regional regulations and to investigate how the current guidelines on HAN in the individual pathological categories are applied at the LHCU level, as well as educational plans to improve their applications, will be the next steps.

Abbreviations

BANS: British Artificial Nutrition Survey; BAPEN: British Association for Parenteral and Enteral Nutrition; CIF: Chronic intestinal failure; ESPEN: European Society for Clinical Nutrition and Metabolism; GI: Gastrointestinal; HAN: Home artificial nutrition; HEN: Home enteral nutrition; HPN: Home parenteral nutrition; LHCUs: Local health care units; NHCS: National Health Care System; SINPE: Italian Society for Artificial Nutrition and Metabolism

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Availability of data and materials

All the data supporting the findings are contained in the manuscript.

Authors' contributions

LP: study design, data analysis, manuscript writing. SINPE Regional Coordinators: data collection and manuscript review. All authors read and approved the final manuscript.

Competing interests

The authors declare that there are no competing interests regarding the publication of this paper.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Not applicable.

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References

1. Pironi L, Candusso M, Biondo A, et al. Prevalence of home artificial nutrition in Italy in 2005: a survey by the Italian Society for Parenteral and Enteral Nutrition (SINPE). *Clin Nutr.* 2007;26:123–32.
2. Pironi L, Arends J, Baxter J, et al. Home Artificial Nutrition & Chronic Intestinal Failure; Acute Intestinal Failure Special Interest Groups of ESPEN : ESPEN endorsed recommendations. Definition and classification of intestinal failure in adults. *Clin Nutr.* 2015;34:171–80.
3. Wengler A, Micklewright A, Hébuterne X, et al. ESPEN-Home Artificial Nutrition working group. Monitoring of patients on home parenteral nutrition (HPN) in Europe: a questionnaire based study on monitoring practice in 42 centres. *Clin Nutr.* 2006;25:693–700.
4. Van Gossum A, Bakker H, De Francesco A, et al. ESPEN-Home Artificial Nutrition Working Group. Home parenteral nutrition in adults: a multicentre survey in Europe in 1993. *Clin Nutr.* 1996;15:53–9.
5. Smith T, Micklewright A, Hirst A, et al. Artificial Nutrition Support in the UK 2000 – 2010. A Report by the British Artificial Nutrition Survey (BANS), a committee of BAPEN (The British Association for Parenteral and Enteral Nutrition). 2011. ISBN: 978-1-899467-76-1. Available from: <http://www.bapen.org.uk>
6. Wanden-Berghe C, Cuerda Compes C, Burgos Peláez R, et al. A home and ambulatory artificial nutrition (NADYA) group report, home parenteral nutrition in Spain, 2013. *Nutr Hosp.* 2015;31:2533–8.
7. Pironi L, Hébuterne X, Van Gossum A, et al. Candidates for intestinal transplantation: a multicenter survey in Europe. *Am J Gastroenterol.* 2006;101:1633–43.
8. Wanden-Berghe C, Álvarez Hernández J, Burgos Peláez R, et al. A home enteral nutrition (HEN); Spanish registry of NADYA-SENPE group; for the year 2013. *Nutr Hosp.* 2015;31:2518–22.

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