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Lifestyles and determinants of perceived health in Italian Grown-up/Adult congenital heart patients: A national survey

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Title

Lifestyles and determinants of perceived health in Italian Grown-up/Adult congenital heart patients: A national survey

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Abstract

Objectives: This study was aimed to provide the first Italian epidemiological description of lifestyles in Grown-up/Adult congenital heart (GUCH/ACHD) population, identifying the determinants of poor perceived health status. **Design**: Cross-sectional pan-national survey. **Setting:** Italian GUCH/ACHD patients who were members of the Italian Association of GUCH/ACHD patients. **Primary and secondary outcome measures**: Lifestyles description through an *ad hoc* developed questionnaire, and health perception (i.e. mental and physical health perception) through SF-12 questionnaire. **Results:** The sample encompassed 629 patients. Many investigated lifestyles in GUCH/ACHD were found similar to the ones of the general population, with the exception of the smoking habits, which were lower. The odds of inadequate perception of physical health increased by more than two times in patients under antiarrhythmic therapies (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008), more than 1.5 times in patients under anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034), and roughly 1.7 times in patients treated with antiplatelet (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041). The odds of inadequate perception of mental health increased by 1.7 time every year of aging (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025). **Conclusion**: A particular attention should be given by the increasing psychological needs given by the aging of those patients. More research are needed to identify associations between lifestyles and clinical outcomes.

Keywords: Congenital heart disease; Grown-up congenital heart; Health perception; Lifestyles; Survey.

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Strengths and limitations of this study

- The determinants of perceived health status among GUCH/ACHD remain poor described worldwide and in the specific of the Italian context

- This Italian national survey aimed to provide the first Italian epidemiological description of lifestyles in GUCH/ACHD population, identifying the determinants of poor perceived health status

- Many lifestyles among GUCH/ACHD are similar to the ones of general population, even for illicit drug consumption behaviors, and the aging is particularly associated to increased psychological needs

- The cross-sectional data collection implies caution in the generalization of the results, as the trajectory over time of life styles was not described in this study

- The self-report approach in the clinical information collection suggested caution in identifying the actual clinical condition of the responders; accordingly, the match between perceived health status and clinical aspects requires more in-depth investigations.

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Introduction

Roughly the 85% of children with congenital heart disease (CHD) becomes adult, representing the population of grown-up/adult patients with congenital heart disease (GUCH/ACHD).[1] More precisely, the rate of GUCH/ACHD has been growing steadily, even if accurate data on the size and characteristics of this population are still lacking.[2] Even if the large variety of CHD and their peculiar clinical problems require specific focus to improve GUCH/ACHD clinical condition, this population shares also a number of important communalities mainly related to the modifiable risk factors of clinical status decline. Among these modifiable risk factors, the lifestyles play a pivotal role in improving the overall health conditions among GUCH/ACHD.[3] Further, the description in those patients of the socio-demographic and clinical determinants of their perceived health status has a paramount role to frame a comprehensive understanding of the actual weaknesses in the educational plans and follow-ups. Specific interventions on the determinants of poor perceived health status could be useful to achieve best outcomes in GUCH/ACHD population, as previously described for other chronic conditions, such as diabetes and acquired heart diseases.[4–7]

So far, the determinants of perceived health status among GUCH/ACHD remain poor described worldwide, despite their possible influence on the overall adherence to the follow-ups, and consequently, on outcomes.[8] As per Italy, both lifestyles and determinants of perceived health status among GUCH/ACHD have not been described previously on large samples, undermining the possibility to plan mid- and long-term strategies for those patients who report poor perceived health or inadequate lifestyles. For these reasons, this study was aimed to provide the first Italian epidemiological description of lifestyles in GUCH/ACHD population, identifying the determinants of poor perceived health status.

Material and methods

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Design, study population and data collection

This cross-sectional survey was promoted by an Italian GUCH/ACHD center, supported by the Italian Association of GUCH/ACHD (AICCA). Study design and reporting were fit the 'STrengthening the Reporting of OBservational studies in Epidemiology' (STROBE) checklist (Supplementary file). Data were collected through the list of contacts of AICCA, between March and October 2017. More precisely, data collection was carried out using a computer/mobile assisted web interviewing survey, sampling participants using the repertory of contacts of AICCA, stratified to reflect the geo-graphical distribution of the population by macro-area (i.e. Northern, Central and Southern Italy). The development of the questionnaire for this study was based on a previous survey of the Italian National Institute of Public Health on population with chronic diseases,[9] adapted using a process of face and content validity to detect the peculiarities of GUCH/ACHD. Accordingly, the questionnaire validation required the involvement of a multi-disciplinary panel of experts to ascertain the questionnaire face and content validity. Precisely, face validity explored the panelists' understanding of each item and their comments about the overall concept they purport to measure, being assessed through open-ended questions to the panelists. Conversely, content validity referred to the 'quantitative' agreement among panelists regarding how pertinent is each item in relation to the aim of its measurement. Once obtained satisfactory indices of content validity, the questionnaire was preliminary tested in a small group of six patients to evaluate the clarity of each item. Both face/content validity and the pilot testing required some minor amendments to the items' wording. The final questionnaire was available and validated for this study in January 2017. The survey required roughly thirty minutes for its compilation, and each respondent received no compensation for this study.

According to the study protocol (approved by the Ethical Committee of the center of reference, prot. N. 111/INT/2016), all patients were informed on the study aim, and they provided consent flagging an electronic form, whereas it was considered implicit due to their voluntarily and anonymously filling of the questionnaire.

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Measurements

The online survey collected the main socio-demographic and clinical characteristics of GUCH/ACHD, the lifestyles, and the perceived health status.

Table 1 synthetized the measurements of this study. Specifically, socio-demographic and clinical characteristics were sex, age, family composition, working role, educational background, provenience, body mass index (BMI), and therapeutic plan. The investigated lifestyles referred to dietary habits, substances usage or abuse (e.g. smoking and drugs), physical and sexual activities. Conversely, the perceived health status was assessed using SF-12.[10] Notably, SF-12 has been successfully developed as a shorter version of SF-36 in nine European countries, showing a good validity in measuring the physical and mental components of health.[10] Thus, these components were respectively physical component summary (PCS) and mental component summary (MCS). Both PCS and MCS have to be scored to 0-100 using the procedure indicated by the authors of reference, where higher values indicate a better health perception.[10] Further, it is possible to dichotomize the scores in adequate versus inadequate perception of health, if we consider keep into account the indications provided by Utah Health Status survey to establish the cut-off points adjusted for the age of the responders.[11]

----Please, insert Table 1 ----

Statistical analysis

We calculated the response rate considering the invitations send to the contacts provided by AICCA. All the collected variables were preliminary checked for possible missing, outliers or errors using the analysis of their frequency distribution. Categorical variables were described using frequency and percentage, while quantitative variables were assessed for the normality using skewness and kurtosis analysis, followed by Shapiro-Wilk test. According to quantitative variables distribution, we used mean ± standard deviation (SD) or median and interquartile range (IQR) to describe these variables. The univariate analysis was based on multiple comparisons of the lifestyles, ongoing treatments, PCS, and MCS between the sub-groups defined by the socio-

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demographic characteristics. According to the nature of each variable, the comparisons were

performed using the following possible tests: χ^2 test or Fisher exact test (when appropriate), Mann–

Whitney U test or Kruskal–Wallis H test (for non-normally distributed variables), t-test or one-way

ANOVA (for normally distributed variables). Variables showing significant differences were

evaluated to be used as predictors of inadequate PCS and MCS, dichotomizing these scores using

the cut-offs indicated by Utah Health Status survey to depict the (in)adequate health perception

adjusted by age.[11] More precisely, considering that it was not known a priori which independent

variable should be included in a model, we followed recent recommendations for variable selection

balancing the significance criteria of the univariate analysis, the information criteria (theoretical

important covariates), and likelihood analysis.[12] Then, PCS and MCS were used as dichotomous

outcomes in two logistic regression (LR) models. LR models were assessed for the possible

collinearity among the independent variable, checking the strength of their bivariate associations

which should not be superior to 0.45.[13] Maximum likelihood estimation was used to determine the

unknown LR model parameters though the generalized linear model function of R, while the

goodness of fit using the Hosmer-Lemeshow Test (non-significant P indicate a good fit), and the

Nagelkerke's pseudo-R^2. The independent variables were entered into the models simultaneously to

control for each other. Significance levels were set using $\alpha = 5\%$. Overall, statistical analysis were

run through Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corporation) and R

Statistical Package (R Foundation for Statistical Computing).

Patient and public involvement

Patients and the public were not involved in the design of this research. However, the

participants and more broadly the public will be informed of the result of the survey through the

network of AICCA. Accordingly, the authors will use the support of AICCA to disseminate the

study results.

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Results

The response rate was 89.7% (626 responses on the 698 invitations). **Table 2** shows the socio-demographic characteristics, lifestyles, ongoing treatments and health perception.

Roughly one patient every five (n=106; 18.1%) declared to be low adherent to the ongoing medical treatment. Particularly, patients were mainly treated using anticoagulants (n=162; 25.9%), antiarrhythmic drugs (n=121; 19.3%), diuretics (n=104; 16.6%), antiplatelet therapy (n=87; 13.9%), antihypertensive drugs (n=81; 12.9%), and dietary supplements (n=160; 25.6%).

The score of physical health (PCS12) had a mean (SD) equal to 48.69 ± 8.96, while mental health (MCS12) was lower (45.56 ± 10.99). Overall, the adequate scores of physical and mental health were respectively 53.6% (n=337) and 63.8% (n=401).

----Please, insert Table 2 ----

As **Table 3** shows, the odds of inadequate perception of physical health increased by more than two times in patients under antiarrhythmic therapies (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008), more than 1.5 times in patients under anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034), and roughly 1.7 times in patients treated with antiplatelet (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041). Conversely, as per **Table 4**, the odds of inadequate perception of mental health increased by 1.7 time every year of aging (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025).

----Please, insert Table 3 ----

----Please, insert Table 4 ----

Discussion

This study represents the first overview in Italy of lifestyles in an ACHD/GUCH population, identifying determinants of poor perceived health status. Our results are strategic considering that they allow a comparison between lifestyles of general population and the ones related to ACHD/GUCH patients. These possible comparisons are particularly worthy, considering that the

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majority of patients born with CHD are expected to survive into adulthood, being exposed to the general risks of inadequate lifestyles (i.e. modifiable cardiovascular risks) in maintaining a healthy status.[14] Further, this study intercepts the most critical determinants associated to poorer physical and mental health, allowing to boost the attention for patients that present those determinants.

Our sample reported an adequate BMI, which is slightly lower than previous epidemiological self-report BMI assessment in Italian general population aged between 30-45 years.[15] The other socio-demographic characteristics are consistent with data on general population.[15,16] Among lifestyles, the rate of smokers among GUCH/ACHD appears to be encouragingly lower than the one reported in general population (10.4% versus 21.4%),[17] and the one shown by a recent description in Malta.[18] This result could be related by the high sensibility of clinicians in providing regular advices and education against smoking. However, cannabis consumption appears to be consistent and slightly higher than the rate of self-report assessed consumption in general population.[19] This result is also in line with previous evidence coming from younger adults with CHD, where the behaviors were described as influenced by peer-relationships more than awareness on the one's clinical condition.[20] This aspect should be addressed by an increasing attention by clinicians towards the illicit drugs consumption, addressing a campaign of information for GUCH/ACHD population, highlighting the risk of increased systolic blood pressure, orthostatic hypotension, and a greater risk of ischemic stroke.[21]

An unexpected result was related to the rates of reported physical activities, which were consistent with the ones described in the general population.[22] Our initial expectation was to find lower rate of physical activities in GUCH/ACHD patients, due to the clinicians, in the past, used to restrict activity for those patients because of concerns that increased activity might be risky.[23] Over the last ten years, the recommendations coming from a consensus of an international expert panel endorsed by the European Society of Cardiology (ESC) encourage regular exercise at in all patients with CHD, even if these recommendations are mainly based on expert opinion, as there is still low evidence on the effects of exercise training.[24] Our results confirm the shifting of paradigm from the

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restriction of physical activities to its support in educational advices. Accordingly, the steady progresses in diagnostics for GUCH/ACHD give the perspective to emphasizing the life-long benefits of regular physical activity on general health also in complex CHD (adequately adherent to the follow-ups).[25]

In our study, the ongoing medical treatment was the sole source to ascertain objectively the clinical condition of the enrolled patients. Our results profiled the patients with higher risk of inadequate physical and mental health, considering their ongoing treatments. Patients treated by antiarrhythmic therapies, anticoagulants, and antiplatelet should be supported more ion preventing inadequate perception of physical health, in relations to the ones' health status. While mental health worsens with the aging. This could be related to the previously described fear of aging of many GUCH/ACHD, enhanced by a sense of uncertainty.[26] In other words, this implies that psychological needs of GUCH/ACHD population increase with aging.

Limitations

The findings in this study are subject to some important limitations. Firstly, the impossibility to collect reliable clinical data (e.g. CHD classification, diagnostics) undermines the possibility of solid inferential associations between lifestyles (behaviors) and clinical outcomes. For this reason, this study should mainly provide descriptive information to frame new knowledge on lifestyles in Italian GUCH/ACHD population. Another limitation was given by the possibility of an underestimation of the levels of risky behaviors and an overestimation of the levels of healthy behaviors, due to the possibility of the social desirability effect in answering. However, the choice to collected data anonymously should limit the probability of the social desirability effect. The strengths of the study are mainly related to the fact that patients roughly represent equally Northern, Central, and Southern Italy, and by the prudent approach used to analyze the data.

Conclusions

So far, this study represents the first Italian description of lifestyles in GUCH/ACHD population. We identified a number of similarities and some differences with the Italian general

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population. Clinicians should address the issue of illicit drug consumption (especially marijuana) more deeply, considering our findings. Further, a particular attention should be given by the increasing psychological needs given by the aging of those patients. More research are needed to identify associations between lifestyles and clinical outcomes, providing more details for homogenous sub-group stratifications considering the clinical information, such as the CHD classification.

Author's contributions statement

RC, FD, CA, SFF, AG, and MC: conception and design, FD, SFF, AG and MC was particularly involved in the acquisition of data, RC and CA in analysis and interpretation of data; RC, FD, CA, SFF, AG, and MC have substantially contributed in drafting the manuscript and in providing critical revision of important intellectual content. Each author gave their final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

Competing interests

The authors declare no conflict of interest.

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Data sharing statement

We intend to make data freely available the data upon request to the corresponding author (rosario.caruso@unimi.it).

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Table 1. Study measurements

Tools	Socio-demographics	Lifestyles	Mental health	Physical health
Developed questionnaire	x	x		
SF-12			x	x

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Table 2. Descriptive characteristics of socio-demographics, lifestyles, ongoing treatment, and health perception (n=626)

			n	%
	Sex			
		Male	290	46.1
		Female	339	53.9
	Provenience			
		Northern Italy	231	36.9%
		Central Italy	223	35.6%
		Southern Italy	172	27.5%
	Age			
		Years (mean; standard deviation)	35.69	13.49
Socio-demographic characteristics	Body Mass Index (BMI)	Kg/m^2 (mean; standard deviation)	23.18	4.07
	Offspring			
		Yes	208	33.2
	Education			
		Lower or equal to high school	490	78.3
		University education	136	21.7
	Occupation			
		Manager	32	5.1
		Office worker	263	42.0
		Student	113	18.1
		Freelance	84	13.4
		Unemployed	110	17.6
		Retired	24	3.8
	Smoking			
		Yes	65	10.4
	Illicit Drugs			
		Occasionally	81	12.9
		Cannabis (occasionally consumer)	77	12.3
		Cocaine (occasionally consumer)	2	0.3
	Regular physical activities			
		Yes	325	52.1
		On daily basis	53	8.5
Lifestyles		Two-three times per week	247	39.4
		Once per week	40	6.4
	Reasons to avoid regular physical activities			
		Ill-judged	21	3.4
		Lack of willing	139	22.2
		Lack of energy	50	7.9
		Fear	93	14.8
	Daily time spent walking			
		Less than 30 minutes	285	45.5
		Between 30 and 60 minutes	340	54.3
		More than 60 minutes	154	24.6

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	Perception of adequate daily physical activities			
		Yes	285	45.5
	Sexuality education			
		Never received	6	0.9
		Poorly received	21	3.5
		Sufficiently received	122	19.5
		Adequately received	477	76.1
	Contraceptive			
		Yes	238	40.5
	Low adherent to the ongoing medical treatment			
		Yes	106	18.1
Ongoing Treatment	*Medical therapy*			
		Diuretics	104	16.6
		Antiarrhythmic therapy	121	19.3
		Anticoagulants	162	25.9
		Antiplatelet	87	13.9
		Antihypertensive therapy	81	12.9
		Dietary supplements	160	25.6
Health perception	*Physical Health*			
		Score (mean; standard deviation)	48.69	8.96
	Mental Health			
		Score (mean; standard deviation)	45.56	10.99
	Adequate physical health (Yes)*		337	53.6
	Adequate mental health (Yes)*		401	63.8

Note: (*)Adequate physical and mental health were calculated considering the indication provided by Utah Health Status survey to establish the cut-off points for perception of adequate physical health (PCS12) and mental health (MCS12), adjusting scores by age.

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Table 3. Determinants of inadequate scores of PCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictors						
Constant	15.21	1	0.000			
Age	1.382	1	0.240	0.991	0.976	1.006
BMI	0.134	1	0.714	0.991	0.946	1.039
Diuretics	2.658	1	0.103	1.576	0.912	2.725
Antiarrhythmic	6.951	1	0.008	**2.045**	**1.201**	**3.479**
Anticoagulants	4.499	1	0.034	**1.638**	**1.038**	**2.585**
Antiplatelet	4.197	1	0.041	**1.743**	**1.024**	**2.966**
Antihypertensive	2.198	1	0.138	1.546	0.869	2.75
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.236		

Table 4. Determinants of inadequate scores of MCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictors						
Constant	1.437	1	0.231			
Age	5.038	1	0.025	**1.017**	**1.002**	**1.032**
BMI	1.784	1	0.182	0.968	0.924	1.015
Diuretics	0.248	1	0.619	1.142	0.677	1.925
Antiarrhythmic	0.683	1	0.409	1.241	0.744	2.070
Anticoagulants	0.462	1	0.497	1.170	0.744	1.838
Antiplatelet	0.019	1	0.891	0.965	0.581	1.603
Antihypertensive	0.012	1	0.913	1.031	0.595	1.787
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.135		

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6-7
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	na
		(*e*) Describe any sensitivity analyses	na
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8

		(*b*) Report category boundaries when continuous variables were categorized	na
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	na
Discussion			
Key results	18	Summarise key results with reference to study objectives	8-9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Lifestyles and determinants of perceived health in Italian grown-up/adult congenital heart patients: A cross-sectional and pan-national survey

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Title

Lifestyles and determinants of perceived health in Italian grown-up/adult congenital heart patients: A cross-sectional and pan-national survey

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Abstract

Objectives: To provide the first epidemiological lifestyle descriptions of the Italian grown-up/adult congenital heart (GUCH/ACHD) population by identifying the determinants of poor perceived health status. **Design**: Cross-sectional pan-national survey. **Setting:** Italian GUCH/ACHD patients who were members of the Italian Association of GUCH/ACHD. **Primary and secondary outcome measures**: To discuss these lifestyle descriptions through an *ad hoc* developed questionnaire and health perceptions (i.e., mental and physical health perception) through an SF-12 questionnaire. **Results:** 629 patients included; many investigated GUCH/ACHD lifestyles were determined similar to those of the general population—with the exception of the smoking habits, which were lower. The odds of the occurrence of inadequate physical health perceptions increased by more than two times in patients undergoing antiarrhythmic therapies (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008), more than 1.5 times in patients taking oral anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034), and roughly 1.7 times in patients treated with antiplatelets (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041). The odds of the occurrence of inadequate mental health perceptions increased by 1.7% for every year that the patients aged (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025). **Conclusion**: Particular attention should be paid to these aging patients' increasing psychological needs, and additional research is needed to identify associations between their lifestyles and clinical outcomes.

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Strengths and limitations of this study

- The study results require caution regarding their generalization, as lifestyle trajectories over time were not described due to the cross-sectional approach taken for the data collection process.

- The self-report approach taken during the clinical information collection requires caution, as a direct assessment of the respondents' actual clinical conditions was not performed to collect data.

- The sampling was performed using the contacts of the Italian Association of GUCH/ACHD (AICCA); therefore, a slight overestimation of the healthy lifestyle is possible, acknowledging that the AICCA patient–members may become more engaged in their treatment than may other patients.

- The questionnaire used in this survey to investigate lifestyles (*ad hoc* developed questionnaire) was validated for content and face validity, while the questionnaire that investigates health perceptions possesses well-known validity proprieties (SF-12).

- The surveyed patients equally represent Northern, Central, and Southern Italy.

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Introduction

Roughly 85% of children with congenital heart disease (CHD) live to adulthood and thus represent the population of grown-up/adult congenital heart disease (GUCH/ACHD) patients.[1] More precisely, the GUCH/ACHD rate has been growing steadily, even if accurate data on the size and characteristics of this population remain lacking.[2] Even if the large variety of CHD and its clinical problems require specific focus for improving the GUCH/ACHD clinical condition, this population also shares a number of important communalities mainly related to the modifiable risk factors of a decline in clinical status. Among these modifiable risk factors, lifestyle plays a pivotal role in improving the overall health conditions associated with GUCH/ACHD.[3] Further, the descriptions of these patients' socio-demographic and clinical determinants of their perceived health statuses play a paramount role in framing a comprehensive understanding of the actual weaknesses present in the educational plans and follow-ups. Specific interventions in the determinants of poor perceived health status may be useful for achieving the most favourable outcomes in the GUCH/ACHD population, as has been previously described for other chronic conditions, such as diabetes and acquired heart diseases.[4–7]

Thus far, the determinants of perceived health status among GUCH/ACHD patients remain poorly described on a global scale, despite their possible influence on the patients' overall adherence to follow-ups and, consequently, on patients' outcomes.[8] In Italy, neither lifestyles nor determinants of perceived health status among GUCH/ACHD patients have been previously for large samples, thus undermining the possibility of planning mid- and long-term strategies for patients who report poor perceived health or inadequate lifestyles. For these reasons, this study aimed to provide the first epidemiological lifestyle descriptions of the Italian GUCH/ACHD population by identifying the determinants of poor perceived health status.

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Material and methods

Design, study population and data collection

This cross-sectional survey was promoted by an Italian GUCH/ACHD centre and supported by the Italian Association of GUCH/ACHD (AICCA). The study design and reporting method aligned with the 'STrengthening the Reporting of OBservational studies in Epidemiology' (STROBE) checklist (supplementary file 1). Data were collected through the list of contacts available in the AICCA's repository between March and October 2017. More precisely, data were collected using a computer/mobile-assisted, web interviewing survey, and participants were sampled via the repertory of contacts of AICCA contacts and stratified to reflect the geo-graphical population by macro-area (i.e., Northern, Central and Southern Italy).

According to the study protocol (approved by the Ethical Committee of San Raffaele Hospital, Prot. N. 111/INT/2016), all patients were informed on the study's aim and provided consent flagging an electronic form, whereas it was considered implicit due to their voluntarily and anonymously completion of the questionnaire.

Validation of the questionnaire on lifestyles

The development of this study's lifestyle questionnaire was based on a previous survey of the Italian National Institute of Public Health on the chronic disease population,[9] adapted using a process of face and content validity to detect the peculiarities of GUCH/ACHD. Accordingly, the questionnaire's validation required the involvement of a multi-disciplinary panel of experts (n=14) to ascertain the new questionnaire's face and content validity. The panellists (9 females; 35.7%) were aged a median of 44.6 years (interquartile range = 7.4 years), had a minimum of 4 years of experience in CHD field, and comprised the following professions: cardiac surgeons (n=2), clinical nutritionists (n=2), clinical psychologists (n=2), clinical cardiologists (n=2), clinical nurses (n=2), experts of public health (n=2), experts in instrument development with a background in nursing at the doctoral level (n=2). Precisely, face validity explored the panellists' understanding of each item and their comments about the overall concept they purported to measure through an assessment

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executed using open-ended questions. Conversely, content validity refers to the 'quantitative' agreement among panellists regarding how pertinent each item is in relation to the aim of its measurement.

Content validity encompassed the panellists' quantitative assessments using the content validity ratio (CVR), and the content validity index for item and scale level (I-CVIs and S-CVI). The CVR may potentially range between -1 (perfect disagreement among panelists) and +1 (perfect agreement among panelists), while I-CVIs and S-CVI range between 0 (no content judged as appropriate) and +1 (content totally judged as appropriate). As per the critical CVR cut-offs for determining adequate/inadequate content indices (i.e., the lowest level of CVR such that the level of agreement was greater than 50%), recent research was proposed to consider critical CVR values as the statistics arising from binomial distribution that are applied to the panel sizes.[10] A critical CVR value for 14 panelists is equal to 0.571;[10] as per I-CVIs, an adequate index must be equal or superior to 0.75, while S-CVI must be equal or superior to 0.70.[11]

The first round of content validity was performed in June 2016 and was based on the questionnaire proposed by the Italian National Institute of Public Health.[9] Thus, the panellists were asked to propose modifications insofar as adequate for developing a questionnaire for the specific GUCH/ACHD population. After four rounds of consulting the panellists and amending the questionnaire, all CVR values were higher than 0.65, I-CVIs were equal or higher than 0.80, and S-CVI was equal to 0.75. Further, the questionnaire was preliminarily tested on a small group of six patients to evaluate the clarity of each item. Patients were asked to respond to a three-point Likert scale (1=completely not understandable; == somewhat understandable; 3=completely understandable) and an open-ended question to investigate the need for an eventual re-wording of the terminology. We computed the Fleiss' kappa to determine the level of quantitative agreement between patients, which was 0.75 and indicated consensus in their defining of the questionnaire as understandable, although some minor amendments to the items' wording were requested as per the answers to the open-ended question. Finally, the questionnaire validation process was concluded in

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January 2017 (supplementary file 2). The survey required roughly thirty minutes for its completion, and no respondent received compensation for participating in this study.

Measurements

The online survey collected the main socio-demographic and clinical characteristics of GUCH/ACHD patients, including their lifestyles and perceived health statuses.

Table 1 synthetizes the study's measurements; specifically, each participant's socio-demographic and clinical characteristics include sex, age, family composition, working role, educational background, provenience, body mass index (BMI), and therapeutic plan. The lifestyles investigations revealed patients' dietary habits, substance use or abuse (e.g., smoking, drugs), and physical and sexual activities. Conversely, their perceived health statuses were assessed using SF-12,[12] which has notably been successfully developed as a shorter version of the SF-36 in nine European countries and demonstrates adequate validity in measuring the physical and mental components of health.[12] Thus, these components were respectively labelled physical component summary (PCS) and mental component summary (MCS), both of which were scored from 0-100 using the procedure indicated by the authors of reference, wherein a higher value indicates a more favourable health perception.[12] Further, it is possible to dichotomize the scores through an adequate versus an inadequate health perception if we consider the median split strategy[13] and acknowledge that the median scores of general Italian population, clustered by different age ranges, were previously described.[14]

----Please, insert Table 1 ----

Statistical analysis

We calculated the response rate by considering the invitations sent to the contacts provided by the AICCA. All the collected variables were preliminary checked for possible missing data, outliers, or errors using an analysis of frequency distribution. Categorical variables were described using frequency and percentage, while quantitative variables were assessed for normality via skewness and kurtosis analysis, followed by Shapiro-Wilk test. According to the quantitative

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variable distributions, we employed mean ± standard deviation (SD) or median and interquartile range (IQR) to describe these variables. The univariate analysis was based on multiple comparisons of the lifestyles, ongoing treatments, PCSs, and MCSs between the sub-groups defined by the socio-demographic characteristics. According to the nature of each variable, the comparisons were performed using the following possible tests: χ^2 test or Fisher exact test (when appropriate), Mann–Whitney U test or Kruskal–Wallis H test (for non-normally distributed variables), t-test or one-way ANOVA (for normally distributed variables). Variables exhibiting significant differences were evaluated to be used as predictors of inadequate PCS and MCS. A median split approach was used to dichotomize PCS and MCS,[13] by considering the median values previously described among Italians aged between 18 and 44 years.[14] Accordingly, PCS scores lower than 52.5 were considered as indicating inadequate physical health, while MCS scores lower than 51.2 were considered as indicating inadequate mental health. Subsequently, PCS and MCS were employed as dichotomous outcomes in two logistic regression (LR) models. The LR models were assessed for the possible collinearity between the independent variable by checking the strength of their bivariate associations, which should not exceed 0.45.[15] Maximum likelihood estimation was used to determine the unknown LR model parameters though the generalized linear model function of R, while the goodness of fiteas determined with the Hosmer-Lemeshow test (non-significant P indicates a good fit), and Nagelkerke's pseudo-R^2. The independent variables were simultaneously entered into the models to examine each variable's relatively unique contribution to health perception. Significance levels were set using $\alpha = 5\%$. Overall, missing data referred to the socio-demographic section were managed using pairwise deletions, while no missing data were expected in the answering of the questionnaire, as all the questions were mandatory to complete the survey. Statistical analysis was run through Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corporation) and R Statistical Package (R Foundation for Statistical Computing).

Patient and public involvement

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Neither patients nor the public were involved in the designing of this research, although both will be informed of the survey results via the AICCA network. Accordingly, the authors will employ the AICCA's support to disseminate the study results.

Results

The response rate was 89.7% (626 responses out of 698 invitations), and **Table 2** illustrates the participants' socio-demographic characteristics, lifestyles, ongoing treatments and health perceptions. Roughly one of every five patients (n=106; 18.1%) declared to be lowly adherent to their ongoing medical treatment. Patients were primarily treated with oral anticoagulants (n=162; 25.9%), antiarrhythmic drugs (n=121; 19.3%), diuretics (n=104; 16.6%), antiplatelet therapy (n=87; 13.9%), antihypertensive drugs (n=81; 12.9%), and dietary supplements (n=160; 25.6%).

The physical health (PCS12) scores reached a mean (SD) equal to 48.69 ± 8.96, which was higher than that of mental health (MCS12; 45.56 ± 10.99). Overall, the adequate physical and mental health scores were 53.6% (n=337) and 63.8% (n=401), respectively.

----Please, insert Table 2 ----

As **Table 3** indicates, the odds of inadequate physical health perception increased by more than two times in patients receiving antiarrhythmic therapy (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008), more than 1.5 times in patients receiving oral anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034), and roughly 1.7 times in patients treated with antiplatelets (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041). Conversely, as per **Table 4**, the odds of inadequate mental health perception increased by roughly 2% for each year a participant aged (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025).

----Please, insert Table 3 ----

----Please, insert Table 4 ----

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Discussion

This study represents the first overview in Italy of ACHD/GUCH patients' lifestyles by identifying determinants of poor perceived health status. Our results are strategic considering that they allow a comparison between the general population's lifestyles and those of ACHD/GUCH patients. These possible comparisons are particularly worthy considering that the majority of patients born with CHD are expected to survive into adulthood, being exposed to the general risks of inadequate lifestyles (i.e. modifiable cardiovascular risks).[16] Further, this study contributes to identify potentially important determinants of poor physical and mental health and focuses attention onto patients who present those determinants.

This study highlights that associations exist between antiarrhythmic drugs, oral anticoagulants, antiplatelet drugs, and lower physical health status. To the best of our knowledge, this study provides the first empirical evidence of these associations in the GUCH/ACHD population. Previous research has demonstrated similar results in patients with paroxysmal atrial fibrillation, wherein patients treated with antiarrhythmic drugs reported lower physical health than did patients treated with radiofrequency ablation.[17] Even if the literature does not fully address the question of whether or not physical health is directly associated with antiarrhythmic drugs in patients with atrial fibrillation,[17] there is room in the clinical practice for monitoring the physical health trajectories of patients treated with antiarrhythmic drug over time. Similar associations with a decreased quality of life and physical health were described in patients treated with anticoagulants and/or antiplatelet drugs,[18] even if little is currently known in GUCH/ACHD population about the effects of these drugs on physical and mental health statuses.[19] These associations should be studied in future research, and possible manifestations of side effects should be monitored to understand whether the worsening of one's physical health is related to the drug-related side effects or other factors, such as the psychological burden related to one's need for medical therapy in terms of posology and adherence.

As described above, our results profile patients who are at greater risk for achieving inadequate physical health in consideration of their ongoing treatments. Conversely, mental health

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status seems to worsen as individuals age, which may be related to many GUCH/ACHD patients' previously described fear of ageing, that is enhanced by a sense of uncertainty;[20] in other words, the GUCH/ACHD population's psychological needs increase with age.

An unexpected result was related to the rates of reported physical activities, which were consistent with those described for the general population.[21] Our initial expectation was to identify a lower rate of physical activity in GUCH/ACHD patients, because past clinicians restricted patients' activity due to concerns that increased activity might be risky for patients' health.[22] Over the last ten years, the recommendations from a consensus of an international expert panel endorsed by the European Society of Cardiology (ESC) encourage that all CHD patients regularly exercise; while these recommendations are mainly based on expert opinion, there nevertheless exists scarce evidence for the effects of exercise training.[23] Our results confirm the shifting of paradigm from the restriction of physical activities to its support of educational advices. Accordingly, the steady progress in GUCH/ACHD diagnostics emphasize the life-long benefits of regular physical activity for general health as well as in complex CHD (adequately adherent to the follow-ups).[24]

Overall, our sample reported an adequate BMI that was slightly lower than previous epidemiological, self-report BMI assessments of the Italian general population aged between 30 and 45 years.[25] The other socio-demographic characteristics are consistent with the current data regarding general population.[25,26] Concerning lifestyles, the rate of smokers among the GUCH/ACHD sample (10.4%) appears to be encouragingly lower than that reported in general population (21.4%)[27] as well as that determined by a recent description in Malta.[28] This result may be related to the clinicians' high sensibility when providing regular anti-smoking advice and education. Cannabis consumption, on the other hand, appears to be consistent with and slightly higher than the general population's rate of self-reported consumption.[29] This result is also in line with previous evidence of younger adults with CHD, whose behaviours were described as being more strongly influenced by peer relationships than the awareness of one's clinical condition.[30] Clinicians should address this aspect with increasing attention to reduce illicit drug consumption by administering to the GUCH/ACHD population

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detailed information that highlights the risk of increased systolic blood pressure, orthostatic hypotension, and ischemic stroke.[31]

Limitations

This study's findings are subject to some important limitations. Firstly, the impossibility of collecting reliable clinical data (e.g., CHD classification, diagnostics) undermined the possibility of drawing solid, inferential associations between lifestyles (behaviours) and clinical outcomes. For this reason, this study has mainly provided descriptive information to frame new knowledge of the Italian GUCH/ACHD population's lifestyles. Secondly, we suspect the possibility that the levels of risky behaviours were underestimated and the levels of healthy behaviours were overestimated according to the potential social desirability effect's occurrence in the participants' responses. However, the choice to anonymously collect data should have limited the probability that the social desirability effect would occur. Thirdly, data collection was performed using the AICCA network, which may have introduced a bias in the sampling procedure because patients from the AICCA— that is, patients who have learned skills of observation, description, and symptom handling, thus increasing their basic knowledge of health problems—may have more likely been 'activated' than general patients and because they were not representative of the general population. We believe this sampling bias is generally marginal in this study, as the AICCA holds the contacts of real-world patients from the majority of CHD centres in Italy, and not all patients in the AICCA network actively participate in the association's initiative. Fourthly, this study has included no information on the possible manifestations of drug-related side effects or other factors that may interact through the relationship between drugs and physical health, which such information might help effectively interpret. Overall, considering this study's limitations, we suggest that caution be taken when generalizing the results. This study's strengths are related firstly to the fact that patients roughly equally represent Northern, Central, and Southern Italy and secondly to the prudent approach used to analyse the data.

Conclusions

Thus far, this study represents the first lifestyle descriptions of the Italian GUCH/ACHD population, and we have identified a number of similarities and differences among the general Italian population. Clinicians should address the issue of illicit drug consumption (especially cannabis) more deeply, and particular attention should be paid to accommodating the increasing psychological needs resulting from these patients' age progression. More research is needed to identify the associations between lifestyles and clinical outcomes to determine additional details for homogenous sub-group stratifications in consideration of patients' clinical information, such as CHD classification.

Author's contributions statement

RC, FD, CA, SFF, AG, and MC: conception and design, FD, SFF, AG and MC was particularly involved in the acquisition of data, RC and CA in analysis and interpretation of data; RC, FD, CA, SFF, AG, and MC have substantially contributed in drafting the manuscript and in providing critical revision of important intellectual content. Each author gave their final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

Competing interests

The authors declare no conflict of interest.

Funding

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Data sharing statement

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We intend to make data freely available the data upon request to the corresponding author (rosario.caruso@unimi.it).

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Table 1. Study measurements

Tools	Socio-demographics	Lifestyles	Mental health	Physical health
Developed questionnaire	x	x		
SF-12			x	x

Table 2. Descriptive characteristics of socio-demographics, lifestyles, ongoing treatment, and health perception (n=629)

			n	%
	Sex			
		Male	290	46.1
		Female	339	53.9
	Provenience			
		Northern Italy	231	36.9%
		Central Italy	223	35.6%
		Southern Italy	172	27.5%
		Missing data	3	-
	Age			
		Years (mean; standard deviation; range: 18-57)	35.69	13.49
	Body Mass Index (BMI)	Kg/m^2 (mean; standard deviation)	23.18	4.07
		Underweight (BMI < 18.5 Kg/m^2)	68	10.9
Socio-demographic characteristics		Normal weight (BMI: 18.5-24.9 Kg/m^2)	373	59.4
		Overweight (BMI: 25-29.9 Kg/m^2)	145	23
		Obese (BMI > 30 Kg/m^2)	42	6.7
		Missing data	1	-
	Offspring			
		Yes	208	33.2
	Education			
		Lower or equal to high school	490	78.3
		University education	136	21.7
		Missing data	3	-
	Occupation			
		Manager	32	5.1
		Office worker	263	42.0
		Student	113	18.1
		Freelance	84	13.4
		Unemployed	110	17.6
		Retired	25	3.8
		Missing data	2	-
	Smoking			
		Yes	65	10.4
	Illicit Drugs			
		Occasionally	81	12.9
		Cannabis (occasionally consumer)	77	12.3
Lifestyles		Cocaine (occasionally consumer)	2	0.3
	Regular physical activities			
		Yes	325	52.1
		On daily basis	53	8.5
		Two-three times per week	247	39.4
		Once per week	40	6.4
	Reasons to avoid regular physical activities			

	Ill-judged	21	3.4
	Lack of willing	139	22.2
	Lack of energy	50	7.9
	Fear	93	14.8
Daily time spent walking			
	Less than 30 minutes	285	45.5
	Between 30 and 60 minutes	340	54.3
	More than 60 minutes	154	24.6
Perception of adequate daily physical activities			
	Yes	285	45.5
Sexuality education			
	Never received	6	0.9
	Poorly received	21	3.5
	Sufficiently received	122	19.5
	Adequately received	477	76.1
Contraceptive			
	Yes	238	40.5
Low adherent to the ongoing medical treatment			
	Yes	106	18.1
Ongoing Treatment *Medical therapy*			
	Diuretics	104	16.6
	Antiarrhythmic therapy	121	19.3
	Anticoagulants	162	25.9
	Antiplatelet	87	13.9
	Antihypertensive therapy	81	12.9
	Dietary supplements	160	25.6
Health perception *Physical Health*			
	Score (mean; standard deviation)	48.69	8.96
Mental Health			
	Score (mean; standard deviation)	45.56	10.99
Adequate physical health (Yes)*		337	53.6
Adequate mental health (Yes)*		401	63.8

Note: (*) Adequate physical and mental health were calculated using the median split, based on the Italian median scores of the study of the IQOLA Project (median score of physical health in general population was equal to 52.5; median score of mental health was equal to 51.2).

As per the univariate analysis to highlight differences between physical/mental health (inadequate versus adequate) and the investigated variables listed in the table 1, results are as follow: the frequencies of each used drug differs between groups (each χ^2 had P < 0.001), while higher BMI category frequencies were higher in inadequate physical health (P = 0.033). The comparison of the age through t-test reported statistical significant differences between physical/mental health (inadequate versus adequate).

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Table 3. Determinants of inadequate scores of PCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictor						
Constant	15.21	1	0.000			
Age	1.382	1	0.24	0.991	0.976	1.006
BMI	0.134	1	0.714	0.991	0.946	1.039
Diuretics	2.658	1	0.103	1.576	0.912	2.725
Antiarrhythmic	6.951	1	0.008	**2.045**	**1.201**	**3.479**
Anticoagulants	4.499	1	0.034	**1.638**	**1.038**	**2.585**
Antiplatelet	4.197	1	0.041	**1.743**	**1.024**	**2.966**
Antihypertensive	2.198	1	0.138	1.546	0.869	2.75
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.236		

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Table 4. Determinants of inadequate scores of MCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictor						
Constant	1.437	1	0.231			
Age	5.038	1	0.025	**1.017**	**1.002**	**1.032**
BMI	1.784	1	0.182	0.968	0.924	1.015
Diuretics	0.248	1	0.619	1.142	0.677	1.925
Antiarrhythmic	0.683	1	0.409	1.241	0.744	2.070
Anticoagulants	0.462	1	0.497	1.170	0.744	1.838
Antiplatelet	0.019	1	0.891	0.965	0.581	1.603
Antihypertensive	0.012	1	0.913	1.031	0.595	1.787
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.135		

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6-7
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	na
		(*e*) Describe any sensitivity analyses	na
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8

		(*b*) Report category boundaries when continuous variables were categorized	na
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	na
Discussion			
Key results	18	Summarise key results with reference to study objectives	8-9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Sondaggio **AICCA**

Grazie per aver deciso di partecipare a questo sondaggio, di seguito troverà una serie di domande di facile comprensione. Il suo supporto e il suo tempo sono fondamentali ai fini della ricerca.

1. Sesso

◯ Maschio

◯ Femmina

2. Età

[   ]

3. Con chi vive?

◯ Solo

◯ Con i genitori

◯ Con la famiglia

◯ Altro (specificare)

[   ]

4. Ha figli?

◯ Si

◯ No

5. Se SI, quanti?

[   ]

6. Titolo di studio

◯ Dottorato di ricerca o specializzazione post laurea

◯ Laurea/Diploma universitario

◯ Diploma scuola media superiore

◯ Licenza scuola media inferiore

◯ Licenza elementare

7. Professione

- ◯ Direttivo, quadro
- ◯ Impiegato, intermedio
- ◯ Capo operaio, operaio subalterno
- ◯ Apprendista
- ◯ Libero professionista
- ◯ Disoccupato
- ◯ Altro (specificare)

[   ]

8. Ha un credo religioso?

- ◯ Si
- ◯ No

9. Se SI, quale?

- ◯ Cristiano-cattolico ◯
- Cristiano-protestante ◯
- Ebraico
- ◯ Musulmano
- ◯ Altro (specificare)

[   ]

Le informazioni delle prossime tre domande devono riferirsi a misurazioni prese dal medico curante

10. Peso (solo una risposta)

Rilevato senza vestiti in Kg

Rilevato con i vestiti in Kg

11. Altezza in cm

12. Quanto misura la sua circonferenza addominale in cm? (misurata senza vestiti con un metro da sarta a livello dell'ombelico senza trattenere il respiro)

13. Lei fuma?

◯ Si

◯ No

14. Se si, quante sigarette fuma al giorno?

◯ Meno di 5 sigarette al giorno

◯ Da 5 a 9 sigarette al giorno

◯ Da 10 a 14 sigarette al giorno

◯ Da 15 a 19 sigarette al giorno

◯ Da 20 a 24 sigarette al giorno

  25 sigarette al giorno o più

15. Se si, ha mai cercato di smettere di fumare?

◯ Si

◯ No

16. Ha mai fatto uso di droghe?

◯ No

◯ 1 sola volta

◯ Saltuariamente

◯ Con regolarità

17. Se si, che tipo di droghe?

◯ Cannabis

◯ Cocaina

◯ Metanfetamine

◯ Eroina

◯ Altro (specificare)

[   ]

18. Pratica regolarmente attività fisica?

⬡ Si

⬡ No

19. Se si, che tipo di attività fisica svolge?

 (possibile dare più di una risposta)

☐ Corsa

☐ Passeggiate all'aria aperta

☐ Calcio o calcetto

☐ Palestra

☐ Piscina

☐ Bicicletta

☐ Altro (specificare)

[ ]

20. Se pratica attività fisica, quanti giorni a settimana?

⬡ Tutti i giorni della settimana

⬡ Alcuni giorni (indicare il numero nella casella sottostante)

⬡ Solo il fine settimana

Se ha indicato "alcuni giorni", specifichi in numero

[ ]

21. Se pratica attività fisica, ogni volta che la fa per quante ore?

⬡ Meno di un'ora

⬡ Un'ora

⬡ Due ore

⬡ Più di due ore

22. Se non pratica attività fisica, ci indichi il perché

◯ Sconsigliato

◯ Mancanza di voglia

◯ Non ce la faccio

◯ Ho paura

◯ Altro (specificare)

23. Se le è stata sconsigliata l'attività fisica, da chi?

◯ Medico di base

◯ Cardiologo

◯ Famigliari

◯ Altro (specificare)

24. Dopo un ricovero in ospedale ha mai fatto un periodo in un centro di riabilitazione?

Si

No

25. Se Si, lo ha trovato utile?

Si

No

26. Se no, pensa che sarebbe stato utile?

Si

No

27. Se no, per quale motivo?

Non le è stato proposto

Le è stato proposto, ma ha rifiutato

Altro (specificare)

28. Calcolando tutti i suoi spostamenti a piedi, per quanto tempo ritiene di camminare al giorno?

Meno di 30 minuti

Dai 30 a 60 minuti

Più di 60 minuti

29. Secondo Lei fa abbastanza movimento durante il giorno?

◯ Si

◯ No

30. Durante la cena, solitamente assume

(possibile dare più di una risposta)

☐ Un primo

☐ Un secondo

☐ Un contorno

☐ Pane

☐ Dolce

☐ Frutta

☐ Niente

☐ Panino / Tramezzino

☐ Pizza / Piadina/Focaccia

☐ Acqua

☐ Vino

☐ Birra

☐ Caffè

☐ Altro (specificare)

31. Lei normalmente beve acqua

◯ Proveniente dal rubinetto

◯ Imbottigliata

32. Quanti litri d'acqua beve al giorno?

◯ Mezzo litro

◯ Un litro

◯ Due o più litri

33. Assume bevande zuccherate per più di 3 volte alla settimana?

◯ Si

◯ No

◯

34. Assume bevande alcoliche?
◯

Si

No

35. Se Si, tutti i giorni della settimana?

Si

No

36. Se assume bevande alcoliche, quali delle seguenti assume durante la giornata (pranzo+cena)?

	1	2	3	Più di 3
Birra (unità di misura = Bottiglia 33 cl)	◯	◯	◯	◯
Vino (unità di misura = Bicchiere 125 ml)				
Superalcolico (unità di misura = Bicchiere 40 ml)				
Cocktail alcolico (unità di misura = Bicchiere 40 ml)				
Altro (specificare)				

37. Lei ha mai pensato che il suo consumo di alcol fosse eccessivo?
◯
Si
◯
No
◯

38. La sera Lei generalmente

    Esce

    Rimane a casa (a vedere la tv, leggere, etc.)

39. Se esce, le capita di bere…

    Niente

    Birra

    Vino

    Bevanda analcolica

    Superalcolico

    Cocktail alcolico

    Altro (specificare)

40. Quanto crede di essere informato sulla sessualità?

⬡ Molto

⬡ Abbastanza

⬡ Sufficientemente

⬡ Poco

⬡ Per nulla

41. Come definirebbe la Sua vita sessuale?

⬡ Intensa

⬡ Buona

⬡ Sufficiente

⬡ Scarsa

⬡ Nulla

42. Se scarsa o nulla, quali sono le cause?

⬡ Mancanza di un partner

⬡ Inesperienza / Incapacità

⬡ Paura legata alla cardiopatia

⬡ Non è importante per me

⬡ Altro (specificare)

43. Fa uso di anticoncezionali?

⬡ Si

⬡ No

44. Se si quali?

◯ Condom (preservativo)

◯ Pillola

◯ Diaframma

◯ Altro (specificare)

[   ]

45. Assume regolarmente farmaci?

◯ Si

◯ No

46. Se SI, quali farmaci?

(possibile più di una risposta)

☐ Diuretici

☐ Antiaritmici

☐ Anticoagulanti

☐ Aspirina

☐ Antipertensivi

☐ Altro (specificare)

[   ]

47. Fa uso dei seguenti prodotti?

	Si	No
Integratori	◯	◯
Prodotti di erboristeria	◯	◯

48. Si è mai dimenticato di assumere i farmaci?

◯ Si

◯ No

49. E' occasionalmente poco attento nell'assunzione dei farmaci?

Si

No

50. Quando si sente meglio, a volte interrompe la terapia?

Si

No

51. Quando si sente peggio, a volte interrompe la terapia?

Si

No

52. In generale, direbbe che la sua salute è

Eccellente

Molto buona

Buona

Passabile

Scadente

BMJ Open

Lifestyles and determinants of perceived health in Italian grown-up/adult congenital heart patients: A cross-sectional and pan-national survey

SCHOLARONE™
Manuscripts

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3 *Title*
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5 **Lifestyles and determinants of perceived health in Italian grown-up/adult**
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8 **congenital heart patients: A cross-sectional and pan-national survey**
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Abstract

Objectives: To provide the first epidemiological lifestyle descriptions of the Italian grown-up/adult congenital heart (GUCH/ACHD) population by identifying the determinants of poor perceived health status. **Design**: Cross-sectional pan-national survey. **Setting:** Italian GUCH/ACHD patients who were members of the Italian Association of GUCH/ACHD. **Primary and secondary outcome measures**: To discuss these lifestyle descriptions through an *ad hoc* developed questionnaire and health perceptions (i.e., mental and physical health perception) through an SF-12 questionnaire. **Results:** 629 patients included; many investigated GUCH/ACHD lifestyles were determined similar to those of the general population—with the exception of the smoking habits, which were lower. The odds of the occurrence of inadequate physical health perceptions increased by more than two times in patients undergoing antiarrhythmic therapies (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008; n=629), more than 1.5 times in patients taking oral anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034; n=629), and roughly 1.7 times in patients treated with antiplatelets (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041; n=629). The odds of the occurrence of inadequate mental health perceptions increased by 1.7% for every year that the patients aged (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025; n=629). **Conclusion**: Particular attention should be paid to these aging patients' increasing psychological needs, and additional research is needed to identify associations between their lifestyles and clinical outcomes.

Keywords: congenital heart disease; grown-up congenital heart; health perception; lifestyles; survey.

Strengths and limitations of this study

- The study results require caution regarding their generalization, as lifestyle trajectories over time were not described due to the cross-sectional approach taken for the data collection process.

- The self-report approach taken during the clinical information collection requires caution, as a direct assessment of the respondents' actual clinical conditions was not performed to collect data.

- The sampling was performed using the contacts of the Italian Association of GUCH/ACHD (AICCA); therefore, a slight overestimation of the healthy lifestyle is possible, acknowledging that the AICCA patient–members may become more engaged in their treatment than may other patients.

- The questionnaire used in this survey to investigate lifestyles (*ad hoc* developed questionnaire) was validated for content and face validity, while the questionnaire that investigates health perceptions possesses well-known validity proprieties (SF-12).

- The surveyed patients equally represent Northern, Central, and Southern Italy.

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Introduction

Roughly 85% of children with congenital heart disease (CHD) live to adulthood and thus represent the population of grown-up/adult congenital heart disease (GUCH/ACHD) patients.[1] More precisely, the GUCH/ACHD rate has been growing steadily, even if accurate data on the size and characteristics of this population remain lacking.[2] Even if the large variety of CHD and its clinical problems require specific focus for improving the GUCH/ACHD clinical condition, this population also shares a number of important communalities mainly related to the modifiable risk factors of a decline in clinical status. Among these modifiable risk factors, lifestyle plays a pivotal role in improving the overall health conditions associated with GUCH/ACHD.[3] Further, the descriptions of these patients' socio-demographic and clinical determinants of their perceived health statuses play a paramount role in framing a comprehensive understanding of the actual weaknesses present in the educational plans and follow-ups. Specific interventions in the determinants of poor perceived health status may be useful for achieving the most favourable outcomes in the GUCH/ACHD population, as has been previously described for other chronic conditions, such as diabetes and acquired heart diseases.[4–7]

Thus far, the determinants of perceived health status among GUCH/ACHD patients remain poorly described on a global scale, despite their possible influence on the patients' overall adherence to follow-ups and, consequently, on patients' outcomes.[8] In Italy, neither lifestyles nor determinants of perceived health status among GUCH/ACHD patients have been previously for large samples, thus undermining the possibility of planning mid- and long-term strategies for patients who report poor perceived health or inadequate lifestyles. For these reasons, this study aimed to provide the first epidemiological lifestyle descriptions of the Italian GUCH/ACHD population by identifying the determinants of poor perceived health status.

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Material and methods

Design, study population and data collection

This cross-sectional survey was promoted by an Italian GUCH/ACHD centre and supported by the Italian Association of GUCH/ACHD (AICCA). The study design and reporting method aligned with the 'STrengthening the Reporting of OBservational studies in Epidemiology' (STROBE) checklist (supplementary file 1). Data were collected through the list of contacts available in the AICCA's repository between March and October 2017. More precisely, data were collected using a computer/mobile-assisted, web interviewing survey, and participants were sampled via the repertory of contacts of AICCA contacts and stratified to reflect the geo-graphical population by macro-area (i.e., Northern, Central and Southern Italy).

According to the study protocol (approved by the Ethical Committee of San Raffaele Hospital, Prot. N. 111/INT/2016), all patients were informed on the study's aim and provided consent flagging an electronic form, whereas it was considered implicit due to their voluntarily and anonymously completion of the questionnaire.

Validation of the questionnaire on lifestyles

The development of this study's lifestyle questionnaire was based on a previous survey of the Italian National Institute of Public Health on the chronic disease population,[9] adapted using a process of face and content validity to detect the peculiarities of GUCH/ACHD. Accordingly, the questionnaire's validation required the involvement of a multi-disciplinary panel of experts (n=14) to ascertain the new questionnaire's face and content validity. The panellists (9 females; 35.7%) were aged a median of 44.6 years (interquartile range = 7.4 years), had a minimum of 4 years of experience in CHD field, and comprised the following professions: cardiac surgeons (n=2), clinical nutritionists (n=2), clinical psychologists (n=2), clinical cardiologists (n=2), clinical nurses (n=2), experts of public health (n=2), experts in instrument development with a background in nursing at the doctoral level (n=2). Precisely, face validity explored the panellists' understanding of each item and their comments about the overall concept they purported to measure through an assessment

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executed using open-ended questions. Conversely, content validity refers to the 'quantitative'

agreement among panellists regarding how pertinent each item is in relation to the aim of its

measurement.

Content validity encompassed the panellists' quantitative assessments using the content

validity ratio (CVR), and the content validity index for item and scale level (I-CVIs and S-CVI).

The CVR may potentially range between -1 (perfect disagreement among panelists) and +1 (perfect

agreement among panelists), while I-CVIs and S-CVI range between 0 (no content judged as

appropriate) and +1 (content totally judged as appropriate). As per the critical CVR cut-offs for

determining adequate/inadequate content indices (i.e., the lowest level of CVR such that the level of

agreement was greater than 50%), recent research was proposed to consider critical CVR values as

the statistics arising from binomial distribution that are applied to the panel sizes.[10] A critical CVR

value for 14 panelists is equal to 0.571;[10] as per I-CVIs, an adequate index must be equal or

superior to 0.75, while S-CVI must be equal or superior to 0.70.[11]

The first round of content validity was performed in June 2016 and was based on the

questionnaire proposed by the Italian National Institute of Public Health.[9] Thus, the panellists were

asked to propose modifications insofar as adequate for developing a questionnaire for the specific

GUCH/ACHD population. After four rounds of consulting the panellists and amending the

questionnaire, all CVR values were higher than 0.65, I-CVIs were equal or higher than 0.80, and S-

CVI was equal to 0.75. Further, the questionnaire was preliminarily tested on a small group of six

patients to evaluate the clarity of each item. Patients were asked to respond to a three-point Likert

scale (1=completely not understandable; == somewhat understandable; 3=completely

understandable) and an open-ended question to investigate the need for an eventual re-wording of

the terminology. We computed the Fleiss' kappa to determine the level of quantitative agreement

between patients, which was 0.75 and indicated consensus in their defining of the questionnaire as

understandable, although some minor amendments to the items' wording were requested as per the

answers to the open-ended question. Finally, the questionnaire validation process was concluded in

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January 2017 (supplementary file 2). The survey required roughly thirty minutes for its completion, and no respondent received compensation for participating in this study.

Measurements

The online survey collected the main socio-demographic and clinical characteristics of GUCH/ACHD patients, including their lifestyles and perceived health statuses.

Specifically, each participant's socio-demographic and clinical characteristics include sex, age, family composition, working role, educational background, provenience, body mass index (BMI), and therapeutic plan. The lifestyles investigations revealed patients' dietary habits, substance use or abuse (e.g., smoking, drugs), and physical and sexual activities. Conversely, their perceived health statuses were assessed using SF-12,[12] which has notably been successfully developed as a shorter version of the SF-36 in nine European countries and demonstrates adequate validity in measuring the physical and mental components of health.[12] Thus, these components were respectively labelled physical component summary (PCS) and mental component summary (MCS), both of which were scored from 0-100 using the procedure indicated by the authors of reference, wherein a higher value indicates a more favourable health perception.[12] Further, it is possible to dichotomize the scores through an adequate versus an inadequate health perception if we consider the median split strategy[13] and acknowledge that the median scores of general Italian population, clustered by different age ranges, were previously described.[14]

Statistical analysis

We calculated the response rate by considering the invitations sent to the contacts provided by the AICCA. All the collected variables were preliminary checked for possible missing data, outliers, or errors using an analysis of frequency distribution. Categorical variables were described using frequency and percentage, while quantitative variables were assessed for normality via skewness and kurtosis analysis, followed by Shapiro-Wilk test. According to the quantitative variable distributions, we employed mean ± standard deviation (SD) or median and interquartile range (IQR) to describe these variables. The univariate analysis was based on multiple comparisons

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of the lifestyles, ongoing treatments, PCSs, and MCSs between the sub-groups defined by the socio-demographic characteristics. According to the nature of each variable, the comparisons were performed using the following possible tests: χ^2 test or Fisher exact test (when appropriate), Mann–Whitney U test or Kruskal–Wallis H test (for non-normally distributed variables), t-test or one-way ANOVA (for normally distributed variables). Variables exhibiting significant differences were evaluated to be used as predictors of inadequate PCS and MCS. A median split approach was used to dichotomize PCS and MCS,[13] by considering the median values previously described among Italians aged between 18 and 44 years.[14] Accordingly, PCS scores lower than 52.5 were considered as indicating inadequate physical health, while MCS scores lower than 51.2 were considered as indicating inadequate mental health. Subsequently, PCS and MCS were employed as dichotomous outcomes in two logistic regression (LR) models. The LR models were assessed for the possible collinearity between the independent variable by checking the strength of their bivariate associations, which should not exceed 0.45.[15] Maximum likelihood estimation was used to determine the unknown LR model parameters though the generalized linear model function of R, while the goodness of fiteas determined with the Hosmer-Lemeshow test (non-significant P indicates a good fit), and Nagelkerke's pseudo-R^2. The independent variables were simultaneously entered into the models to examine each variable's relatively unique contribution to health perception. Significance levels were set using $\alpha = 5\%$. Overall, missing data referred to the socio-demographic section were managed using pairwise deletions, while no missing data were expected in the answering of the questionnaire, as all the questions were mandatory to complete the survey. Statistical analysis was run through Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corporation) and R Statistical Package (R Foundation for Statistical Computing).

Patient and public involvement

Neither patients nor the public were involved in the designing of this research, although both will be informed of the survey results via the AICCA network. Accordingly, the authors will employ the AICCA's support to disseminate the study results.

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Results

The response rate was 89.7% (626 responses out of 698 invitations). Missing data were reported only for the provenience (n=3; 0.4%), BMI (n=1), education (n=3; 0.1%), and occupation (n=2; 0.3%). **Table 1** illustrates the participants' socio-demographic characteristics, lifestyles, ongoing treatments and health perceptions. Roughly one of every five patients (n=106; 18.1%) declared to be lowly adherent to their ongoing medical treatment. Patients were primarily treated with oral anticoagulants (n=162; 25.9%), antiarrhythmic drugs (n=121; 19.3%), diuretics (n=104; 16.6%), antiplatelet therapy (n=87; 13.9%), antihypertensive drugs (n=81; 12.9%), and dietary supplements (n=160; 25.6%).

The physical health (PCS12) scores reached a mean (SD) equal to 48.69 ± 8.96, which was higher than that of mental health (MCS12; 45.56 ± 10.99). Overall, the adequate physical and mental health scores were 53.6% (n=337) and 63.8% (n=401), respectively.

----Please, insert Table 1 ----

Differences of the variables described in Table 1 between adequate and inadequate physical health were significant considering diuretics (χ^2=22.9; d.f.=1; P<0.001), antiarrhythmic drugs (χ^2=28.1; d.f.=1; P<0.001), anticoagulants (χ^2=21.2; d.f.=1; P<0.001), antiplatelet drugs (χ^2=11.1; d.f.=1; P=0.001), antihypertensive drugs (χ^2=10.4; d.f.=1; P=0.001), BMI (χ^2=8.4; d.f.=3; P=0.033), and age (t=4.1; d.f.=610; P<0.001). Conversely, ddifferences of the same variables between adequate and inadequate mental health were significant considering diuretics (χ^2=20.1; d.f.=1; P<0.001), antiarrhythmic drugs (χ^2=22.7; d.f.=1; P<0.001), anticoagulants (χ^2=19.2; d.f.=1; P<0.001), antiplatelet drugs (χ^2=10.2; d.f.=1; P=0.002), antihypertensive drugs (χ^2=9.4; d.f.=1; P=0.003), and age (t=-2.3; d.f.=610; P=0.011).

As **Table 2** indicates, the odds of inadequate physical health perception increased by more than two times in patients receiving antiarrhythmic therapy (OR adjusted = 2.045; 95% CI = 1.201-3.479; P = 0.008; n=629), more than 1.5 times in patients receiving oral anticoagulants (OR adjusted = 1.638; 95% CI = 1.038-2.585; P = 0.034; n=629), and roughly 1.7 times in patients

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treated with antiplatelets (OR adjusted = 1.743; 95% CI = 1.024-2.966; P = 0.041; n=629).

Conversely, as per **Table 3**, the odds of inadequate mental health perception increased by roughly

2% for each year a participant aged (OR adjusted = 1.017; 95% CI = 1.002-1.032; P = 0.025;

n=629).

----Please, insert Table 2 ----

----Please, insert Table 3 ----

Discussion

This study represents the first overview in Italy of ACHD/GUCH patients' lifestyles by

identifying determinants of poor perceived health status. Our results are strategic considering that

they allow a comparison between the general population's lifestyles and those of ACHD/GUCH

patients. These possible comparisons are particularly worthy considering that the majority of

patients born with CHD are expected to survive into adulthood, being exposed to the general risks

of inadequate lifestyles (i.e. modifiable cardiovascular risks).[16] Further, this study contributes to

identify potentially important determinants of poor physical and mental health and focuses attention

onto patients who present those determinants.

This study highlights that associations exist between antiarrhythmic drugs, oral

anticoagulants, antiplatelet drugs, and lower physical health status. To the best of our knowledge, this

study provides the first empirical evidence of these associations in the GUCH/ACHD population.

Previous research has demonstrated similar results in patients with paroxysmal atrial fibrillation,

wherein patients treated with antiarrhythmic drugs reported lower physical health than did patients

treated with radiofrequency ablation.[17] Even if the literature does not fully address the question of

whether or not physical health is directly associated with antiarrhythmic drugs in patients with atrial

fibrillation,[17] there is room in the clinical practice for monitoring the physical health trajectories of

patients treated with antiarrhythmic drug over time. Similar associations with a decreased quality of

life and physical health were described in patients treated with anticoagulants and/or antiplatelet

drugs,[18] even if little is currently known in GUCH/ACHD population about the effects of these drugs

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on physical and mental health statuses.[19] These associations should be studied in future research, and possible manifestations of side effects should be monitored to understand whether the worsening of one's physical health is related to the drug-related side effects or other factors, such as the psychological burden related to one's need for medical therapy in terms of posology and adherence.

As described above, our results profile patients who are at greater risk for achieving inadequate physical health in consideration of their ongoing treatments. Conversely, mental health status seems to worsen as individuals age, which may be related to many GUCH/ACHD patients' previously described fear of ageing, that is enhanced by a sense of uncertainty;[20] in other words, the GUCH/ACHD population's psychological needs increase with age.

An unexpected result was related to the rates of reported physical activities, which were consistent with those described for the general population.[21] Our initial expectation was to identify a lower rate of physical activity in GUCH/ACHD patients, because past clinicians restricted patients' activity due to concerns that increased activity might be risky for patients' health.[22] Over the last ten years, the recommendations from a consensus of an international expert panel endorsed by the European Society of Cardiology (ESC) encourage that all CHD patients regularly exercise; while these recommendations are mainly based on expert opinion, there nevertheless exists scarce evidence for the effects of exercise training.[23] Our results confirm the shifting of paradigm from the restriction of physical activities to its support of educational advices. Accordingly, the steady progress in GUCH/ACHD diagnostics emphasize the life-long benefits of regular physical activity for general health as well as in complex CHD (adequately adherent to the follow-ups).[24]

Overall, our sample reported an adequate BMI that was slightly lower than previous epidemiological, self-report BMI assessments of the Italian general population aged between 30 and 45 years.[25] The other socio-demographic characteristics are consistent with the current data regarding general population.[25,26] Concerning lifestyles, the rate of smokers among the GUCH/ACHD sample (10.4%) appears to be encouragingly lower than that reported in general population (21.4%)[27] as well as that determined by a recent description in Malta.[28] This result may be related to the clinicians' high

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sensibility when providing regular anti-smoking advice and education. Cannabis consumption, on the other hand, appears to be consistent with and slightly higher than the general population's rate of self-reported consumption.[29] This result is also in line with previous evidence of younger adults with CHD, whose behaviours were described as being more strongly influenced by peer relationships than the awareness of one's clinical condition.[30] Clinicians should address this aspect with increasing attention to reduce illicit drug consumption by administering to the GUCH/ACHD population detailed information that highlights the risk of increased systolic blood pressure, orthostatic hypotension, and ischemic stroke.[31]

Limitations

This study's findings are subject to some important limitations. Firstly, the impossibility of collecting reliable clinical data (e.g., CHD classification, diagnostics) undermined the possibility of drawing solid, inferential associations between lifestyles (behaviours) and clinical outcomes. For this reason, this study has mainly provided descriptive information to frame new knowledge of the Italian GUCH/ACHD population's lifestyles. Secondly, we suspect the possibility that the levels of risky behaviours were underestimated and the levels of healthy behaviours were overestimated according to the potential social desirability effect's occurrence in the participants' responses. However, the choice to anonymously collect data should have limited the probability that the social desirability effect would occur. Thirdly, data collection was performed using the AICCA network, which may have introduced a bias in the sampling procedure because patients from the AICCA—that is, patients who have learned skills of observation, description, and symptom handling, thus increasing their basic knowledge of health problems—may have more likely been 'activated' than general patients and because they were not representative of the general population. We believe this sampling bias is generally marginal in this study, as the AICCA holds the contacts of real-world patients from the majority of CHD centres in Italy, and not all patients in the AICCA network actively participate in the association's initiative. Fourthly, this study has included no information on the possible manifestations of drug-related side effects or other factors that may interact through

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the relationship between drugs and physical health, which such information might help effectively interpret. Overall, considering this study's limitations, we suggest that caution be taken when generalizing the results. This study's strengths are related firstly to the fact that patients roughly equally represent Northern, Central, and Southern Italy and secondly to the prudent approach used to analyse the data.

Conclusions

Thus far, this study represents the first lifestyle descriptions of the Italian GUCH/ACHD population, and we have identified a number of similarities and differences among the general Italian population. Clinicians should address the issue of illicit drug consumption (especially cannabis) more deeply, and particular attention should be paid to accommodating the increasing psychological needs resulting from these patients' age progression. More research is needed to identify the associations between lifestyles and clinical outcomes to determine additional details for homogenous sub-group stratifications in consideration of patients' clinical information, such as CHD classification.

Author's contributions statement

RC, FD, CA, SFF, AG, and MC: conception and design, FD, SFF, AG and MC was particularly involved in the acquisition of data, RC and CA in analysis and interpretation of data; RC, FD, CA, SFF, AG, and MC have substantially contributed in drafting the manuscript and in providing critical revision of important intellectual content. Each author gave their final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

Competing interests

The authors declare no conflict of interest.

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Data sharing statement

We intend to make data freely available the data upon request to the corresponding author (rosario.caruso@unimi.it).

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Table 1. Descriptive characteristics of socio-demographics, lifestyles, ongoing treatment, and health perception (n=629)

			n	%
	Sex			
		Male	290	46.1
		Female	339	53.9
	Provenience			
		Northern Italy	231	36.9%
		Central Italy	223	35.6%
		Southern Italy	172	27.5%
	Age			
		Years (mean; standard deviation; range: 18-57)	35.69	13.49
	Body Mass Index (BMI)	Kg/m^2 (mean; standard deviation)	23.18	4.07
Socio-demographic characteristics		Underweight (BMI < 18.5 Kg/m^2)	68	10.9
		Normal weight (BMI: 18.5-24.9 Kg/m^2)	373	59.4
		Overweight (BMI: 25-29.9 Kg/m^2)	145	23
		Obese (BMI > 30 Kg/m^2)	42	6.7
	Offspring			
		Yes	208	33.2
	Education			
		Lower or equal to high school	490	78.3
		University education	136	21.7
	Occupation			
		Manager	32	5.1
		Office worker	263	42.0
		Student	113	18.1
		Freelance	84	13.4
		Unemployed	110	17.6
		Retired	25	3.8
	Smoking			
		Yes	65	10.4
	Illicit Drugs			
		Occasionally	81	12.9
		Cannabis (occasionally consumer)	77	12.3
		Cocaine (occasionally consumer)	2	0.3
	Regular physical activities			
Lifestyles		Yes	325	52.1
		On daily basis	53	8.5
		Two-three times per week	247	39.4
		Once per week	40	6.4
	Reasons to avoid regular physical activities			
		Ill-judged	21	3.4
		Lack of willing	139	22.2
		Lack of energy	50	7.9
		Fear	93	14.8

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	Daily time spent walking			
		Less than 30 minutes	285	45.5
		Between 30 and 60 minutes	340	54.3
		More than 60 minutes	154	24.6
	Perception of adequate daily physical activities			
		Yes	285	45.5
	Sexuality education			
		Never received	6	0.9
		Poorly received	21	3.5
		Sufficiently received	122	19.5
		Adequately received	477	76.1
	Contraceptive			
		Yes	238	40.5
	Low adherent to the ongoing medical treatment			
		Yes	106	18.1
Ongoing Treatment	*Medical therapy*			
		Diuretics	104	16.6
		Antiarrhythmic therapy	121	19.3
		Anticoagulants	162	25.9
		Antiplatelet	87	13.9
		Antihypertensive therapy	81	12.9
		Dietary supplements	160	25.6
Health perception	*Physical Health*			
		Score (mean; standard deviation)	48.69	8.96
	Mental Health			
		Score (mean; standard deviation)	45.56	10.99
	Adequate physical health (Yes)*		337	53.6
	Adequate mental health (Yes)*		401	63.8

Note: (*) Adequate physical and mental health were calculated using the median split, based on the Italian median scores of the study of the IQOLA Project (median score of physical health in general population was equal to 52.5; median score of mental health was equal to 51.2).

Table 2. Determinants of inadequate scores of PCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictor						
Constant	15.21	1	0.000			
Age	1.382	1	0.24	0.991	0.976	1.006
BMI	0.134	1	0.714	0.991	0.946	1.039
Diuretics	2.658	1	0.103	1.576	0.912	2.725
Antiarrhythmic	6.951	1	0.008	**2.045**	**1.201**	**3.479**
Anticoagulants	4.499	1	0.034	**1.638**	**1.038**	**2.585**
Antiplatelet	4.197	1	0.041	**1.743**	**1.024**	**2.966**
Antihypertensive	2.198	1	0.138	1.546	0.869	2.75
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.236		

Table 3. Determinants of inadequate scores of MCS12 (outcome)

	Wald's χ^2	d.f.	P	e^b	95%CI	
Predictor						
Constant	1.437	1	0.231			
Age	5.038	1	0.025	**1.017**	**1.002**	**1.032**
BMI	1.784	1	0.182	0.968	0.924	1.015
Diuretics	0.248	1	0.619	1.142	0.677	1.925
Antiarrhythmic	0.683	1	0.409	1.241	0.744	2.070
Anticoagulants	0.462	1	0.497	1.170	0.744	1.838
Antiplatelet	0.019	1	0.891	0.965	0.581	1.603
Antihypertensive	0.012	1	0.913	1.031	0.595	1.787
Model fit	χ^2	d.f.	P	Pseudo-R^2 (Nagelkerke)		
Likehood ratio test	16.3	9	0.049	0.135		

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6-7
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	na
		(*e*) Describe any sensitivity analyses	na
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8

		(*b*) Report category boundaries when continuous variables were categorized	na
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	na

Discussion

Key results	18	Summarise key results with reference to study objectives	8-9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Sondaggio **AICCA**

Grazie per aver deciso di partecipare a questo sondaggio, di seguito troverà una serie di domande di facile comprensione. Il suo supporto e il suo tempo sono fondamentali ai fini della ricerca.

1. Sesso

◯ Maschio

◯ Femmina

2. Età

[   ]

3. Con chi vive?

◯ Solo

◯ Con i genitori

◯ Con la famiglia

◯ Altro (specificare)

[   ]

4. Ha figli?

◯ Si

◯ No

5. Se SI, quanti?

[   ]

6. Titolo di studio

◯ Dottorato di ricerca o specializzazione post laurea

◯ Laurea/Diploma universitario

◯ Diploma scuola media superiore

◯ Licenza scuola media inferiore

◯ Licenza elementare

7. Professione

    ⬡   Direttivo, quadro

    ⬡   Impiegato, intermedio

    ⬡   Capo operaio, operaio subalterno

    ⬡   Apprendista

    ⬡   Libero professionista

    ⬡   Disoccupato

    ⬡   Altro (specificare)

8. Ha un credo religioso?

    ⬡   Si

    ⬡ No

9. Se SI, quale?

    ⬡   Cristiano-cattolico ⬡

    Cristiano-protestante ⬡

    Ebraico

    ⬡   Musulmano

    ⬡   Altro (specificare)

Le informazioni delle prossime tre domande devono riferirsi a misurazioni prese dal medico curante

10. Peso (solo una risposta)

Rilevato senza vestiti in Kg

Rilevato con i vestiti in Kg

11. Altezza in cm

12. Quanto misura la sua circonferenza addominale in cm? (misurata senza vestiti con un metro da sarta a livello dell'ombelico senza trattenere il respiro)

13. Lei fuma?

○ Si

○ No

14. Se si, quante sigarette fuma al giorno?

○ Meno di 5 sigarette al giorno

○ Da 5 a 9 sigarette al giorno

○ Da 10 a 14 sigarette al giorno

○ Da 15 a 19 sigarette al giorno

○ Da 20 a 24 sigarette al giorno

25 sigarette al giorno o più

15. Se si, ha mai cercato di smettere di fumare?

○ Si

○ No

16. Ha mai fatto uso di droghe?

○ No

○ 1 sola volta

○ Saltuariamente

○ Con regolarità

17. Se si, che tipo di droghe?

○ Cannabis

○ Cocaina

○ Metanfetamine

○ Eroina

○ Altro (specificare)

[   ]

18. Pratica regolarmente attività fisica?

⬡ Si

⬡ No

19. Se si, che tipo di attività fisica svolge?

(possibile dare più di una risposta)

☐ Corsa

☐ Passeggiate all'aria aperta

☐ Calcio o calcetto

☐ Palestra

☐ Piscina

☐ Bicicletta

☐ Altro (specificare)

[   ]

20. Se pratica attività fisica, quanti giorni a settimana?

⬡ Tutti i giorni della settimana

⬡ Alcuni giorni (indicare il numero nella casella sottostante)

⬡ Solo il fine settimana

Se ha indicato "alcuni giorni", specifichi in numero

[   ]

21. Se pratica attività fisica, ogni volta che la fa per quante ore?

⬡ Meno di un'ora

⬡ Un'ora

⬡ Due ore

⬡ Più di due ore

22. Se non pratica attività fisica, ci indichi il perché

◯ Sconsigliato

◯ Mancanza di voglia

◯ Non ce la faccio

◯ Ho paura

◯ Altro (specificare)

23. Se le è stata sconsigliata l'attività fisica, da chi?

◯ Medico di base

◯ Cardiologo

◯ Famigliari

◯ Altro (specificare)

24. Dopo un ricovero in ospedale ha mai fatto un periodo in un centro di riabilitazione?

Si

No

25. Se Si, lo ha trovato utile?

Si

No

26. Se no, pensa che sarebbe stato utile?

Si

No

27. Se no, per quale motivo?

Non le è stato proposto

Le è stato proposto, ma ha rifiutato

Altro (specificare)

28. Calcolando tutti i suoi spostamenti a piedi, per quanto tempo ritiene di camminare al giorno?

Meno di 30 minuti

Dai 30 a 60 minuti

Più di 60 minuti

29. Secondo Lei fa abbastanza movimento durante il giorno?

⬡ Si

⬡ No

30. Durante la cena, solitamente assume

(possibile dare più di una risposta)

☐ Un primo

☐ Un secondo

☐ Un contorno

☐ Pane

☐ Dolce

☐ Frutta

☐ Niente

☐ Panino / Tramezzino

☐ Pizza / Piadina/Focaccia

☐ Acqua

☐ Vino

☐ Birra

☐ Caffè

☐ Altro (specificare)

[ ]

31. Lei normalmente beve acqua

⬡ Proveniente dal rubinetto

⬡ Imbottigliata

32. Quanti litri d'acqua beve al giorno?

⬡ Mezzo litro

⬡ Un litro

⬡ Due o più litri

33. Assume bevande zuccherate per più di 3 volte alla settimana?

◯ Si

◯ No

◯
34. Assume bevande alcoliche?
◯

Si

No

35. Se Si, tutti i giorni della settimana?

Si

No

36. Se assume bevande alcoliche, quali delle seguenti assume durante la giornata (pranzo+cena)?

	1	2	3	Più di 3
Birra (unità di misura = Bottiglia 33 cl)	◯	◯	◯	◯
Vino (unità di misura = Bicchiere 125 ml)				
Superalcolico (unità di misura = Bicchiere 40 ml)				
Cocktail alcolico (unità di misura = Bicchiere 40 ml)				
Altro (specificare)				

◯

◯
37. Lei ha mai pensato che il suo consumo di alcol fosse eccessivo?
◯
Si
◯
No
◯

38. La sera Lei generalmente

 Esce

 Rimane a casa (a vedere la tv, leggere, etc.)

39. Se esce, le capita di bere…

 Niente

 Birra

 Vino

 Bevanda analcolica

 Superalcolico

 Cocktail alcolico

 Altro (specificare)

40. Quanto crede di essere informato sulla sessualità?

◯ Molto

◯ Abbastanza

◯ Sufficientemente

◯ Poco

◯ Per nulla

41. Come definirebbe la Sua vita sessuale?

◯ Intensa

◯ Buona

◯ Sufficiente

◯ Scarsa

◯ Nulla

42. Se scarsa o nulla, quali sono le cause?

◯ Mancanza di un partner

◯ Inesperienza / Incapacità

◯ Paura legata alla cardiopatia

◯ Non è importante per me

◯ Altro (specificare)

43. Fa uso di anticoncezionali?

◯ Si

◯ No

44. Se si quali?

◯ Condom (preservativo)

◯ Pillola

◯ Diaframma

◯ Altro (specificare)

[ ]

45. Assume regolarmente farmaci?

◯ Si

◯ No

46. Se SI, quali farmaci?

(possibile più di una risposta)

☐ Diuretici

☐ Antiaritmici

☐ Anticoagulanti

☐ Aspirina

☐ Antipertensivi

☐ Altro (specificare)

[ ]

47. Fa uso dei seguenti prodotti?

	Si	No
Integratori	◯	◯
Prodotti di erboristeria	◯	◯

48. Si è mai dimenticato di assumere i farmaci?

◯ Si

◯ No

49. E' occasionalmente poco attento nell'assunzione dei farmaci?

Si

No

50. Quando si sente meglio, a volte interrompe la terapia?

Si

No

51. Quando si sente peggio, a volte interrompe la terapia?

Si

No

52. In generale, direbbe che la sua salute è

Eccellente

Molto buona

Buona

Passabile

Scadente