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Illness perceptions and health literacy are strongly associated with health-related quality of life, anxiety and depression in patients with coronary heart disease: results from the EUROASPIRE V cross-sectional survey.

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ABSTRACT:

AIMS: To 1) Describe the sociodemographic and risk factor profiles of a sample of patients with coronary disease, 2) Explore associations between illness perceptions and health literacy with sociodemographic characteristics and risk factors, health-related quality of life, anxiety and depression.

METHODS AND RESULTS: Conducted as part of the ESC Prevention of CVD Project and EUROASPIRE V survey, patients were consecutively and retrospectively identified 6 months to 2 years after an acute event or elective procedure from 12 countries and interviewed. 3,408 participants (76% male, mean age 64 years) were recruited, 16% were smokers, 38% obese,

60% physically inactive and 41% hypertensive. 40% had attended cardiac rehabilitation. More threatening illness perceptions were associated with female gender ($P<0.0001$), lower income ($P<0.0001$), lower education ($P=0.02$), obesity ($P<0.0001$), sedentary behaviour ($P<0.0001$) and diabetes ($P<0.0001$). Poorer health literacy was associated with obesity ($P=0.02$) and sedentary behaviour ($P=0.0001$). Threatening illness perceptions were strongly associated with anxiety, depression and poorer ratings of health-related quality of life after multivariable adjustment (all $P<0.001$). Poor health literacy was associated with anxiety and depression ($P<0.0001$) and poorer ratings of health-related quality of life (HeartQoL scores $P=0.03$). Results were consistent across regions of Europe, age, gender and socioeconomic strata.

CONCLUSIONS: Interventions like cardiac rehabilitation should be targeted at vulnerable groups given the strong associations between more threatening illness perceptions, lower health literacy, lower health related quality of life, and higher levels of anxiety and depression. The delivery and content of these interventions should be accessible for those with low health literacy.

KEY WORDS:

Health literacy, health related quality of life, secondary prevention, illness perceptions, coronary heart disease

1. INTRODUCTION

One of the aims of cardiovascular prevention and rehabilitation is to improve the health-related quality of life (HRQoL) of patients with coronary disease. However, to improve quality of life, it is important to understand the factors that influence it and how these may vary across health conditions. HRQoL is a complex multidimensional concept that is self-reported, subjective and reflects the general health and well-being of an individual, as well as wider social and environmental factors. There is no consensus on a definition, but the combination of biological and physical factors, symptom and functional status, combined with perceptions of health explain up to 72% of variance in HRQoL scores. (1) In the past HRQoL was perceived as a 'soft' outcome sometimes overlooked in favour of clinical outcomes such as mortality. However, from a patient perspective, quality of life can be as meaningful as quantity of life and has been found to be an independent predictor of morbidity and mortality. (2)

HRQoL is reduced in patients with coronary disease compared to the general population. (1) There is also evidence that female gender, non-ST elevation myocardial infarction and multiple co-morbidity are factors associated with lower HRQoL scores twelve months after admission for acute myocardial infarction. (3) Negative mood states, such as anxiety and depression are also associated with reduced HRQoL. (4) Depression is known to have a bidirectional relationship with coronary disease; patients with depression are more likely to develop coronary disease and those with the condition are more likely to be depressed. (5)

The common-sense model of illness self-regulation explains the psychological processes that occur when people are diagnosed with a chronic illness, such as coronary disease. (6) Illness perceptions are grouped into cognitive and emotional dimensions which in parallel influence coping behaviours and illness outcomes. (6, 7) Illness perceptions are important because they

are correlated to, and predict, HRQoL and mood across a range of health conditions including coronary disease. (8) More threatening Illness perceptions also represent an important and modifiable link between depression and HRQoL. (9)

Preliminary evidence indicates that health literacy also modifies HRQoL, (10, 11) but few studies have fully explored this association. Health literacy is reported to be moderately correlated with HRQoL but more large-scale studies are needed (12)

Health literacy is important in cardiology settings because it is known to be a critical factor in the success of prevention. (13) Low health literacy is also consistently associated with hospital readmission, increased anxiety and low levels of social support. (11) Since the introduction of the term health literacy in the 1970's several definitions have been developed. Health literacy has been conceptualised in several ways; as either a hierarchy of functions, or a set of skills and/or knowledge (14). A recent systematic review provides a contemporary definition of health literacy 'the ability of an individual to obtain and translate knowledge and information in order to maintain and improve health in a way that is appropriate to the individual and system contexts' (14). This definition recognises the importance of both intrinsic and extrinsic factors that together influence health literacy.

In this study, we aim to firstly describe the sociodemographic and risk factor profiles of patients with coronary disease and secondly to explore associations between self-reported illness perceptions and healthy literacy with sociodemographic characteristics and risk factors, health-related quality of life, anxiety and depression.

To the best of our knowledge, this is the largest survey study to date, that has investigated the relationships between the variables of illness perceptions, health literacy, HRQoL, anxiety and depression, in a population of patients who were hospitalised, 6-months to 2-years, previously for an acute cardiac event or elective revascularisation procedure. We hypothesized that illness perceptions and health literacy are associated with poor risk factor profiles, HRQoL, anxiety and depression in people with coronary disease across regions of Europe.

2. METHODS:

Using a cross-sectional survey design, patients with ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, acute myocardial ischaemia, or elective coronary artery bypass surgery, coronary angioplasty were retrospectively and consecutively identified from hospital information and clinical coding systems and interviewed between 6 months and 2 years following their event. Eligible participants were adults aged 18-80 years, recruited from sixty-seven centres in defined geographical areas across 12 of the countries participating in the EUROASPIRE V survey: Egypt, Ireland, Kazakhstan, Lithuania, Netherlands, Poland, Portugal, Russian Federation, Sweden, Turkey, Ukraine, United Kingdom. Patients were excluded if they did not meet the age criteria or were unable to physically attend the interview. A more detailed description of the EUROASPIRE V methodology can be found elsewhere. (15)

The study reported in this paper drew on data collected at the time of interview using the standard EUROASPIRE V case record form which collected data on lifestyle and biological risk factors, socio-demographic characteristics and preventive care including attendance at cardiac rehabilitation. Validated self-administered questionnaires were also used to collect data on HRQoL, anxiety and depression. Additional questionnaires were included as part of

the ESC Prevention of CVD Project to evaluate illness perceptions and health literacy (see Measurements section below). More information on this project can be found on the following link: <https://www.escardio.org/Education/ESC-Prevention-of-CVD-Programme>.

2.1. Measurements

2.1.1. Sociodemographic Data and Coronary Risk Factor profile

The case record form included the sociodemographic factors of age, gender and self-reported educational level. Education was assessed with the question ‘What is the highest level of education you have completed?’ with the possible categories 1. No formal schooling, 2. Less than primary school, 3. Primary school, 4. Secondary school, 5. High school, 6. Intermediate between secondary level, 7. College/University and 8. Postgraduate degree. This was categorised as follows: low: 1-3, medium: 4-6 and, high: 7-8. Income was self-reported according to the following question: In your opinion your family income is: Very low; Low; Middle; High. The following data on participants’ coronary risk factor profile were used in the present paper: current smoking (self-report validated with expired breath CO \geq 10 ppm measured using the Bedfont Micro+ smokerlyser), obesity (Body Mass Index (BMI) \geq 30kg/m² using the SECA height measuring stick model 220 and SECA weighing scales model 701), central obesity (waist circumference in men \geq 102 cm and women \geq 88 cm using a metal tape measure), raised blood pressure (\geq 140/90 mmHg, \geq 140/85 if diabetic, using Omron M6 HEM 7211-E automatic digital sphygmomanometer), raised LDL-C \geq 1.8 mmol/L (\geq 70 mg/dL), physical inactivity (self-report data defined as taking less than 150 minutes per week of moderate physical activity as defined in the ESC Prevention Guidelines (16), self-reported diabetes (Type 1 and 2) and attendance at cardiac rehabilitation

2.1.2. *Illness Perceptions, health literacy, HRQoL, anxiety and depression*

We used 5 validated self-administered measures which were translated into ten different languages. Validated translations were used wherever possible, otherwise the country teams organised translations which were back translated and checked by the central coordinating team.

Illness perceptions were measured using the Brief Illness Perception questionnaire (B-IPQ) (17, 18) which was designed to provide simple and rapid assessment of the perceptions people have of their illness. It uses a single item, on a scale from 0 to 10, to assess each illness perception dimension; perceived consequences (Item 1), timeline (acute-chronic) (Item 2), amount of perceived personal control (Item 3), treatment control (Item 4), and identity (symptoms) (Item 5), concern about the illness (Item 6), illness comprehensibility (Item 7) and emotional representation (Item 8). Based on the individual items, we computed an overall B-IPQ score as the arithmetic mean of the 8 scores and representing the degree to which the illness is perceived as threatening or benign. The “*Cognitive illness representations*” score was computed as the arithmetic mean of the scores 1, 2, 3, 4 and 5. The “*Emotional representations*” score was computed as the arithmetic mean of the scores 6 and 8 and the “*Illness comprehensibility*” score was equivalent to score 7. In the calculation of the overall summary score as well as these three subscales, scores for items 3 (personal control), 4 (treatment control) and 7 (understanding) were reversed so that higher scores consistently reflect a more threatening view of the illness. For dimensions 1, 2, 5, 6 and 8, a higher score reflects a more threatening view of the illness. Items 3, 4 and 7 are reverse scored. The original evaluation of the B-IPQ found that it demonstrated good psychometric properties, including concurrent, predictive and discriminant validity. (17)

The validated Health Literacy Questionnaire (HLQ-9) is a contemporary measure used to evaluate both intrinsic and extrinsic dimensions of health literacy. (19) The HLQ-9 measure has 44 items in total. To minimise participant burden we opted to use only the 9th scale of the HLQ-9 which measures basic functional health literacy (“Understanding health information well enough to know what to do”). We selected this dimension because self-managing cardioprotective medications is central to effective cardiovascular prevention. The 9th scale has 5 items evaluating capacity around 1) confidence in completing medical forms in the correct way, 2) ability to understand and 3) accurately follow instructions from health care professionals, 4) reading and understanding written health care information 5) reading and understanding information on medicine packages. Response categories used in EUROASPIRE V are: ‘cannot’, ‘very difficult’, ‘difficult’, ‘easy’ and ‘very easy’. Higher scores represent superior health literacy levels. The HLQ was reported to have satisfactory measurement properties. (20)

HRQoL was measured using established generic and disease specific measures; the visual analogue scale (VAS) from the EQ-5D (21) provides a generic assessment of HRQoL and is part of the EQ-5D utility measure. It gives scores ranging from 0 to 100 with higher scores indicating better self-rated quality of life. The EQ 5-D has been demonstrated to have satisfactory psychometric properties. (22)

The 14-item HeartQoL (23) is designed to be used across heart disease diagnoses of angina, myocardial infarction, and heart failure. The measure has physical and emotional subscales and a global score. Scores range from 0 to 3 with higher scores indicating better HRQoL. The HeartQoL has been shown to be a valid and reliable measure. (24)

The Hospital Anxiety and Depression Scale (HADS) (25) is a 14-item measure designed to assess symptoms of anxiety (7 items) and depression (7 items). Each separate dimension has a score ranging from 0 to 21; higher scores indicating more symptoms of anxiety/depression (0-7 'normal', 8-10 'mild', 11-14 'moderate' and 15-21 'severe'). The HAD scale has been shown to be a useful tool to screen for psychological distress in patients with coronary heart disease. (26)

2.2. Statistical analyses

Descriptive statistics used were mean, standard deviation (SD), median, interquartile range (P25-P75) and % (n). Distributions of illness perception scores, health literacy scores, HADS, HeartQoL and EQ-5D VAS scores were compared across gender, age groups and educational levels using the Kruskal-Wallis test. The associations of illness perception and health literacy levels with HRQoL, and symptoms of anxiety and depression were characterized by means of partial Spearman correlation coefficients adjusted for age. The effect of illness perceptions and health literacy scores on HRQoL, anxiety and depression scores, independently from age, gender and educational level, was analyzed according to linear mixed modeling taking clustering of patients within countries into account. Given the skewed distributions of all scores, the use of non-parametric tests was preferred. Statistical analyses were undertaken using SAS statistical software (release 9.4) in the Department of Public Health and Primary Care, Ghent University, Belgium.

2.3. Data management

Data management was undertaken by the EURObservational Research Program (EORP), ESC, Sophia-Antipolis, France. All data were collected electronically through web-based data entry using a unique identification number for country, centre and individual. Checks for completeness, internal consistency and accuracy were run. All data were stored under the provisions of the National Data Protection Regulations.

2.4. Ethical approval

EUROASPIRE V national coordinators were responsible for obtaining Local Research Ethics Committees approvals. Written, informed consent was obtained from each participant by the investigator by means of a signed declaration. The research assistants signed in the Case Record Form to confirm that informed consent was obtained and stored the original signed declaration consent in the patient file.

3. RESULTS:

3.1. Description of sociodemographic and risk factor profiles

A total of 3,408 patients (mean age 63.9 years, 25% female) were recruited and attended interview. The participation rate was 38% but varied substantially between countries (from 13% in Portugal to 73% in Turkey). Sociodemographic characteristics and coronary risk profiles are shown in Table 1. Sixteen percent of participants were current smokers, 38% were obese, 60% physically inactive and 41% had raised blood pressure. Forty-percent reported having attended at least 50% of cardiac rehabilitation programme sessions.

3.2. Self-reported illness perceptions and health literacy with sociodemographic characteristics and risk factors

The distribution of illness perception (B-IPQ) and health literacy (HLQ-9) scores are shown in Table 2. Women had higher scores than men for all illness perception subscales ($P < 0.0001$) apart from the illness comprehensibility sub-scale ($P = 0.86$). The illness perception scores did not differ with age, apart from the emotional representations score ($P < 0.0001$) with significantly lower scores in older patients. Overall, illness perception scores were not associated with educational attainment apart from illness comprehensibility ($P < 0.0001$) with significantly higher values evident in less educated patients indicating a lower level of understanding. Seventeen-percent of participants reported not knowing the cause of their heart disease and the most frequently reported causal attribution (19%) was genetics/positive family history.

HLQ-9 scores did not differ significantly between men and women ($P = 0.58$) and between age groups ($P = 0.29$), but lower HLQ-9 scores were statistically significantly associated with lower educational attainment ($p = 0.0001$), lower income ($p = 0.0004$), lower physical activity levels ($p = 0.0001$) and higher BMI ($p = 0.02$).

A sub-analysis by country (See figure 1) shows the percentage of participants reporting difficulties with the 5 dimensions of the health literacy scale, ('Understanding health information well enough to know what to do'), by country. There was considerable variation with scores ranging from 3% to 87% of participants reporting 'difficulty' with one of the 5 dimensions of HLQ-9 'Understanding health information well enough to know what to do'. The most frequently identified aspect of health literacy causing

‘difficulty’ reported by participants across 8 of the 12 countries was ‘reading and understanding all of the information on medication labels’.

3.3. Associations between Illness Perceptions, Health Literacy, Health-related Quality of Life and Anxiety and Depression Scale Scores

Table 3 shows the distribution of HRQoL and anxiety and depression scale scores. Regarding HRQoL, trends were similar across regions and by gender and educational attainment for both the global score and the physical and emotional subscale scores of the HeartQoL instrument. The EQ-5D VAS scores were significantly lower in younger participants ($P=0.02$), were higher among men ($P<0.0001$) and those with higher education ($P=0.007$).

Table 4 shows the correlations of illness perception and health literacy scores with anxiety and depression, HeartQoL and EQ-VAS scores for men and women. Both illness perception sub-scores and overall scores, as well as the health literacy score, were significantly associated with all subscales of the anxiety and depression scale, HeartQoL and EQ-5D, but with consistently weaker associations with the health literacy and the illness-comprehensibility score than with cognitive and emotional representations. Results were similar in men and women and are depicted by quartile of the global illness perception score and the health literacy score in Figures 2a&b (further details presented in Supplementary Table 1). Correlations of illness perception and health literacy scores with HRQoL scores are grouped by country are given in the Supplementary Table 2.

Table 5 further illustrates the independent effect of illness perceptions and health literacy on HRQoL in multivariate models. The association between less threatening illness perceptions and enhanced HRQoL and lower levels of anxiety and depression is maintained, after

adjustment for age and educational level, and accounting for the clustering of patients within countries. The same is true for health literacy with better HRQoL scores, and fewer symptoms of anxiety and depression in participants with higher health literacy scale scores.

4. DISCUSSION:

In this sub-study of the EUROASPIRE V survey we have described the sociodemographic and risk factor profiles of a population of 3408 patients with established coronary disease across 12 countries. A significant proportion reported adverse lifestyle habits with multiple cardiovascular risk factors showing the need for improved cardiovascular prevention.

We have explored associations between self-reported illness perceptions and healthy literacy with socio-demographic and risk factor profiles, health-related quality of life, anxiety and depression. We have confirmed that more threatening illness perceptions and low health literacy levels are strongly, and independently, associated with poorer ratings of HRQoL, and a greater burden of anxiety and depression symptoms. We have also identified sociodemographic factors and lifestyle behaviours associated with poor health literacy and more threatening illness perceptions. These included low income, low educational level, female gender, higher BMI and lower reported physical activity levels. Large variations in illness perceptions, health literacy levels and HRQoL were identified between European regions which demonstrates the need for a tailored approach to cardiovascular prevention. Whilst this study was not designed to explain the direction of causality between illness perceptions, health literacy and HRQoL, it does highlight the need to take into account particularly vulnerable groups when designing our interventions.

Pan-European studies reporting health literacy levels amongst the general population are scarce but one large scale survey of 8000 participants recruited from 8 European countries showed that at least one third of participants had problematic health literacy levels. (27) To the best of our knowledge our study is the largest to date evaluating health literacy levels in patients with established coronary disease. Our findings show that anywhere between 3% and 87% percent of patients report some level of difficulty with “Understanding health information well enough to know what to do”. Low health literacy is associated with increased health resource use, lower screening rates, poorer ability to understand health messages and manage medicines as prescribed. (28) This leads to poorer health status and increased mortality rates particularly amongst the elderly. To give people with coronary disease the best opportunity to self-manage their heart health it is important that they are able to access, understand, process and apply important and relevant health information, particularly information on medication labels. These skills and abilities are part of the broader concept of health literacy (29) which has been identified as a critical factor to the success of coronary disease prevention. (13)

Patients with coronary disease often do not reach desired targets for healthy lifestyle changes (30). Our study findings found an association between more threatening illness perceptions, obesity, diabetes and low self-reported levels of physical activity. Patients reporting adverse lifestyle habits, such as obesity and physical inactivity, are to a certain extent correct in having more threatening illness perceptions as their risk of recurrent disease is higher. One observational study from the Netherlands of illness perceptions in people from the general population compared obese and non-obese patients. (31) In common with our study, participants with obesity reported more threatening illness perceptions and attributed their obesity to behavioural factors. (31) This points to the need to target perceptions about lifestyle behaviour and obesity in our interventions, especially as this Dutch study reported an

association between these negative illness perceptions and poorer self-ratings of HRQoL.

Whilst most participants in our study reported having a clear understanding of their illness, as indicated by the ‘comprehensibility’ score from the B-IPQ, it is important to remember that this ‘understanding’ is self-reported and therefore not necessarily accurate. Almost one fifth of participants reported that they did not understand the cause of their coronary disease.

Poorer understanding (comprehensibility) has also been linked to poorer perception of control over symptoms and poorer self-reported HRQoL, (8) especially in the case of an unexpected medical event (e.g. myocardial infarction).

The patients in our study (30) reported a chronic timeline for their condition and this increased according to the number of unhealthy lifestyles reported. Patients with coronary disease may initially perceive treatment (for example with coronary angioplasty) as curative. (32) However, studies (33, 34, 35) have reported that, over time, perceptions of coronary disease chronicity increased and perceived control (both personal and treatment) decreased. Brief hospital interventions may help to make perceptions less threatening (33) and lead to a reduction in fatigue and improved HRQoL. Therefore, in working with these patients, especially when perceptions of personal control are reduced, health professionals should seek to empower them to be able to change behaviours and thus reduce their risk. Patients are not always able to make healthy lifestyle changes and concentrate on adhering to their medications (intentionally or non-intentionally) when preoccupied with psychological comorbidities enhanced by threatening illness perceptions. (35, 36)

The selection and adoption of coping behaviours is strongly linked to illness perceptions with negative perceptions about consequences, identity (symptoms) and timeline leading to emotion focussed coping, denial and avoidance; whilst strong control perceptions can lead to cognitive reappraisal, problem focussed coping and seeking social support which in turn

translates into psychological wellbeing and vitality. (7) Placing this also in the context of the relationship between negative illness perceptions, depression and poorly rated HRQoL, (9) it is essential that measurement and management of illness perceptions is carefully integrated into our interventions.

In our study we found a strong relationship between illness perceptions and HRQoL. This confirms findings from other studies. (8, 33, 35). Improving illness perceptions is already known to improve HRQoL in patients with heart disease. (37) Our study has confirmed this relationship in a European cohort. We also found that illness perceptions were improved in patients who had attended cardiac rehabilitation. Tailored educational interventions which include information about how to enhance personal and treatment control (lifestyle change, taking medications) and how this can favourably influence consequences has a beneficial effect on illness perceptions and thus on self-rated HRQoL. In addition, Cognitive Behavioural (CBT) interventions can also be beneficial in dispelling misconceptions and improving HRQoL and anxiety and depression. (8)

Our findings and their interpretation point to potential ways to intervene to improve HRQoL by integrating interventions to improve both health literacy and illness perceptions into existing interventions for patients with coronary disease following an event. Greater attention to the format of health information is needed so that it can be more easily understood by people with low levels of functional health literacy. This is particularly important for the written information supplied with cardioprotective medications. Practical interventions include the use of plain language in health educational literature, tools like 'Teach-back' and pictures when communicating verbally with patients and families. Sticking to essential information, avoiding overload and ensuring patients are clear about a small

number of key messages is important. The use of technology and digital interventions may be helpful, although care must be taken to not widen the ‘digital divide’ with disadvantages groups not always having access to smart phones and good internet connections. A comprehensive description of interventions to integrate health literacy interventions into cardiovascular care is provided in the AHRQ Universal Precautions Toolkit. (13) Other useful interventions include ensuring cultural sensitivity and a focus on the community, as well as taking care to educate and train all those involved in the delivery of care about the issues around health literacy and how to manage them.

Remembering also that illness perceptions were found in our study to be improved in patients who had attended cardiac rehabilitation and more threatening illness perceptions are associated with drop out, (33) it is essential and relevant that these programmes should include screening and management of illness perceptions during the course of a cardiac rehabilitation programme. Nurses and other personnel involved in running cardiac rehabilitation programmes should be trained in the use of these techniques. In addition, these programmes should screen for health literacy levels and take them into account when designing and delivering prevention and rehabilitation initiatives, especially as this can have a positive effect on improving lifestyle habits and cardiovascular risk factors. (14)

Unfortunately, provision of cardiac rehabilitation varies enormously across countries and attendance is often poor, although, when advised to attend, a large proportion do so. (15) In our European study attendance at cardiac rehabilitation was reported by only 40%.

4.1.Limitations

The EUROASPIRE V study suffered from differing response rates between countries ranging from 30% in the UK to 95% in Ukraine. These reflect the overall response rates to the survey

in all EUROASPIRE V countries and not just those participating in this patient survey from the ESC Prevention of CVD project. This may have been a source of selection bias for the results of this observational survey. This is particularly relevant for the UK (30%), Lithuania (30%) and the Netherlands (49%), however internal validity will not have been affected unless there was a selection bias regarding the outcomes of interest, for example socio-economic status and health literacy. The probability is that the bias is towards healthier patients given that those who are less healthy are less likely to participate, for example smokers, those with psychological and other co-morbidities and those having difficulties getting to the interview. Therefore, our results are more likely to overestimate the health and psycho-social status of these patients and the quality of care in terms of risk factor control and drug prescribing. A truly representative patient sample is likely to include more higher risk patients with less healthier lifestyles and even poorer standards of secondary preventive care.

This survey used self-report to assess several factors including smoking status, physical activity levels and income. Self-reported measures can lead to underestimation especially where there is no bio-marker or objective measure. In the case of smoking, expired breath carbon monoxide was measured to validate self-report. In addition, validated measures were used to assess, for example, physical activity and HRQoL. For income, it would have been problematic to use a validated measure given that income varies between these very different regions included in the study.

In this cross-sectional survey we did not measure illness perceptions and health literacy and HRQoL longitudinally, however, the significance of the association is very clear.

4.2. Strengths:

The EUROASPIRE surveys have been conducted over a number of years and use classical epidemiological methods to support them including centralised training for data collection personnel and the use of standardised and validated tools and equipment to take measurements. This EUROASPIRE V cross-sectional survey is one of the largest to date reporting data across countries evaluating illness perceptions and health literacy and associations with HRQoL, anxiety and depression in patients with established coronary disease. The findings from this European study provide an important point of reference in the greater understanding of factors that influence HRQoL in patients with coronary heart disease.

5. Conclusion:

Given the strong link between threatening illness perceptions, reduced health literacy and poorer ratings of HRQoL, anxiety and depression, it is essential to evaluate these factors as part of prevention and rehabilitation interventions and to emphasise that lifestyle changes, no matter how modest, can reduce ‘threat’. Patients with coronary disease who are obese and/or physically inactive have more threatening illness perceptions suggesting that they recognize the negative impact of these factors upon their heart health. Interventions need to focus on providing participants with accessible health information that can be understood across different health literacy levels and support so that they can self-manage their lifestyle and medications regimes more effectively. These interventions should also aim to improve HRQoL and reduce the burden of anxiety and depression associated with established coronary disease.

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See Supplementary Appendix

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Conflicts of interest:**Authors' contributions:****Data availability statement:**

The database containing individual data of all patients participating in the EUROASPIRE V survey is property of the European Society of Cardiology (ESC), EURObservational Research Programme (EORP), and cannot be shared publicly.

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Figure Legends:

Figure 1. Perceived difficulties with understanding health information by country- HLQ-9 scale

Figure 2a. Median HRQoL and anxiety and depression scores according to quartiles of the B-IPQ overall score distribution

Figure 2b. Median HRQoL and anxiety and depression scores according to quartiles of the HLQ-9 score distribution

Supplementary Appendix

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