

Treating the patient not just the disease? Delving deeper into the possible link between affective disorders and coronary heart disease through statistical analysis of a random sample of Maltese people

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Abstract

Background: Ischemic heart disease is the leading cause of death in Males in Malta and globally. Affective disorders are the commonest psychological problem. This cross-sectional study utilizes a multiple regression model utilizing binary logistic to delve deeper into the link between affective disorders and coronary heart disease and also the link between coronary heart disease and anxiety and depression separately.

Methods: The study was performed in the small Mediterranean island of Malta through the European health interview survey (EHIS), at a national level involving 5500 participants. The response rate attained in the actual field work was 72%. Statistical analysis involved performing chi-squared tests on all contributing variables and retaining those variables that were significant to both diseases. These were then placed in a multiple regression model using forward stepwise binary logistic to retain only the most significant variables.

Results: Age, gender, BMI, diabetes prevalence, depression prevalence, anxiety prevalence, hypertension prevalence, affective disorders(having either anxiety or depression), smoking status, frequency of alcohol intake, and educational level all had a significance of <0.05 , some; than less than 0.01. On fitting a multiple regression model, Anxiety ($p=0.033$), age ($p=<0.001$), gender ($p=<0.001$), hypertension ($p=0.016$) retained their significance in the model. Diabetes could not be analyzed due to power issues.

Conclusion: BMI was not retained in the model having been replaced by associated conditions such as hypertension, together with age and gender as strongly associated risk factors. Anxiety nevertheless retained its independent association with coronary heart disease, in spite of the presence of the other stronger predictors described above.

Keywords

anxiety, depression, coronary heart disease, public health, multiple regression model.

Abbreviations

p: Probability value, CI: confidence interval. EHIS: European health interview survey, sig: significance

Background

Ischemic heart disease has been the top cause of mortality one killer in middle aged to old men for many decades.¹ In this study we consider the link between coronary heart disease and affective disorders (ie with either anxiety or depression prevalent), and also the link between coronary heart disease and anxiety and depression separately.

In Malta studies studying the association between mental and cardiovascular health are lacking. The aim of the paper is to raise awareness on the physiological importance of mental health and hence help to soften the undeniable taboo surrounding mental health on this tiny island. This cross-sectional study makes use of data

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collected by the local national European health interview survey (EHIS) in 2008 and utilizes a multiple binary logistic regression model to explore better the possible link between affective disorders and coronary heart disease.

Literature review

Depression and anxiety in coronary heart disease.

Affective disorders have for a long time been reported to be associated with abnormal functioning of the body; a specific example being stress as implicated in irritable bowel syndrome.² Chronic depression and stress bring about biochemical changes in the body which may affect cardiac health as has been observed in a study concerning medical students during examinations.³ Evidently during examination period, students' cholesterol levels were found to be elevated when compared to relaxed controls.

Mental depression seems to increase blood clotting, inflammation and hyper-coagulability, increases the risk of hypothyroidism, increases oxidative stress, and hyperactivity of the sympathetic system. All these factors associated with depression lead to increased predisposition to atheroma and hence myocardial infarction and congestive cardiac failure.⁴ Therefore dealing with depression is important to prevent these lethal metabolic changes but it is more complex than just treating the patient pharmacologically as the use of antidepressants has not reduced the risk of coronary events.⁵

The Type-d personality is related to probability of long term development of general heart disease.⁶ A type-d personality is used in medical psychology to refer to an irritable, stressed person, a person with negative affectivity; this concept was developed by John Denollet. Evidently distressed patients are much more likely to develop heart disease in the long run.⁷

Findings on this topic are not always consistent. In a particular study, men with pre-existing clinical depression did not differ in baseline blood pressure, serum cholesterol levels, smoking status, physical activity, obesity, or family history of coronary artery disease but depression was still associated with increased incidences of heart disease even several decades after the onset of the clinical depression.⁸ Strangely enough in another study⁹ blood pressure and cholesterol levels were found to be increased in anxious and depressed subjects.

Depression is considered to be a major risk factor as much as lack of physical activity and diabetes in

causing heart disease, though the exact nature of the relationship remains unknown.¹⁰ Depression may predispose to development of adverse behaviors.¹¹ Chronic anxiety has also been related to destructive behaviors. In Malta chronic anxiety has been statistically linked to unemployment, marital status, low education level, income and age.¹² In other studies anxiety has also been linked to increased incidences of smoking¹³ and drinking¹⁴ low socioeconomic status¹⁵ and increased rates of obesity.¹⁶

Many other variables have also been statistically proven to be contributors of depression and anxiety. According to Peter M. McEvoy et al¹⁷, the incidence of chronic depression and anxiety is related to age and individuals in the oldest age range are at the greatest risk of developing anxiety.

Therefore to summarize the above, when analyzing current literature on the subject, it is safe to say that even though a link evidently exists between both diseases, the exact nature of the mechanism behind the link still remains relatively unknown.

Methodology

The type of study used is a cross-sectional study that utilizes a multiple regression model with binary logistic. A European health interview survey was conducted by EHIS at a national level involving 5500 participants, the youngest being of 15 years of age. The sample was drawn from the population register obtained from the Maltese national statistics office and was stratified by age, gender and locality. Before the actual fieldwork, field testing was carried out on 430 individuals, 310 responded. The response rate attained in the actual field work was 72%. The survey was carried out in June 2008. It consisted of two questionnaires. It was made sure that the questionnaires were adapted to highlight important local issues at the same being comprehensible and not too lengthy. The first interview carried out by an interviewer and the second interview which contained more sensitive topics was filled in by the interviewee. Questionnaires were available in both Maltese and English depending on the preference of the interviewee.

Randomly selected interviewees received a letter of introduction from the Directorate for Health Information and Research and a phone call from the interviewers to arrange a suitable appointment to meet face to face. Interviewees below age 18 were accompanied by a guardian. Interviews and questionnaires were held in complete confidentiality.

Figure 1: Variables significant to coronary heart disease and at least one affective disorder

	Coronary heart disease	Depression	Chronic Anxiety	Affective disorders (depression or anxiety)
Age	**	**	**	**
Gender	**	**	**	**
BMI	**	**	**	**
Hypertension	**	**	**	**
Coronary heart disease prevalence	**	**	*	**
Do you smoke?	*	**	*	*
Alcohol frequency during the past 12 months	*	**	*	*
Educational level	**	**	**	**

* $p < 0.05$ *** $p < 0.01$ **Figure 2:** Variables retained in the multiple regression model

Variables	Confidence interval Lower-Upper	Odds ratio	Significance of the change
Hypertension	0.392-0.905	0.596	0.016
Chronic anxiety	0.276-0.912	0.502	0.033
Age	0.309-0.708	0.468	<0.001
Sex	0.928-0.955	0.941	<0.001

Statistical analysis

Using the statistical package SPSS version 19, chi-squared tests were used for the association between coronary heart disease prevalence and for all the categorical variables namely, depression prevalence, chronic anxiety prevalence, coronary heart disease prevalence, present day smoking, past smoking, alcohol frequency, bingeing, gender, educational level and average range of income, hypertension prevalence and medication use for all diseases and environmental variables such as noise pollution, discrimination bullying, time pressure violence in the area of residence, smells and air pollution. This was done to see which variables were statistically significant in contributing to depression and/or coronary heart disease. For age and BMI, which are continuous variables, the independent samples T-test was used to evaluate significance.

Diabetes could not be analyzed due to power issues. Variables were grouped into 4 categories; first category was for those variables significant to coronary heart

disease and at least one affective disorder. The second category included those significant only to heart disease, the third category for those significant to the affective disorder (chronic anxiety or depression) and the 4th category was for those significant to none of the diseases. Only the variables in the first category were further analyzed. These are shown in Figure 1.

The variables in the first category were then placed in a multi-variate binary logistic regression model to assess the independent effect of each of the variables in the presence of confounders, the dependent variable being coronary heart disease. Only the variables that retained their significance were kept in the model. This is shown in Figure 2.

Results

When smoking was analyzed it resulted that significantly less people with coronary heart disease tend to smoke at the time of the survey ($p=0.014$) but a statistically significant amount of people used to smoke

daily in the past ($p < 0.001$). In contrast significantly more people with chronic depression ($p = 0.025$) and chronic anxiety ($p = 0.030$) were found to smoke at the time of the survey but these affective disorders were not found to be statistically associated with past smoking as was the case for coronary heart disease. Similar results were obtained for alcohol use. People with coronary heart disease tending to drink less ($p = 0.022$), while people with affective disorders tending to drink more ($p < 0.001$).

Alcohol consumption is positively related to chronic depression and anxiety ($p < 0.001$) as is bingeing with chronic depression ($p = 0.027$).

During our analysis educational background was found to be strongly linked to chronic anxiety and depression as well as coronary heart disease. This has been already been described by other studies.¹⁸

Affective disorders, that is the presence of either chronic anxiety or depression or both were also found to be statistically linked to coronary heart disease when analyzed independently ($p < 0.001$).

Age was also significantly linked ($p < 0.001$) for both chronic depression and anxiety and coronary heart disease. When adjusted, age remained in the model suggesting that it exerts an independent influence in the development of coronary heart disease.

These variables were placed in a multi-variant binary logistic regression model with coronary heart disease as the dependent variable. Figure 2 shows the variables that remained in the final model.

Hypertension was also found to be strongly linked to coronary heart disease ($p < 0.001$).

Chronic anxiety remained clinically significant even when put amongst other variables that one would commonly think about as being the more relevant risk factors, when adjusted, chronic depression and affective disorders did not retain significance within the model.

Discussion

The hypothesis statistically proven for this case has already been suggested by other papers.¹⁹⁻²⁰ Although the relationship is not as strong as that with variables such as age, sex, and hypertension, a statistically significant relationship is still present for chronic anxiety. Diabetes had to be excluded from this part of the analysis because of power issues. Depression and affective disorders did not statistically hold up in this particular case indicating that their effect is probably governed by variables retained in the model.

Smoking and alcohol abuse

Smoking has been long known to cause adverse cardiovascular effects^{21,22} as has been alcohol abuse²³⁻²⁴. The main findings on smoking in this study tend to support the findings of other studies. Referring to the above results, in this study, since people with coronary

heart disease are statistically linked to having smoked daily in the past and not linked to smoking much nowadays and since people with chronic depression statistically smoke more nowadays one can therefore speculate a temporal link that when examining the role of smoking as follows an affective disorder may be occurring first predisposing towards smoking which may then accelerate coronary heart disease, which smoking may have been curtailed following the diagnosis of heart disease.

Referring to the above results in the case of alcohol similar events occur, people with coronary heart disease tend to drink less, but alcohol consumption is positively related to chronic depression and anxiety as is bingeing with chronic depression hence pointing towards affective disorders as a possible culprit for these unhealthy destructive behaviors. A similar model could therefore be proposed for alcohol. With chronic anxiety, a similar statistically significant relationship is observed but chronic anxiety is not associated with alcohol bingeing.

The effect of low education and socioeconomic status

Low education is associated with low income, and low income is statistically linked to increased incidences of affective disorders as has been shown in Figure 1. Therefore a tough economical situation may predispose to development of affective disorders²⁵ and hence predispose a person to heart disease.²⁶ This does not exclude a direct link between low education and income to heart disease, independent of mental health.²⁷ The mechanisms of how affective disorders could bring about heart disease remain to be explored and are likely to be multiple. In this study chronic depression was most prevalent in people who had stopped their education at primary level or upper secondary level of education.

The effect of other contributing diseases

Hypertension and diabetes could be considered as precursors for coronary heart disease.²⁸⁻²⁹ In this study it was found that affective disorders are linked to hypertension and diabetes further solidifying the original hypothesis; that affective disorders are in some way linked to coronary heart disease be it directly or indirectly.

The effect of age

The risk of heart attack increases significantly with age.³⁰ This has been further supported by this study. Affective disorders also appear to be more to be more prevalent with increasing age, but so are most other diseases. In this case hypertension, diabetes, coronary heart disease and chronic depression were all linked with age. Therefore one can say that since older people are more likely to be suffering from conditions that cause

some degree of suffering or limitation, it would be foolish to assume that depression on its own increases with age. Depression prevalence is more likely to increase as a co-morbid factor.³¹

The effect of BMI

BMI has been linked with increased incidences of depression and coronary heart disease.³²The above results also show this. The fact that BMI was not retained in the model shows that its effect is probably governed by the presence of variables retained in the model. These are likely to be predisposing psychosocial variables together with the presence of conditions whose onset may have been facilitated by the presence of obesity.

Limitations

The major limitation of this paper is that the data is self reported. This means that the data can't be independently verified. The paper being self reported means that selective memory, attribution or simply awareness might have all inadvertently affected the results of this study. One other limitation is that the study is a cross-sectional one and therefore one can only speculate on potential hypothetical temporal links between variables.

Conclusion

When adjusted, depression lost its independent influence suggesting that its prevalence is almost entirely explained by the presence of other risk factors. The findings from this study seem to support the consistent findings of other studies that affective disorders are in some way linked to heart disease. When it comes to chronic anxiety, this paper should act as a step towards solidifying the hypothesis that, chronic anxiety and coronary heart disease are indeed linked and to further exemplify the importance of the title of this paper, which is; to treat the patient not just the disease.

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