Prevalence of psychomorbidity among patients with chronic cough

Lorcan PA McGarvey*1, Carol Carton2, Lucy A Gamble2, Liam G Heaney1, Richard Shepherd1, Madeline Ennis3 and Joseph MacMahon1

Address: 1Department of Respiratory Medicine, Belfast City Hospital, N. Ireland, UK, 2Department of Clinical Psychology, Belfast City Hospital, N. Ireland, UK and 3Department of Clinical Biochemistry, The Queen’s University of Belfast, N. Ireland, UK

Email: Lorcan PA McGarvey* - l.mcgarvey@qub.ac.uk; Carol Carton - c.carton@bch.n-i.nhs.uk; Lucy A Gamble - l.gamble@bch.n-i.nhs.uk; Liam G Heaney - l.heaney@qub.ac.uk; Richard Shepherd - r.shepherd@bch.n-i.nhs.uk; Madeline Ennis - m.ennis@qub.ac.uk; Joseph MacMahon - j.macmahon@bch.n-i.nhs.uk

* Corresponding author

Abstract

Background: Chronic cough may cause significant emotional distress and although patients are not routinely assessed for co-existent psychomorbidity, a cough that is refractory to any treatment is sometimes suspected to be functional in origin. It is not known if patients with chronic cough referred for specialist evaluation have emotional impairment but failure to recognise this may influence treatment outcomes. In this cross-sectional study, levels of psychomorbidity were measured in patients referred to a specialist cough clinic.

Methods: Fifty-seven patients (40 female), mean age 47.5 (14.3) years referred for specialist evaluation of chronic cough (mean cough duration 69.2 (78.5) months) completed the Hospital Anxiety and Depression (HAD) scale, State Trait Anxiety Inventory (STAI) and the Crown Crisp Experiential Index (CCEI) at initial clinic presentation. Subjects then underwent a comprehensive diagnostic evaluation, after which they were classified as either treated cough (TC) or idiopathic cough (IC). Questionnaire scores were compared between TC (n = 42) and IC (n = 15).

Results: Using the HAD scale, 33% of all cough patients were identified as anxious, while 16% experienced depression. The STAI scores suggested moderate or high trait anxiety in 48% of all coughers. Trait anxiety was significantly higher among TC (p < 0.001) and IC patients (p = 0.004) compared to a healthy adult population. On the CCEI, mean scores on the phobic anxiety, somatisation, depression, and obsession subscales were significantly higher among all cough patients than the published mean scores for healthy controls. Only state anxiety was significantly higher in IC patients compared with TC patients (p < 0.05).

Conclusion: Patients with chronic cough appear to have increased levels of emotional upset although psychological questionnaires do not readily distinguish between idiopathic coughers and those successfully treated.
Background
Chronic cough is a common and disruptive symptom, which impacts adversely on a patient's quality of life [1]. Individuals with a persistent cough frequently report exhaustion, sleep deprivation and social withdrawal and it is reasonable to expect an increased level of emotional distress in this patient group. However, patients evaluated for chronic cough are not routinely assessed for concurrent psychomorbidity. A few studies have suggested a relationship between cough and emotional distress. In a community-based study, Ludviksdottir et al reported that persistent coughing was significantly associated with anxiety, although study participants were not representative of those typically referred for evaluation of chronic cough [2]. Hutchings and co-workers reported that individuals with obsessive traits were unable to voluntarily suppress experimentally induced cough [3]. Recently, a high prevalence of depressive symptoms in patients with chronic cough has been reported [4].

Although management strategies for chronic cough are often successful [5], in some circumstances, coughing may persist in the absence of an identifiable cause and despite extended trials of empirical therapy [6]. Such individuals have been classified as having an idiopathic cough (IC). Although sometimes suspected of having a functional disorder, it is not known if idiopathic coughers have a different range and severity of psychological distress compared to those with treatable cough.

Therefore, the aims of this study were to

1. determine the levels and range of psychomorbidity in patients referred to a specialist cough clinic
2. determine whether differences in psychomorbidity exist between patients subsequently diagnosed as idiopathic coughers and those in whom a cause for cough is identified and successfully treated.

Methods
Subjects
Patients with non-productive cough persisting for more than eight weeks as their sole respiratory symptom were recruited from the cough clinic at Belfast City Hospital. All patients had been physician referred, aged between 18 and 80 years, were lifetime non-smokers, and had a normal chest radiograph and spirometry. Patients with a previous history of chest disease, any systemic disease, an upper respiratory tract infection (URTI) within the preceding 8 weeks or those taking angiotensin converting enzyme inhibitors (ACE-Is) were excluded. No patient had a history of previous psychiatric disease. The Research Ethics Committee of the Queen's University of Belfast approved the study and written informed consent was obtained from all subjects.

Psychological measurements
Each patient was asked to complete the following three questionnaires at the first outpatient visit;

- Hospital Anxiety and Depression (HAD) scale [7].
- State Trait Anxiety Inventory (STAI) [8].
- Crown Crisp Experiential Index (CCEI) [9].

These three validated questionnaires were chosen because they were short, self report assessment instruments, and each had published healthy and patient control scores for comparison. Further information regarding each questionnaire is detailed below.

The HAD scale is a well validated 14 item questionnaire giving a rating for a person on anxiety and depression subscales which score from 0 – 21. A score of 8 – 10 is borderline and 11 or greater indicates probable disorder.

The STAI measures the underlying tendency to anxiety in the individual (trait) and how anxious they are at that present moment (state). State anxiety is believed to reflect a transitory emotional state that is characterised by subjective, consciously perceived feelings of tension and apprehension. State anxiety may fluctuate over time and can vary in intensity. In contrast, trait anxiety refers to the general tendency of the individual to respond with anxiety to perceived threats in the environment. Norms have been established and published for a population of healthy adults and for general medical and surgical patients with and without psychiatric disorders [8]. Low, moderate and high anxiety categories for scores on the STAI questionnaire have been established by Auerbach and were used for comparison in this study [10].

The CCEI is a standardised self rating inventory which scores on each of six scales, measuring free floating anxiety, phobic anxiety, obsessionality, somatic anxiety, depression and hysteria. It is designed to obtain a quick approximation to the diagnostic information that would be gained from a formal psychiatric interview. CCEI scores for healthy controls and a group of psychiatric outpatients are available [9]. Participants were also asked to record their cough symptom severity using a visual analogue scale (VAS).

Diagnostic evaluation
All patients underwent evaluation for cough based on a comprehensive diagnostic protocol, the details of which have been published elsewhere [6]. In brief, after history
and physical examination, chest radiograph and spirometry were arranged in all patients. Where indicated, 24 hour oesophageal pH monitoring and/or bronchoprovocation challenge testing were requested. Suspected asthmatic cough or gastro-oesophageal reflux associated cough was treated according to our established management protocol. Patients with normal spirometry and no evidence of bronchial hyperreactivity received two weeks of oral prednisolone to exclude a steroid responsive cough. Patients with persisting upper airway symptoms despite intensive nasal therapy underwent formal ear, nose and throat (ENT) assessment and/or CT scan of sinuses. Diagnoses were considered on the basis of a consistent history and/or investigation but were only accepted as contributing to cough when the patient reported satisfactory improvement or complete resolution after a period of diagnosis – specific therapy. A satisfactory improvement was recorded when the patient reported that the cough had subsided to the extent that it was no longer troublesome.

**Data analysis**

Descriptive statistics for the standardised measures of the psychoneurotic symptoms were used. Values are given as mean (standard deviation) unless otherwise stated. The range is given where appropriate. As the questionnaire scores for the cough patients were normally distributed, comparisons between treated cough and idiopathic patients were made using unpaired t-Tests. Differences between means of published healthy control population and cough patients were calculated using independent sample t tests. A Pearson correlation coefficient matrix was constructed for assessment of both internal consistency and inter-correlation for the scales. A p value of < 0.05 was considered statistically significant.

**Results**

Fifty-seven unselected patients (40 female) were recruited and completed the questionnaires. The mean age was 47.5 (14.3) years and patients had been coughing for 69.2 (78.5) months. The range of cough duration was from 2 months to 240 months. Seventeen (29.8%) patients volunteered that stressful situations precipitated their cough. Two distinct groups were identified using the diagnostic protocol, one where a cause for cough was identified and successfully treated (TC) (n = 42 patients) and the other, idiopathic (IC) (n = 15 patients). Both groups were matched for cough severity on VAS assessment. The causes of cough identified were as follows; cough variant asthma (CVA), n = 15, postnasal drip syndrome (PNDS), n = 10, gastro-oesophageal reflux disease (GORD), n = 11, and dual aetiologies, n = 6.

**HAD scale**

The means and standard deviations for the HAD are displayed in table 1. There are no normal population values for the HAD scale, but there are widely accepted cut off values which have been validated in several studies [11]. With these cut off values, 21% of cough patients scored as borderline anxiety cases (score >8 and < 11) and 12.3% experienced clinically important symptoms (score ≥11). On the HAD depression subscale, 10.5% were classified as having borderline depression and 5.3% with clinically important symptoms (scores ≥11).

**STAI**

Using the categories established by Auerbach [10], for trait anxiety, moderate and high levels of anxiety were identified in 44.2% and 3.8% of subjects respectively. On the state anxiety scale, no patient achieved a high anxiety score, although moderate anxiety was identified in 28% of patients. The remaining patients (72%) could be classified as low state anxiety.

| Psychological measure | All cough (n = 57) | Idiopathic cough (n = 15) | Treated cough (n = 42) | Normal adult populationa (n = 694) | Medical/surgical patients without psychiatric disorderb (n = 110) | Medical/surgical patients with psychiatric disorderb (n = 34) |
|-----------------------|-------------------|--------------------------|------------------------|-----------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| **HAD scale**          |                   |                          |                        |                                   |                                                               |                                                               |
| Anxiety               | 6.4 (4.4)         | 5.23 (3.6)               | 6.7 (4.7)              |                                   |                                                               |                                                               |
| Depression            | 3.8 (3.8)         | 3.9 (3.9)                | 3.8 (3.7)              |                                   |                                                               |                                                               |
| **STAI**              |                   |                          |                        |                                   |                                                               |                                                               |
| State                 | 32.3 (8.8)        | 36.5 (9.5)               | 30.9 (8.2)             | 33.40 (9.50)                      | 42.7 (13.8)                                                   | 42.4 (15.7)                                                   |
| Trait                 | 38.9 (11.3)*      | 39.15 (8.8)**            | 38.9 (12.2)**          | 32.8 (8.3)                        | 41.3 (12.5)                                                   | 44.6 (14.1)                                                   |

Values given as mean (SD)

* p < 0.001 All cough versus normal adult population [8]

** p = 0.004 Idiopathic cough versus normal adult population [8]

*** p < 0.001 Treated cough versus normal adult population [8]

HAD – Hospital Anxiety and Depression scale, STAI – State-Trait Anxiety Inventory
The means and standard deviations for scores on the STAI for the study population compared with norms established by Spielberger [8] are displayed in table 1. Trait anxiety was significantly higher among all coughers compared to the healthy adult population (p < 0.001). This was the case for both idiopathic (p = 0.004) and successfully treated coughers (p < 0.001). However, there was no significant difference in trait anxiety scores between all coughers and the published medical and surgical reference population (p = 0.23)[8]. There was no significant difference between state anxiety scores between coughers and the established healthy adult population (p = 0.40).

CCEI

The scores for cough patients on the CCEI were consistently elevated compared with published values for a normal population but lower than values for a psychiatric out-patient population. The mean scores for phobic anxiety, obsession, somatisation and depression subscales for cough patients were significantly higher than the means for published healthy controls (table 3) [9]. Correlation coefficients between the individual subscales on the CCEI suggested good internal consistency with those sharing common diagnostic criteria i.e. phobic anxiety and free floating anxiety correlating well (r = 0.635, p < 0.01).

Correlation between psychological questionnaires

Pearson correlation coefficients between HAD anxiety subscale and STAI state anxiety and trait anxiety were highly significant (0.621 and 0.607 respectively, p < 0.01) suggesting strong correlation between questionnaires and good concurrent validity.

Correlation between the CCEI and other psychological questionnaires were highly significant for common diagnostic criteria indicating strong concurrent validity (free floating anxiety and HAD anxiety, r = 0.867, phobic anxiety and HAD anxiety, r = 0.603, phobic anxiety and trait anxiety, r = 0.582, CCEI depression and HAD depression, r = 0.633, p < 0.01 for all correlations).

Individuals with idiopathic cough had significantly higher state anxiety scores compared with those where a cause was identified and successfully treated. There was no significant difference between these two groups on any of the other psychoneurotic scales. No significant differences were seen between male and female cough patients. Similarly, patients reporting stressful situations as a precipitant for their cough did not score significantly differently on the questionnaires. There was weak positive correlation between cough symptom duration and both HAD depression and trait anxiety (0.321 and 0.320 respectively, p < 0.05).

Discussion

Patients with persistent cough referred to a specialist cough clinic appear to have higher levels of emotional distress than would be expected in a healthy population. Apart from higher levels of state anxiety, there are no major distinguishing features in psychomorbidity between idiopathic coughers and individuals with successfully treated cough. Cough duration has some positive correlation with both anxiety and depression although age and gender appear to bear no relationship to the occurrence of psychiatric morbidity.

The level of anxiety disorder identified in this study is greater than the expected lifetime prevalence for anxiety disorders in the community, which has been estimated at 15% [12]. In particular for trait anxiety, 48% of cough patients in our study scored in the moderate and high range. The strong correlation between the anxiety subscales for both HAD and STAI questionnaires add particular validity to this finding. While Ludviksdottir and colleagues suggested a significant association between habitual coughing and anxiety, their patient group was

| Table 2: Comparison of psychoneurotic scales between idiopathic cough patients (n = 15) and successfully treated patients (n = 42) |
|---------------------------------------------------------------|
| **Treated cough (n = 42)** | **Idiopathic (n = 15)** | **Unpaired t value** | **P value** |
|--------------------------|-------------------------|----------------------|-------------|
| **HAD**                  |                         |                      |             |
| Anxiety                  | 6.74 (4.66)             | 5.27 (3.62)          | -1.107      | 0.136       |
| Depression               | 3.81 (3.72)             | 3.93 (3.97)          | 0.109       | 0.457       |
| **STAI**                 |                         |                      |             |
| State                    | 30.92 (8.20)            | 36.5 (9.53)          | 1.975       | 0.027*      |
| Trait                    | 38.92 (12.16)           | 39.15 (8.58)         | 0.063       | 0.475       |
| **CCEI**                 |                         |                      |             |
| FFA                      | 5.47 (4.37)             | 6.75 (4.20)          | 0.859       | 0.197       |
| PA                       | 4.05 (3.34)             | 4.33 (3.60)          | 0.249       | 0.402       |
| OBS                      | 6.58 (3.76)             | 7.58 (3.11)          | 0.837       | 0.203       |
| SOM                      | 5.92 (3.98)             | 4.75 (4.48)          | -0.086      | 0.196       |
| DEP                      | 4.71 (3.52)             | 4.50 (3.23)          | 1.49        | 0.07        |

Values given as mean (SD)* p < 0.05, HAD – Hospital Anxiety and Depression scale, STAI – State-Trait Anxiety Inventory, CCEI – Crown Crisp experiential Index, FFA – free floating anxiety, PA – phobic anxiety, OBS – obsession, SOM – somatisation, DEP – depression
Among our cough patients are similar to that reported in
the European Community Respiratory Health Survey
[2]. Such a population is likely to differ considerably from
individuals with persistent cough referred for specialist
evaluation.

Using the CCEI questionnaire, the scores for almost all
psychoneurotic symptoms measured in patients with
chronic cough were significantly higher than scores in the
healthy population but lower than scores in the psychi-
atriac outpatients reported by Crown and Crisp [9]. In partic-
ular, the CCEI suggested high levels of phobic anxiety
among coughers which concurred with the HAD and STAI
questionnaires. The CCEI also identified increased levels
of somatisation among our cough patients, which is con-
sistent with reports of significantly higher somatization
scores among cough patients compared to asymptomatic
adults [13]. In a large, three centre study, which reported
on lifetime prevalence of specific psychiatric disorders,
somatization was very rare with a prevalence rate of less
than 0.2% [12].

There are a number of explanations for our current find-
ings. Firstly, it is known that persistent cough impacts neg-
avatively on the individuals’ quality of life [1]. Patients with
chronic cough suffer significant lifestyle and social restric-
tions and this may induce a psychological stress response.
Secondly, the specific psychological profile of patients
may influence their perception of symptoms. Patients
with anxiety, depression and hypochondriasis are more
aware of their body’s physiology, for example their own
heartbeat [14]. Increased levels of anxiety and somatiza-
tion have also been associated with increased reporting of
minor pain such as headache and abdominal pain [15].
Therefore it is possible that the general psychomorbidity
associated with persistent cough might influence an indi-
vidual’s awareness of the symptom and lowers the thresh-
old for seeking medical attention.

The levels of emotional distress in particular anxiety
among our cough patients are similar to that reported in
patients with other chronic respiratory diseases [16].
However, the range and severity appear to be less than
that identified in severe airways disease such as difficult-
to-control asthma. We have recently reported that almost
half of the patients with difficult asthma referred for spe-
cialist evaluation had a psychiatric diagnosis (depression
in 60% of cases) identified at formal psychiatric assess-
ment [17]. This high prevalence of depression has also
been reported in patients referred for evaluation of a
chronic cough [4].

Although our cough patients were carefully characterised,
there are a number of limiting factors to our study. Signif-
ificant differences in psychomorbidity between idio-
pathic coughers and successfully treated cough patients
may have been overlooked because of the relatively small
numbers in each group. Secondly, while comparison of
the measures of psychomorbidity used in this study and
measures of cough specific health status would have been
of interest, participants were recruited prior to the publi-
cation of existing cough specific quality of life question-
naires [18,19]. Finally, given the cross-sectional design of
this study, psychological questionnaires were only com-
pleted at initial presentation, and although changes in
questionnaire scores over time would have been of inter-
est, this was not an objective of the current study.

In summary, the findings from this study suggest that
patients referred for evaluation of chronic cough have sig-
nificant psychological distress. Failure to identify this may
contribute to the slow response to specific therapy
reported by clinicians [5]. While the use of self-assessment
psychological questionnaires is not likely to discriminate
individuals with idiopathic cough, it may identify those
with high levels of emotional distress who could benefit
from psychotherapy.

Acknowledgements
Dr B Johnston, Dr J Lawson, Ms C Scally, Sister Liz Crawford and Mrs J
Megarry are thanked for their help in the evaluation of the cough patients
in this study. We acknowledge the statistical assistance given by Dr Colin
Cooper. We also thank Mrs I Murray for secretarial support. We are grate-
ful to the Northern Ireland Chest Heart and Stroke for financial support.

Table 3: Comparison of mean scores on CCEI subscales for cough patients (n = 15) and published healthy controls(n = 109) [9]

|                  | All Cough (n = 57) | Published controls (n = 109) | t value | p value |
|------------------|-------------------|----------------------------|---------|---------|
| **FFA**          | 5.8 (4.5)         | 5.11 (3.1)                 | 0.96    | NS      |
| **PA**           | 4.1 (3.4)         | 2.9 (2.2)                  | 2.32    | < 0.05  |
| **OBS**          | 6.8 (3.6)         | 5.8 (3.1)                  | 1.71    | < 0.05  |
| **SOM**          | 5.6 (4.1)         | 3.2 (2.4)                  | 3.9     | < 0.001 |
| **DEP**          | 4.7 (3.4)         | 3.3 (2.3)                  | 2.54    | < 0.05  |

Values given as mean (SD)

CCEI – Crown Crisp experiential Index, FFA – free floating anxiety, PA – phobic anxiety, OBS – obsession,
SOM – somatisation, DEP – depression, NS – not significant
References

1. French CL, Irwin RS, Curley FJ, Krikorian CJ: Impact of chronic cough on quality of life. Arch Intern Med 1998, 158:1657-1661.
2. Ludviksdottir D, Bjornsson E, Janson C, Boman G: Habitual coughing and its associations with asthma, anxiety, and gastroesophageal reflux. Chest 1996, 109:1262-1268.
3. Hutchings HA, Eccles R, Smith AP, Jawad MS: Voluntary cough suppression as an indication of symptom severity in upper respiratory tract infections. Eur Respir J 1993, 6:1449-1454.
4. DiCapizas PV, Tso R: Prevalence of depressive symptoms in patients with chronic cough. Am J Respir Crit Care Med 2005, 171:A520.
5. Irwin RS, Curley FJ, French CL: Chronic cough. The spectrum and frequency of causes, key components of the diagnostic evaluation, and outcome of specific therapy. Am Rev Respir Dis 1990, 141:640-647.
6. McGarvey LP, Heaney LG, Lawson JT, et al.: Evaluation and outcome of patients with chronic non-productive cough using a comprehensive diagnostic protocol. Thorax 1998, 53:738-743.
7. Zigmond AS, Snith RP: The hospital anxiety and depression scale. Acta Psychiatr Scand 1983, 67:361-370.
8. Spielberger CD, Gorsuch RL, Lushene R, Jacobs GA: Manual for the State-Trait Anxiety Inventory (Form Y) 1st edition. California: Consulting Psychologists Press; 1984.
9. Crown S, Crisp AH: A short clinical diagnostic self-rating scale for psychoneurotic patients. The Middlesex Hospital Questionnaire (M.H.Q.). Br J Psychiatry 1966, 112:917-923.
10. Auerbach SM: Trait-state anxiety and adjustment to surgery. J Consult Clin Psychol 1973, 40:264-271.
11. Bramley PN, Easton AM, Morley S, Snith RP: The differentiation of anxiety and depression by rating scales. Acta Psychiatr Scand 1988, 77:133-138.
12. Robins LN, Helzer JE, Weissman MM, et al.: Lifetime prevalence of specific psychiatric disorders in three sites. Arch Gen Psychiatry 1984, 41:949-958.
13. Carney IK, Gibson PG, Murree-Allen K, Saltos N, Olson LG, Hensley MJ: A systematic evaluation of mechanisms in chronic cough. Am J Respir Crit Care Med 1997, 156:211-216.
14. Lipowski ZJ: Somatization: a borderland between medicine and psychiatry. CMAJ 1986, 135:609-614.
15. Kellner R: Hypochondriasis and somatization. JAMA 1987, 258:2718-2722.
16. Yellowlees PP, Alpers JH, Bowden JJ, Bryant GD, Ruffin RE: Psychiatric morbidity in patients with chronic airflow obstruction. Med J Aust 1987, 146:305-307.
17. Heaney LG, Conway E, Kelly C, Gamble J: Prevalence of psychiatric morbidity in a difficult asthma population: relationship to asthma outcome. Respir Med 2005, 99:1152-1159.
18. Birring SS, Prudon B, Carr AJ, Singh SJ, Morgan MD, Pavord ID: Development of a symptom specific health status measure for patients with chronic cough: Leicester Cough Questionnaire (LCQ). Thorax 2003, 58:339-343.
19. French CT, Irwin RS, Fletcher KE, Adams TM: Evaluation of a cough-specific quality-of-life questionnaire. Chest 2002, 121:1123-1131.

Publish with BioMed Central and every scientist can read your work free of charge

"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."
Sir Paul Nurse, Cancer Research UK

Your research papers will be:
- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:
http://www.biomedcentral.com/info/publishing_adv.asp