

# Depression and obesity in adults with asthma: multiple comorbidities and management issues

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Multiple comorbidities are common in patients with asthma and may complicate their management. For example, psychological disturbance, such as anxiety or depression, is common in people with asthma and is associated with reduced asthma control and medication use and increased demand for health care.<sup>1</sup> Obesity is also associated with asthma<sup>2,3</sup> and has, in turn, been associated with anxiety and depression.<sup>4</sup>

Without a clear understanding of the pattern and impact of comorbidities, we may fail to identify vulnerable groups or may mislabel or mismanage asthma,<sup>5</sup> with consequently poorer health outcomes for patients. We aimed to assess the prevalence, interactions and relationships of asthma, obesity and depression, and their impact on physical functioning in a large representative population sample.

## METHODS

### The sample

The North West Adelaide Health Study cohort of people aged 18 years or older and the methods of selection have been described previously.<sup>6</sup> In brief, people aged  $\geq 18$  years from households selected at random from the electronic White Pages telephone directory were eligible. In 2000–2002, 4060 respondents completed surveys and underwent clinical assessments (Stage 1). Clinical follow-up visits (mean, 3.5 years; SD, 0.5 years) occurred in 2004–2005 (Stage 2) for 3175 participants (78%), who comprised the sample for our analysis.

The study was approved by institutional ethics committees of the North West Adelaide Health Service.

### Assessment of morbidity

Participants' height (to the nearest 0.5 cm using a stadiometer) and weight (to the nearest 0.1 kg in light clothing and without shoes using standard digital scales) were measured. Body mass index (BMI;  $\text{kg}/\text{m}^2$ ) was calculated and categorised according to World Health Organization criteria for normal weight, overweight and obesity.<sup>7</sup>

Respiratory symptoms were assessed with the chronic lung disease (CLD) index.<sup>8</sup> This

## ABSTRACT

**Objective:** To examine the comparative prevalence and distribution of obesity and psychological disturbance in the asthma and non-asthma populations, and to determine how these comorbidities are associated with physical functioning.

**Design, setting and participants:** A South Australian population-representative study of 3175 adults who provided data on asthma, psychological morbidity, physical functioning, and body mass index. Bivariate and multivariate analyses identified how these comorbidities were distributed in asthma and non-asthma subpopulations, and the variance in physical functioning that they explained.

**Main outcome measures:** Rates of obesity and psychological morbidity, and physical functioning scores in asthma and non-asthma populations.

**Results:** Men and women in the asthma population had similar prevalences of obesity (35.3% v 33.6%) and psychological morbidity (29.5% v 29.4%). When compared with non-asthma controls, both comorbidities were significantly higher only in men with asthma. The prevalence of psychological morbidity within different weight categories in the asthma population compared with non-asthma weight-category controls varied by sex. Physical functioning was lower in the asthma population than the non-asthma population (46.6 [95% CI, 45.9–47.3] v 48.8 [95% CI, 47.8–50.0];  $P < 0.001$ ), and psychological morbidity explained 22% of this variance.

**Conclusions:** Psychological morbidity and obesity are common in people with asthma. The sex-specific variation in psychological morbidity across weight categories suggests that future studies of psychological morbidity in groups with asthma should adopt designs that consider sex-specific controls rather than comparisons between the sexes.

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six-item questionnaire has subscales relating to the frequency and intensity of dyspnoea and wheeze, frequency of coughing and volume of sputum production, and has been validated in Australian populations.<sup>9</sup>

Post-bronchodilator spirometry was conducted using a MicroLab 3300 spirometer (Micro Medical, Chatham, UK) according to American Thoracic Society criteria.<sup>10</sup> Asthma was identified by current self-reported physician-diagnosed asthma or demonstration of a significant bronchodilator response of at least 12% of baseline forced expiratory volume in one second.

Psychological morbidity was assessed using the 12-item General Health Questionnaire (GHQ-12). The GHQ-12 is a well validated and extensively used instrument designed to measure current psychiatric and affective disorders, with a focus on disruptions to normal functioning rather than life-long traits.<sup>11</sup>

Demographic details and smoking status were obtained by questionnaire, and data on physical functioning using the Physical

Component Summary (PCS) of the 36-item Short Form (SF-36) health-related quality-of-life questionnaire.<sup>12</sup>

### Statistical analysis

Data were weighted to the Australian Bureau of Statistics 1999 estimated resident population for South Australia,<sup>13</sup> by region, age group, sex and probability of selection in the household, to provide population-representative estimates. Data were analysed using SPSS, version 14 (SPSS Inc, Chicago, Ill, USA). For bivariate analyses, obesity was classified as an ordinal variable (normal, overweight and obese) and psychological disturbance was dichotomised (no disturbance v mild, moderate or severe disturbance), according to published criteria.<sup>14</sup> Severe psychological disturbance was compared with no disturbance in a separate analysis.

The research questions were concerned first with the distribution and relationships of the comorbidities and how these compared between the asthma and non-asthma populations. Second, the impact of the

**1 Prevalence of obesity and psychological morbidity in the asthma and non-asthma populations, by sex**

	Obesity			Psychological morbidity		
	Asthma	Non-asthma*	Odds ratio (95% CI)	Asthma	Non-asthma*	Odds ratio (95% CI)
Men	79/224 (35.3%)	355/1331 (26.7%)	1.44 (1.10–2.04)	66/224 (29.5%)	288/1331 (21.6%)	1.51 (1.09–2.10)
Women	111/330 (33.6%)	386/1290 (29.9%)	1.19 (0.91–1.55)	97/330 (29.4%)	334/1290 (25.9%)	1.19 (0.90–1.57)
Total	190/554 (34.3%)	741/2621 (28.3%)	1.20 (1.07–1.39)	163/554 (29.4%)	622/2621 (23.7%)	1.34 (1.09–1.65)

\* Referent group for odds ratios.

comorbidities in terms of variance on the PCS that they explained, controlling for age and sex, was assessed in stepwise models. The PCS was entered as the dependent variable into a multiple regression analysis with BMI, age and sex (to standardise the analysis); and psychological disturbance, smoking, and the CLD index (in increasing order of strength) were entered stepwise as explanatory variables.

**RESULTS**

Box 1 shows that men and women with asthma experienced similar rates of obesity (35.3% v 33.6%) and psychological morbidity (29.5% v 29.4%). However, when compared with sex and weight-category non-asthma controls, both comorbidities were significantly higher only in men with asthma.

Results of further analyses by weight categories show that psychological morbidity was significantly higher for normal-weight men and women and obese men with asthma, compared with sex-matched controls (Box 2). By contrast, psychological morbidity was significantly lower in obese women with asthma than in obese women without asthma.

Further examination of the data in logistic regression analyses (Box 3) showed that the best set of explanatory variables for psychological morbidity in the asthma population was: age between 40 and 59 years, overweight or severe obesity, moderate or severe chronic lung symptoms, and being a current smoker. In the non-asthma population, the best set of explanatory

**2 Psychological morbidity in the asthma and non-asthma populations, by sex and weight category**

Weight category	Asthma	Non-asthma	Total
<b>Men</b>			
Normal	19/48 (39.6%)*	85/390 (21.8%)	104/438 (23.7%)*
Overweight	19/97 (19.6%)	132/586 (22.5%)	151/683 (22.1%)
Obese	28/79 (35.4%)*	71/355 (20.0%)	99/434 (22.3%)
Total	66/224 (29.5%)*	288/1331 (21.6%)	354/1555 (22.7%)*
<b>Women</b>			
Normal	44/117 (37.6%)*	119/502 (23.7%)	163/619 (26.3%)
Overweight	25/102 (24.5%)	86/402 (21.4%)	111/504 (22.0%)
Obese	28/111 (25.2%)*	129/386 (33.4%)†	157/497 (31.6%)
Total	97/330 (29.4%)	334/1290 (25.9%)†	431/1620 (26.6%)†

\* Significantly different ( $P < 0.05$ ) to the non-asthma population. † Significantly different to men.

**3 Odds ratios (95% CIs) of variables associated with psychological morbidity in the asthma and non-asthma populations**

Variable	Asthma	Non-asthma
<b>Sex</b>		
Male	1.00	1.00
Female	0.90 (0.60–1.34)	1.32 (1.10–1.59)
<b>Age</b>		
< 40 years	1.00	1.00
40–59 years	1.71 (1.03–2.85)	0.86 (0.69–1.06)
≥ 60 years	1.26 (0.74–2.15)	0.67 (0.52–0.86)
<b>Body mass index (kg/m<sup>2</sup>)</b>		
18.5–24.9 (normal weight)	1.00	1.00
25.0–29.9 (overweight)	1.87 (1.14–3.06)	1.02 (0.82–1.29)
30.0–34.9 (obese)	0.98 (0.56–1.72)	1.16 (0.88–1.53)
≥ 35.0 (severely obese)	1.94 (1.07–3.53)	1.44 (1.07–1.95)
<b>Chronic lung disease index</b>		
No/mild symptoms	1.00	1.00
Moderate/severe symptoms	1.31 (0.77–2.21)	2.97 (2.03–4.35)
<b>Smoking status</b>		
Current non-smoker	1.00	1.00
Current smoker	1.78 (1.11–2.86)	1.91 (1.54–2.37)

tory variables for psychological morbidity was: female sex, age less than 40 years (using age ≥ 60 years as the referent), severe obesity, moderate or severe chronic lung symptoms, and being a current smoker.

Physical functioning was significantly lower in the asthma population than the non-asthma population (PCS score: 46.6 [95% CI, 45.9–47.3] v 48.8 [95% CI, 47.8–50.0];  $P < 0.001$ ). In the asthma population, a stepwise logistic regression model containing age, psychological morbidity, BMI, smoking status and chronic lung symptoms explained 41% of the variation in physical functioning. Psychological morbidity explained just over half of this variance (22%).

**DISCUSSION**

This study has shown that psychological morbidity and obesity are highly prevalent and interacting conditions in both the asthma and non-asthma populations. The greatest overall burden of both conditions was seen in the asthma population, and this will add to the complexity of managing asthma in primary care. In Australia, depression is the top-ranking cause of non-fatal disease burden,<sup>14</sup> and its effects can lead to suboptimal use of asthma therapy and poor asthma control.<sup>15</sup> It has also been argued that depression in asthma patients may increase the risk of death.<sup>1</sup>

The variation in distribution of the comorbidities is also an important finding. More than a third of the asthma population in this study were obese and nearly a third experienced psychological

## RESEARCH

morbidity. Although overall rates of both comorbidities were similar for both sexes, there were within-sex variations. Understanding these variations is necessary for effectively targeting the asthma problem, but it was beyond the scope of this study to explain the reasons behind them. Further explanation will be best achieved by comparison of asthma and non-asthma weight- and sex-specific categories. In other words, we need to research why psychological morbidity is much higher in normal-weight women with asthma than in normal-weight women without asthma, rather than why psychological morbidity varies between obese men and obese women.

The major historical research focus of psychological morbidity has been on comparisons between men and women, producing explanations relating to social roles, life events, hormones, reporting levels and clinical presentations, among others.<sup>16,17</sup> Although this is important, there is now more to be gained from designing sex-specific studies, where greater control of confounders and interactions can be achieved. Studies of weight categories within sex-specific groups will provide better control of endogenous factors that vary considerably between the sexes.

There are identifiable limitations of this study. First, although we found that psychological morbidity in the asthma population was the variable explaining most variance in physical functioning, it is possible that the two-way relationships that exist between the comorbidities of psychological disturbance and weight may also mean the existence of additional pathways of effect that cannot be assessed in a cross-sectional study. We must also remember the relationship of obesity with more severe psychopathological problems, and acknowledge that the form of the relationship is different for male and female patients.<sup>4</sup>

Second, the GHQ-12 is not a true measure of depression. However, it is a very reliable indicator instrument in epidemiological studies and has been shown to be a useful screening instrument for detecting depression in primary care.<sup>11,18</sup>

The overall rates of psychological morbidity found in this representative population are higher than previously reported in Australia.<sup>19,20</sup> Further, in the case of depression, Australian primary care doctors most often believe they are dealing with chronic mild depression in their patients.<sup>21</sup> This might not be the case, as a supplementary analysis

in this study showed that 45% of all psychological morbidity was severe.

In summary, obesity and psychological morbidity are important comorbidities in the asthma population and necessitate integrated comprehensive care. Future studies need to address how much these comorbidities affect asthma severity and control, the benefits of a sex-specific approach, and the practicalities and benefits of holistic rather than disease-focused care.

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### COMPETING INTERESTS

None identified.

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