The comorbidity burden of the treated asthma patient population in British Columbia

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Abstract

To date there has been little investigation of the prevalence of comorbid conditions in asthma patients. Using 1996/97 cross-sectional health services administrative data for British Columbia, we compared the prevalence of comorbid conditions in treated adult asthma patients with the general adult population using a standardized comorbidity identification methodology, the Adjusted Clinical Group (ACG) Case-Mix System. We also profiled the comorbidity burden of pediatric asthma patients.

Adults with asthma were significantly more likely to have a range of comorbidities, including respiratory infections, allergic rhinitis and 8 high impact/high prevalence chronic conditions (HIHPCCs). One in 4 adults with asthma had depression, the most prevalent HIHPCC. Children with asthma had a lower comorbidity burden than adults, but 12.6% had a stable or unstable chronic medical condition, with the most prevalent HIHPCC also depression.

Adults with asthma had a high and complex comorbidity burden, particularly in terms of multiple chronic conditions. We discuss the implications for services planning and delivery.

Keywords: *asthma, comorbidity, multimorbidity, burden of illness, population health, chronic conditions, British Columbia, Canada*

Introduction

Asthma is a chronic inflammatory disease of the respiratory system, and is one of the most prevalent chronic diseases, affecting an estimated 300 million people worldwide and creating a burden in the order of 15 million disability-adjusted life years lost annually—approximately the level for diabetes or schizophrenia. Prevalence appears to be increasing.[1]

In recent years there has been a growing recognition of the importance of addressing comorbidity in patients with chronic conditions. There are several reasons for this: co-occurrence of multiple chronic conditions is common;[2,3] comorbidity has a negative impact on patients' quality of life;[2,3] and chronic disease management patients with higher levels of comorbidity use more health care services than patients with lower levels.[4]

To date there have been few published studies of comorbidity in asthma patients, and the research has had limitations with respect to (a) the range of comorbid chronic conditions studied, (b) lack of consistency and of reported details of the definitions used for the comorbid conditions studied and (c) representativeness and/or size of the samples studied. The lack of uniformity and representativeness are important in relation to obtaining unbiased and precise estimates of the prevalences of conditions—especially less common conditions—and of co-occurrences of particular pairs of conditions.

Van Manen et al.[5] used a questionnaire to obtain data about 23 comorbid conditions from 290 general practice patients over the age of 40 with asthma and/or chronic obstructive pulmonary disease (COPD) and 421 control patients. Locomotive diseases, insomnia, stomach and duodenal ulcers, migraine, sinusitis, depression, cancer and atherosclerosis were significantly more prevalent in the former group.

Using data collected in an Australian general population health survey from 834 adults with asthma and 6609 without, Adams et al.[6] found that, after age and sex adjustments, arthritis, heart disease, stroke, cancer and osteoporosis were more prevalent among the asthmatic respondents.

Soriano et al.[7] estimated the prevalences of comorbid conditions—reported in terms of the major organ systems affected, e.g. gastrointestinal—and other types of disorders, e.g. infections, in an administrative data–based study in Britain involving 7933 patients with asthma and an equal number of matched controls without.

It is difficult to compare the results of these studies. Further, with the exception of a study by Diette et al.[8] concerning a few selected conditions in older asthma

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patients and the van Manen et al. study,[5] there appears to have been little systematic analysis that describes prevalences of asthma patients' comorbidities in relation to age, sex and asthma severity.

In order to better design interventions and allocate health care resources, it is important for planners of chronic disease management programs to fully understand the needs of their target populations. Zhao et al.[9] recently proposed a methodology called disease burden profiling as a means of identifying and describing populations with chronic conditions. In this approach, prevalences for a wide range of comorbid condition categories are computed in a population with a particular index condition, and excess morbidity ratios are computed for these categories to compare prevalences for patients without the index condition. One key to the successful implementation of this approach is the categorization of the comorbidities in a standardized manner using case-mix software.

Starfield et al.[10] used the Johns Hopkins University Adjusted Clinical Group (ACG) Case-Mix System[11] as a standardized method to categorize comorbidity in a study of resource utilization by managed care organization patients with chronic conditions. For the index conditions studied—hypertension, asthma, diabetes and 8 others—patterns of use of physician and emergency room were highly related to the degree of comorbidity.

Broemeling et al.[12] also used this tool to categorize comorbidity in a population-based study of chronic conditions in British Columbia (BC). In 2000/01, 36% of the adult population had at least 1 chronic condition, and 30% of this group had 6 or more comorbid conditions. In comparison, 33% of the adult population had acute conditions only, and just 2.5% of this group had 6 or more comorbid conditions. Again, resource utilization was strongly linked to both the index conditions studied and patients' level of comorbidity.

The objective of this study is to compare the prevalences of common chronic and acute conditions in adults with asthma to prevalences in the province's general adult population using a standardized set of comorbidity identification algorithms—the ACG Case-Mix System.

Methods

Study design and data sources

We conducted a cross-sectional comparison of comorbidity prevalence in two populations: the population of treated adult (18 years and older) asthma patients in BC and the province's adult general medical services user population. The prevalence estimates used for the latter were obtained from a report by Reid et al.[13] on high-cost users of physician services in BC during the 1996/97 fiscal year that includes adult asthma patients.[13] In addition, we examined the prevalence of comorbidities in children with asthma aged 5 to 17 years and compared comorbidity profiles of subgroups within the adult and child populations.

The primary data sources used in this study were 3 linked BC Ministry of Health databases: the Medical Services Plan database containing fee-for-service general practitioner and specialist physician billing records, the Discharge Abstracts Database of hospital separation records and the PharmaNet database that captures all prescription drug dispensing in community pharmacies throughout BC.

The treated asthma population of BC

The treated asthma population in 1996/97, the year used by Reid et al.,[13] comprised 112 000 patients with continuous health care system enrolment aged 5 years or older between April 1, 1996, and March 31, 1997, who satisfied one or more of the following criteria during the year: (a) at least 3 dispensing events for asthma medications (the list of qualifying medications is available from the corresponding author); (b) at least one hospital discharge with International Classification of Diseases version 9 (ICD-9) code 493 as the principal diagnosis or (c) at least two 493-coded physician visits. In a previous validation study,[14] we estimated the sensitivity and specificity of our case definition to be 0.632 and 0.997, respectively, relative to a case selection algorithm developed using latent class modeling.

Data elements

Like Reid et al.,[13] we used the Johns Hopkins University ACG Case-Mix System (version 5) as a standardized, validated set of algorithms for creating a set of binary variables indicating the presence or absence of specific types of comorbidity. This system is extensively described in the reference manual for the software that is used to generate these variables from patients' physician visits and hospitalization records.[11] Recent validation studies in several jurisdictions—Sweden,[15] Spain[16,17] and two Canadian provinces[18]—have shown the system to be effective in characterizing the morbidity burden of populations.

Briefly, the system's set of 32 mutually exclusive Aggregated Diagnosis Groups (ADGs) form a high level classification scheme for groups of diseases/conditions. Each of the ICD diagnostic codes is assigned to a single ADG on the basis of 5 clinical dimensions of the condition: duration, severity, etiology, diagnostic certainty and the need for specialty care involvement. The conditions within an ADG are similar with respect to the expected level of resource utilization by patients. Having 1 or more of 8 major ADGs such as Chronic Medical: Unstable (ADG11) or Malignancy (ADG32), for example, is predictive, *ceteris paribus*, of greater resource use than having minor ADGs like Time-limited – Minor (ADG1) or Likely to Recur – Discrete (ADG7).

The system's 264 Expanded Diagnosis Cluster (EDC) variables represent sets of ICD diagnostic codes grouped on the basis of clinical similarity of the associated conditions. In contrast to ADGs, this grouping does not take into account possible differences in disease severity, chronicity or expected resource requirements. The EDCs, for example, Allergic Rhinitis (ALL03) or Ischemic Heart Disease (CAR03), are more useful than ADGs in identifying patients with particular comorbid conditions.

Table 1 provides the full names and abbreviations for the ADGs and EDCs we focused on in this study—40 of the 46 EDCs used by Reid et al.[13] The major ADGs are flagged. Note that several ADGs are omitted including ADG6 (Asthma), ADG31

TABLE 1
Aggregated Diagnosis Group (ADG) and Expanded Diagnosis Cluster (EDC) names and identifiers

	Aggregated Diagnosis Group (ADG)		Expanded Diagnosis Cluster (EDC)
1	Time limited: minor	ALL01	Allergic reactions
2	Time limited: minor – primary infections	ALL03	Allergic rhinitis
3	Time limited: major	CAR02[a]	Hypertension
4	Time limited: major – primary infections	CAR03[a]	Ischemic heart disease
5	Allergies	CAR05[a]	Congestive heart failure
7	Likely to recur: discrete	CAR09[a]	Cardiac arrhythmia
8	Likely to recur: discrete – infections	CAR10	Generalized atherosclerosis
9	Likely to recur: progressive	EAR01	Otitis media
10	Chronic medical: stable	EAR09	Chronic pharyngitis and tonsillitis
11	Chronic medical: unstable	EAR11[a]	Acute upper respiratory tract infection
12	Chronic specialty: stable – orthopedic	END01[a]	Diabetes mellitus
13	Chronic specialty: stable – ear, nose, throat	END02	Osteoporosis
14	Chronic specialty: stable – eye	END04	Thyroid disease
16	Chronic specialty: unstable – orthopedic	GAS02	Inflammatory bowel disease
17	Chronic specialty: unstable – ear, nose, throat	GAS05	Chronic liver disease
18	Chronic specialty: unstable – eye	GAS06[a]	Peptic ulcer disease
20	Dermatologic	GAS08	Gastroesophageal reflux
21	Injuries/adverse effects: minor	GAS09	Irritable bowel syndrome
22	Injuries/adverse effects: major	GSU11	Peripheral vascular disease
23	Psychosocial: time limited, minor	GUR08[a]	Urinary tract infection
24	Psychosocial: recurrent or persistent, stable	HEM02[a]	Iron deficiency, other deficiency anemias
25	Psychosocial: recurrent or persistent, unstable	INF01	Tuberculosis infection
26	Signs/symptoms: minor	MAL01	Malignant neoplasms of the skin
27	Signs/symptoms: uncertain	MAL02[ab]	Low impact malignant neoplasms
28	Signs/symptoms: major	MAL03[ab]	High impact malignant neoplasms
29	Discretionary	MUS03[a]	Degenerative joint disease
30	See and reassure	MUS14[a]	Low back pain
32	Malignancy	NUR01	Neurologic signs and symptoms
		NUR05[a]	Cerebrovascular disease
		NUR06	Parkinson's disease
		NUR08	Multiple sclerosis
		PSY01[a]	Depression, anxiety, neuroses
		PSY07[a]	Schizophrenia and affective psychoses
		REN01	Chronic renal failure
		RES02[a]	Acute lower respiratory tract infection
		RES03	Cystic fibrosis
		RES04[a]	Emphysema, chronic bronchitis, COPD
		RES07	Sinusitis
		RHU01[a]	Autoimmune and connective tissue diseases
		SKN02[a]	Dermatitis and eczema

Notes:

Shading indicates major ADGs and High Impact/High Prevalence (HI/HP) EDCs.

[a] EDCs for which comparisons are made with the general adult population. Asthma, our index condition, is also HI/HP.

[b] MAL02 and MAL03 are combined as Cancer when considering the HI/HP conditions.

(Preventive and Administrative), ADG33 (Pregnancy) and ADG34 (Dental). ADGs 15 and 19 are no longer used.

Statistical analyses

For each of 28 ADGs we computed the proportion of adult asthma patients who had the ADG and compared these odds with the corresponding odds for the general adult population. We repeated our profile comparison using the 21 EDCs and 19 additional EDCs (see Table 1). We obtained approximate 95% bootstrap confidence intervals[19] for each odds ratio (OR) using 1000 samples from the adult asthma patient population (n = 93 512). In computing the ORs we treated the odds values for the general population (computed from the Reid et al. proportions[13]) as exact estimates because of this population's large size (N = 2 521 248). Because comorbid conditions are interrelated and multiple comparisons of their prevalences are not independent, we used an adaptation of Westfall's multiple comparison method[20] to control type 1 error rate in testing composite hypotheses about intergroup ADG (EDC) profile differences. Using the age distribution reported by Reid et al.[13] for the adult service user (ASU) population and the age distribution for the adult asthma patient cohort, we created a set of weights that could be applied to the latter's data to perform a crude age adjustment in our OR comparisons of the asthma patient and ASU groups. We have reported weighted and unweighted comparisons.

We also created ADG and EDC prevalence profiles for male and female adults and children and compared the corresponding prevalences via ORs using bootstrapping to create confidence intervals, repeatedly sampling from each subgroup. We used SPSS version 15 for all our analyses.[21]

Results

Table 2 shows age and sex distributions for the adult asthma patient population and the general ASU population of BC. The latter comprises 84% of the province's total adult population. The percentages of asthma patients in the 60-to-74-year and 75-year -plus age groups are larger than the corresponding percentages for the ASU population. The proportion of men is similar for the adult asthma patient and ASU populations.

Table 3, which shows the prevalence of each ADG in the adult asthma patient and ASU populations, provides a summary of the 2 populations' comorbidity burdens. Adult asthma patients were significantly more likely to have any particular (ADG) category of comorbidity.

Table 3 also provides a comparison of the populations via ORs for the 28 ADGs. All but 2 of the ADGs had an OR, computed with weighting, that was significantly larger than 1, signifying a greater morbidity burden in the asthma population. Further, individual adults with asthma tended to have more multimorbidity than individual ASUs—larger numbers of ADGs, and in particular more of the 8 major ADGs (3, 4, 9, 11, 16, 22, 25 and 32) associated with very high expected resource use.[9] Of adult asthma patients, 36% had 6 or more ADGs, compared with 20% for ASUs; 18.9% of adult asthma patients had 2 or more major ADGs compared with 9.3% of ASUs.

While children with asthma generally had a lower comorbidity burden than adult asthma patients, 12.1% had 6 or more ADGs (14.8% for girls and 10.2% for boys); 12.6% had a stable or unstable chronic medical condition; and 4.3% had 2 or more major ADGs. The most prevalent ADG (65%) among these children was time-limited minor infections. Almost 1 in 6 children (15%) with asthma had allergies (ADG5), and 1 in 12 children—9.2% of girls and 6.9% of boys—had depression (PSY01). Note that ADG5 incorporates allergic rhinitis associated with a variety of factors, e.g. animal hair, but not conditions such as atopic dermatitis.

The most prevalent comorbidity among adult asthma patients was time-limited minor infections (ADG2): 56% had this ADG, an indicator of a variety of illnesses including acute bronchitis and acute upper respiratory tract infections (RTIs). A majority of adult asthma patients (59%) had either a chronic medical stable comorbid condition (ADG10) or a chronic medical unstable comorbidity (ADG11) or both. Examples of ADG10 conditions include essential hypertension, adult onset type 1

TABLE 2
Age and sex profiles of asthma patients and general adult service user (ASU) population

	Asthma patients		General adult
	All	Adults	service user population
	(n = 111 780)	(n = 93 512)	(N = 2 521 248)
Age (years)	%	%	%
5–11	10.3		
12–17	6.0		
18–29	9.8	11.7	20.0
30–44	17.4	20.8	32.0
45–59	17.4	20.8	23.4
60–74	23.2	27.7	15.8
75+	15.9	19.0	8.8
Total	100	100	100
	Patients aged 5–17	**Patients aged 18+**	**Adult service users**
Sex	%	%	%
M	57.7	43.5	45.6
F	42.3	56.5	54.4

TABLE 3
Prevalences and odds ratios for ADGs in adults with asthma and general adult service users

Aggregated Diagnosis Group (ADG)[a]		Prevalence per 1000 population		Unweighted[b]		Weighted[b]	
		Adults with asthma	General population users	Odds ratio	95% CI	Odds ratio	95% CI
27	Signs/symptoms: uncertain	486	400	1.42	(1.40, 1.44)	1.29	(1.27, 1.31)
28	Signs/symptoms: major	488	398	1.44	(1.42, 1.46)	1.36	(1.34, 1.38)
2	Time limited: minor – primary infections	561	359	2.29	(2.26, 2.31)	2.32	(2.28, 2.35)
26	Signs/symptoms: minor	497	309	2.21	(2.18, 2.24)	2.05	(2.02, 2.08)
10	Chronic medical: stable	437	282	1.98	(1.96, 2.01)	1.46	(1.44, 1.48)
1	Time limited: minor	324	276	1.26	(1.24, 1.28)	1.30	(1.28, 1.32)
7	Likely to recur: discrete	261	186	1.55	(1.52, 1.57)	1.48	(1.46, 1.51)
24	Psychosocial: recurrent or persistent, stable	231	170	1.46	(1.44, 1.49)	1.58	(1.56, 1.61)
21	Injuries/adverse effects: minor	174	150	1.19	(1.17, 1.21)	1.30	(1.28, 1.33)
11	Chronic medical: unstable	376	141	3.68	(3.63, 3.73)	2.44	(2.41, 2.48)
20	Dermatologic	140	125	1.14	(1.12, 1.16)	1.15	(1.12, 1.17)
8	Likely to recur: discrete – infections	170	121	1.49	(1.47, 1.52)	1.60	(1.57, 1.63)
29	Discretionary	164	118	1.46	(1.44, 1.49)	1.39	(1.37, 1.42)
22	Injuries/adverse effects: major	166	113	1.56	(1.53, 1.59)	1.56	(1.53, 1.59)
14	Chronic specialty: stable – eye	82	73	1.14	(1.12, 1.17)	0.73	(0.71, 0.75)
4	Time limited: major – primary infections	109	59	1.93	(1.89, 1.97)	1.74	(1.70, 1.78)
18	Chronic specialty: unstable – eye	68	59	1.17	(1.14, 1.20)	0.82	(0.80, 0.85)
3	Time limited: major	96	53	1.92	(1.88, 1.96)	1.50	(1.46, 1.53)
23	Psychosocial: time limited, minor	71	49	1.49	(1.45, 1.53)	1.60	(1.56, 1.65)
5	Allergies	102	47	2.29	(2.24, 2.34)	2.71	(2.65, 2.77)
32	Malignancy	71	34	2.18	(2.13, 2.24)	1.45	(1.41, 1.49)
25	Psychosocial: recurrent or persistent, unstable	50	31	1.66	(1.61, 1.71)	1.68	(1.62, 1.73)
9	Likely to recur: progressive	51	23	2.28	(2.22, 2.35)	1.44	(1.40, 1.49)
12	Chronic specialty: stable – orthopedic	27	21	1.29	(1.24, 1.35)	1.28	(1.22, 1.33)
13	Chronic specialty: stable – ear, nose, throat	24	14	1.70	(1.63, 1.77)	1.43	(1.36, 1.50)
16	Chronic specialty: unstable – orthopedic	20	14	1.40	(1.34, 1.47)	1.36	(1.30, 1.44)
30	See and reassure	20	14	1.45	(1.39, 1.51)	1.25	(1.19, 1.32)
17	Chronic specialty: unstable – ear, nose, throat	13	8	1.61	(1.52, 1.71)	1.38	(1.30, 1.48)

Notes:

Abbreviations: CI, confidence interval.

[a] The ADGs are in order of decreasing prevalence in the general adult service user population.

[b] In the unweighted computations, the asthma patients' age distribution is unmodified. In the weighted computations, cases were weighted to produce an age distribution that approximated that of the general adult service using population. Prevalences for adults with asthma are unweighted.

TABLE 4
Prevalences and odds ratios for EDCs in adults with asthma and general adult service user population

Expanded Diagnosis Cluster (EDC)[a]		Prevalence per 1000 population		Unweighted[b]		Weighted[b]	
		Asthma	General	Odds ratio	95% CI	Odds ratio	95% CI
EAR11	Acute upper respiratory tract infection	262	205	1.38	(1.36, 1.40)	1.60	(1.57, 1.62)
PSY01	Depression, anxiety, neuroses	249	187	1.44	(1.42, 1.46)	1.56	(1.54, 1.59)
NUR01	Neurologic signs and symptoms	225	175	1.37	(1.35, 1.39)	1.34	(1.32, 1.37)
RES02	Acute lower respiratory tract infection	354	115	4.23	(4.17, 4.29)	3.87	(3.81, 3.93)
CAR02	Hypertension	179	112	1.73	(1.70, 1.75)	1.16	(1.14, 1.18)
MUS14	Low back pain	137	106	1.34	(1.32, 1.37)	1.39	(1.37, 1.42)
SKN02	Dermatitis and eczema	77	58	1.35	(1.32, 1.38)	1.45	(1.41, 1.49)
GUR08	Urinary tract infection	82	56	1.51	(1.48, 1.55)	1.43	(1.38, 1.46)
CAR03	Ischemic heart disease	93	49	2.00	(1.95, 2.04)	1.22	(1.19, 1.25)
END01	Diabetes mellitus	67	41	1.68	(1.63, 1.72)	1.23	(1.19, 1.26)
MUS03	Degenerative joint disease	80	40	2.12	(2.07, 2.17)	1.49	(1.45, 1.52)
GAS06	Peptic ulcer disease	64	37	1.79	(1.75, 1.84)	1.66	(1.61, 1.71)
CAR09	Cardiac arrhythmia	58	27	2.24	(2.18, 2.30)	1.38	(1.34, 1.42)
MAL02	Low impact malignant neoplasms	49	24	2.08	(2.01, 2.14)	1.43	(1.38, 1.48)
HEM02	Iron deficiency, other deficiency anemias	38	19	2.07	(2.00, 2.14)	1.56	(1.50, 1.62)
RHU01	Autoimmune and connective tissue diseases	66	19	3.75	(3.65, 3.85)	3.13	(3.04, 3.22)
RES04	Emphysema, chronic bronchitis, Chronic Obstructive Pulmonary Disease (COPD)	197	16	14.75	(14.5, 15.0)	9.13	(8.96, 9.30)
CAR05	Congestive heart failure	61	14	4.62	(4.49, 4.74)	2.46	(2.39, 2.54)
PSY07	Schizophrenia and affective psychoses	20	13	1.50	(1.44, 1.57)	1.52	(1.45, 1.60)
NUR05	Cerebrovascular disease	25	12	2.23	(2.14, 2.33)	1.35	(1.29, 1.40)
MAL03	High impact malignant neoplasms	27	9	3.10	(2.97, 3.23)	2.21	(2.12, 2.31)

Notes:

[a] EDCs are listed in order of decreasing prevalence in the general adult service using population.

[b] In the unweighted computations, the asthma patients' age distribution is unmodified. In the weighted computations, cases were weighted to produce an age distribution that approximated that of the population of general adult service users. Prevalences for adults with asthma are unweighted.

diabetes and osteoarthritis; chronic liver disease, COPD and multiple sclerosis are examples of ADG11 conditions. The prevalences among adult asthma patients of ADGs 10 and 11 were 44% and 38%, respectively. One in 10 adult asthma patients had an allergy.

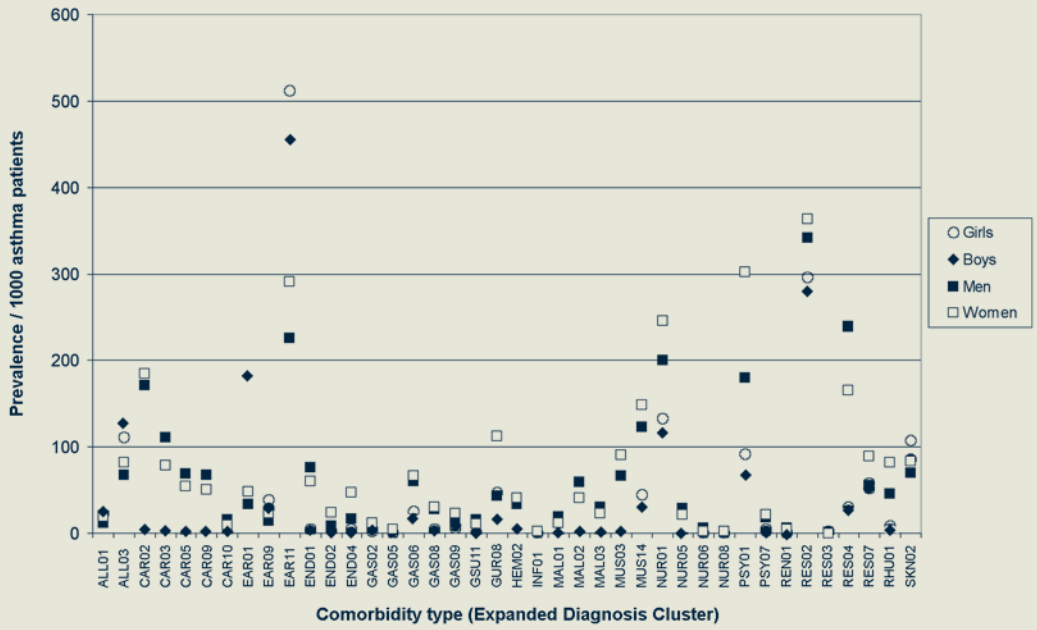
ADGs 2, 5 and 11 had the 3 largest ORs: 2.29 (95% CI = 2.26, 2.31); 2.29 (95% CI = 2.24, 2.34) and 3.68 (95% CI = 3.63, 3.73), respectively. The 28 ORs were recomputed after weights were applied to the adult asthma patient data to approximate the age distribution in the ASU population. The ORs changed, generally in the direction one would expect, but these 3 still had the largest ORs.

Table 4 shows the prevalences for 21 specific comorbid conditions—indicated by EDCs—in the adult asthma patient and ASU populations, and shows the ORs comparing the populations with respect to these EDCs. For each EDC the prevalence was higher for adult asthma patients than for ASUs. All 21 ORs were significantly larger than 1.

Among these 21 comorbidities are 10 that have been categorized by Broemeling et al.[12] as "high impact and/or high prevalence" chronic conditions (HIHPCCs). (Broemeling et al. also categorized asthma, our index condition, as an HIHPCC.[12]) The impact of each condition was assessed in terms of expected short-term resource use and outcomes. The HIHPCCs are depression, hypertension, diabetes, ischemic heart disease, degenerative joint disease, cardiac arrhythmia, cancer, congestive heart failure, cerebrovascular disease and COPD (including chronic bronchitis and emphysema). Note that in the interest of brevity we will use the term COPD to refer to the 3 conditions, recognizing that the "COPD" label is most applicable to patients 55 years of age or older.

Sixty percent of adult asthma patients had 1 or more additional HIHPCC, and 12% had 3 or more of these. One in 4 had depression and 1 in 6, hypertension. The prevalences of 3 of the HIHPCCs—high impact malignant neoplasms, congestive

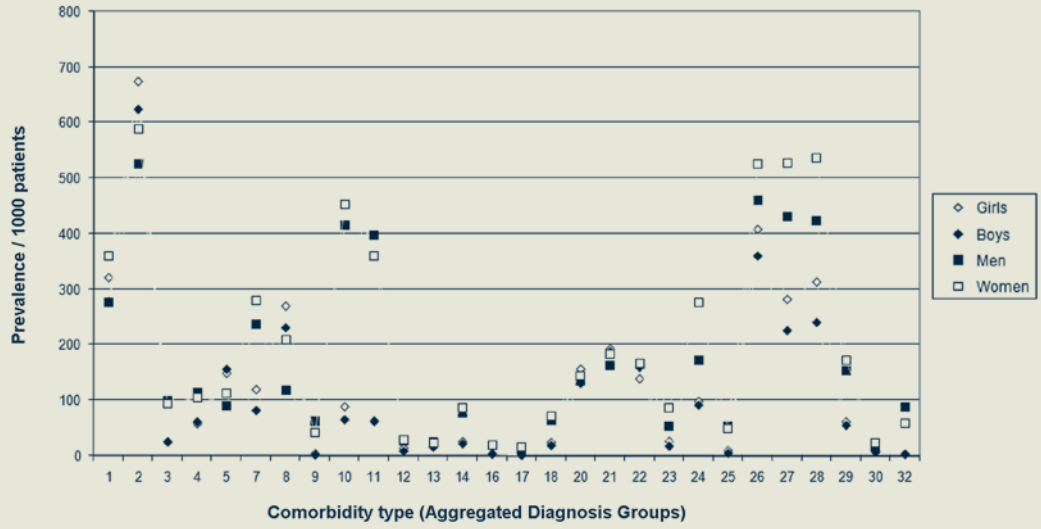
FIGURE 1
Comorbidity (Expanded Diagnosis Cluster) prevalences for four age and sex groups of asthma patients[a] (1996/97)



Note: Expanded Diagnosis Cluster labels are listed in Table 1.

[a] Girls and boys 5 to 17 years old, men and women 18 years old and over

FIGURE 2
Comorbidity (Aggregated Diagnosis Group) prevalences for four age and sex groups of asthma patients[a] (1996/97)



Note: Aggregated Diagnosis Group labels are listed in Table 1.

[a] Girls and boys 5 to 17 years old, men and women 18 years old and over

heart failure and COPD—were considerably higher (OR ≥ 2.0) in adult asthma patients than in ASUs. Adult asthma patients' odds of having depression were more than 50% higher than the odds for ASUs.

Of particular interest is the co-occurrence of additional chronic respiratory conditions in asthma patients. One in 5 adult asthma patients also had COPD, compared with 1.6% in the ASU population. Among asthma patients aged 56 and older, the proportion increased to 38% for men and 28% for women. The odds for adult asthma patients having COPD were 9.1 times larger than the odds for the ASU population. The ORs for acute lower and upper RTIs were 3.9 and 1.6, respectively.

Figures 1 and 2 show, respectively, the EDC and ADG profiles for male and female patients in the 5 to 17 years and 18 years and older age groups. The 4 EDC profiles were significantly different as were the 4 ADG profiles. Acute lower RTIs were the most prevalent comorbid condition for men and women and the second most prevalent for boys and girls, following acute upper RTIs. Otitis media was the third most prevalent condition in both boys and girls, while allergic rhinitis was fourth for boys and fifth for girls. COPD was more common in men than women, ranking second for men and sixth for women. Depression, anxiety and neuroses, however, were more prevalent in women, ranking second for women and fifth for men.

Discussion

The population of adult British Columbians with asthma has a higher overall illness burden than the province's general population of adult health care users. Each ADG category of comorbidity is significantly more prevalent in the asthma population. The proportion of the asthma population's members with 2 or more major ADGs is double the proportion of the general adult population. For each of 10 HIHPCCs, as well as 11 other specific comorbid conditions, the prevalence in adults with asthma was higher. This remains the case after adjusting for age differences in the two populations.

Although we expected to see a higher prevalence of allergies, acute respiratory conditions and COPD in the asthma population, we also found an increased prevalence for non-respiratory chronic conditions. In particular, we found that adult asthma patients have increased odds for having cancer, heart disease, stroke and arthritis. These findings have been reported by other investigators.[6] In contrast to Ben-Noun[22] and Adams et al.,[6] however, we found diabetes to be significantly more prevalent in the adult asthma patient population than in the general adult population.

Having multiple chronic conditions is common for adults in BC,[12] and this is particularly true for adult asthma patients where 1 in 8 had 3 or more HIHPCCs, increasing to 1 in 5 for adults 55 years and older. The most prevalent of the HIHPCCs in this multimorbidity subgroup were depression, hypertension, ischemic heart disease and COPD.

As Broemeling et al.[12] point out, it is important to consider both impact and prevalence of comorbid chronic conditions in analyzing the health care needs of the asthma patient population. While it may be tempting to enhance patient care by focusing on treatment of asthma patients' depression because it is common, chronic conditions like COPD have a higher impact, in terms of health service utilization, albeit for a smaller proportion of asthma patients.

In contrast, and as expected, children with asthma are relatively free of major comorbidities. Fewer than 1 in 4 has any major ADGs and only 12% have 1 or more HIHPCCs. The most prevalent major comorbidity category is major injuries/adverse effects, and the most prevalent HIHPCC is depression.

The BC population of asthma patients is very heterogeneous, and many patients have complex treatment and self-management needs. As Adams et al.[6] point out, age needs to be considered in planning care for patient subgroups: comorbidity profiles of children and older and younger adult populations differ considerably. We have also found that asthma patients of a particular age and sex can differ considerably in terms of their comorbidity profiles.

The literature and clinical practice guidelines tend to portray asthma patients as if they only had asthma. Knowing comorbidity prevalences for this (or any other condition-based) population and the similarities and differences in service needs of patient subgroups can help health system planners make more rational allocations of resources,[23] and can enable clinicians, particularly those in primary care, to consider and develop holistic approaches to treatment. Chronic disease management strategies that are suitable for patients with a single chronic disease will need to be adapted for patients with multiple, possibly unrelated, chronic conditions. Self-management approaches that are more generic, such as those developed by Lorig et al.,[24] may serve as a model.

Patients with multimorbidity face numerous barriers to following complex disease management plans,[25] and some combinations of conditions make this particularly difficult. Increasing exercise might be an appropriate goal for an obese patient with diabetes, for example, but having asthma and arthritis as well might make this difficult to accomplish.[26] Having depression, as 25% of adult BC asthma patients do, makes it difficult to maintain motivation to follow a treatment plan.[27]

We have compared two populations with respect to the prevalences of common acute and chronic conditions—a complete provincial population of adults with treated asthma and the province's general adult health service using population—using a standardized set of comorbidity identification algorithms. We have described the nature of the higher comorbidity burden of the asthma patient population. A variety of associations, between asthma and other respiratory and atopic conditions—links that clinicians and physiologists are familiar with—have been supported and given precise estimates at a population level.

In addition, we have compared the comorbidity prevalence profiles of male and female adults and children. These comparisons are possible because of the comprehensiveness of service use data from a large universal public health care system. In contrast to several other studies that have used small sample surveys and non-standard methods to identify comorbid conditions, the methodology of our study could be used to make precise comparisons of asthma patients' comorbidity profiles between jurisdictions that have population-based administrative data.

Several limitations of our study are a result of data access issues. Individual level data for the general adult population were not available to us: we relied on 1996/97 aggregated data reported by Reid et al.[13] making it possible to perform a simple age-related weighting adjustment to adult asthma patients' data in computing ORs but not to match asthma patients

to individuals without asthma by age and sex—a preferable approach that would reduce underestimation of associations. Further, we did not have access to general population children's data, precluding the type of comparisons we made for adults. Population comparisons based on more recent data, were we able to make them, could show different results. A comparison of adult asthma patients' comorbidity profiles across 5 years (results not shown) suggests that for the majority of conditions we examined, prevalence increased.

We recognize that we are really estimating prevalences of treated comorbidities. Patients with mild conditions for which they seldom if ever use physician or hospital services would not be counted as having the comorbidity. On the other hand, because the primary focus in health care planning is usually on users of the health care system, especially frequent or high-cost users, our current results are very relevant.

The case definition we used to identify asthma patients is similar to the one used by the BC Ministry of Health for surveillance purposes.[28] Using a definition with a higher sensitivity—a more inclusive definition would probably create a more heterogeneous cohort—could have the effect of lowering the odds ratios we observed. In older patients it is often difficult to distinguish COPD from asthma because the two conditions share several clinical features including the symptoms of dyspnea, cough, wheezing and sputum production. If some asthma patients identified by the ACG algorithm as having COPD were false positives, the effect would be to lower the apparent prevalence of COPD in these patients.

In summary, our current research suggests that treated adult asthma patients have a significantly greater comorbidity burden than adults in the general population, both in terms of number of comorbid conditions and in terms of occurrence of specific conditions. While higher prevalences of additional respiratory and atopic conditions are expected, the higher prevalences of conditions like cancer are less so. These latter associations may provide a starting point for further clinical research.

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