SUBSTANCE ABUSE and health problems seem to be inextricably related. Many individuals presenting in primary care, emergency departments, and hospitals have alcohol and/or other drug problems, and medical and psychiatric disorders are very frequent among populations with alcohol or drug disorders.6,8 Until recently the main body of epidemiological research has focused much more on alcohol than on other drugs. Heavy drinking is associated with liver and pancreatic disease, hypertension, reproductive system disorders, trauma, stroke, and fetal alcohol syndrome.6,8,11 A few studies also show associations between particular medical problems and specific drugs. Although there has been little research on the prevalence of medical problems among methamphetamine abusers, studies in emergency and trauma settings suggest that methamphetamine use is associated with trauma and other health concerns12 including rhabdomyolysis.13 Long-term marijuana use has been found to be associated with cognitive impairments such as memory and attention deficits,14,15 bronchitis,14,15 and adverse cardiovascular effects.14 There is evidence among cocaine users of cardiovascular complications,6,10,17 and neurologic and psychiatric disorders.3,6,17 Research on the prevalence of medical conditions among individuals with alcohol and drug disorders has largely been conducted on public populations (ie, patients treated in publicly funded programs), inpatient populations, or general populations (ie, untreated individuals from the general US population).8,9,18 There is little research on insured populations, particularly in managed care. This study examines individuals in the year prior to entering chemical-dependency treatment in Northern California Kaiser Permanente (KP), a large group-model health main-
tenance organization (HMO). The KP Northern California membership, approximately 3 million individuals, represents 60% of the commercially insured population in this area. Most members younger than 65 years are insured through the workplace (themselves or as dependents). The membership is diverse occupation-ally and socioeconomically; it includes municipal, university, and business professionals as well as service workers. Thus, findings pertaining to this population can be generalized to other private, commercially insured populations, which makes KP an ideal setting for this study.

Understanding the prevalence and patterns of medical conditions within subgroups, defined demographically and by substance of dependence, of individuals with alcohol and drug disorders might be of great clinical utility. Such information could be used to suggest what medical screening and other services could optimize health care for both public and private populations. Further, clients in alcohol and drug treatment could benefit if their medical and psychiatric conditions were treated concurrently. Recent studies have focused on the benefits of linking medical and substance abuse services.1,19-21

This study contributes to the literature on alcohol and drug epidemiology by comparing the prevalence of medical and psychiatric conditions among patients in the year prior to entering alcohol and drug treatment with demographically matched controls from the same health plan. It also examines whether the risk of medical and psychiatric conditions varies according to dependence on different types of substance.

METHODS

STUDY SETTING, SAMPLES, AND DESIGN

The patients entering alcohol and drug treatment (cases) were drawn from a larger study.1 The cases were a sample of 747 adult patients meeting the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for alcohol or other drug abuse or dependence and entering the KP Chemical Dependency Recovery Program (CDRP) in Sacramento, Calif, between April 1997 and December 1998. All patients who had a CDRP intake appointment during the study window were eligible to participate. For patients ready to begin treatment (after detoxification when needed), research staff explained the study, obtained written informed consent, and administered the baseline questionnaire. Institutional review board approval was obtained from the Kaiser Research Foundation Institute and the University of California, San Francisco.1

Kaiser Permanente is a large group-model HMO covering 60% of the commercially insured population in Northern California. The Kaiser Health Plan membership is insured primarily through the workplace, and its income and employment levels are higher than in the general population.21 The treatment sample had a higher proportion of men and was younger than the general membership.

The controls consisted of 3690 individuals who were also enrolled in the Kaiser Health Plan and residing in the Sacramento service area. A maximum of 5 controls were matched with each substance abuse patient on age (in 5-year categories), sex, and length of health plan enrollment (exact beginning date of health plan membership). The pool of members from which we drew the matched controls excluded individuals with a diagnosis of substance abuse or dependence or who were treated for substance abuse through the health plan. A small number of cases (n=22) had fewer than 5 controls because appropriate matches could not be found. The matched-controls design enabled a comparison of the diagnoses of a sample of patients entering substance abuse treatment with those of a general membership population that is demographically equivalent. In this way, confounding due to differences in age, sex, or length of enrollment is reduced.

The baseline questionnaire was completed by all patients recruited in the CDRP. It was largely a computerized self-report instrument (with a research assistant available to administer the questionnaire if needed), but some parts, including those using DSM-IV criteria to assess alcohol and drug dependence and abuse, were administered via an interview. The questionnaire was designed to obtain baseline (pretreatment) measures of the severity of alcohol and drug problem as well as employment status, ethnicity, and other demographic characteristics.

MEASURES FROM THE HEALTH PLAN DATABASES

We used the health plan’s Outpatient Summary Clinical Record and admissions/discharges/transfers automated diagnostic databases22 to identify patients diagnosed as having medical and psychiatric disorders in KP outpatient clinics or hospitals in the year prior to CDRP intake for the cases (physicians record a primary and multiple secondary diagnoses at each health plan visit and inpatient stay). The 12-month window for diagnosis of the matched controls began 1 year prior to the intake date of the matching case. Thus, for each case and matched controls, we examined diagnoses in the same 12-month period, ie, the 12 months before treatment entry for the case. We examined 23 common medical and psychiatric conditions. In addition to being chosen for their usefulness to health services research, these conditions represented 69% of the health plan’s direct medical expenses for adults.24 We also examined conditions known to be related to alcohol and drug problems; these were cirrhosis, diseases of the pancreas, hepatitis C, alcoholic neuropathy, alcoholic cardiomyopathy, alcoholic gastritis, excessive blood alcohol level, toxic effects of alcohol, and perinatal alcohol and drug dependence (International Classification of Diseases, Ninth Revision codes available on request from the corresponding author).

We did not include human immunodeficiency virus (HIV) infection because less than 0.01% of our sample had this diagnosis and because of the extraordinary health plan confidentiality of HIV data.

Sex, age, and length of health plan enrollment for the cases and matched controls were obtained from KP’s automated membership databases.

MEASURES FROM THE QUESTIONNAIRE

For the cases we also used measures from the study’s baseline questionnaire that was administered at the CDRP intake. Questions from the Diagnostic Interview Schedule for Psychosynthetic Substance Dependence were used to provide a DSM-IV diagnosis for alcohol and other drug (13 substance types) dependence and abuse.25 The baseline questionnaire also included questions on employment status and other demographic characteristics.

ANALYSES

We examined the prevalence of medical conditions for cases and controls. We also examined the subgroups of cases who were dependent on the 5 most prevalent substances of dependence within the patient sample (alcohol, marijuana, stimu-
lants, cocaine, and narcotic analgesics) and each of the matched controls for those particular cases. Because of the matched-controls design of the study, we used conditional logistic regression to obtain odds ratios (ORs) and 95% confidence intervals (CIs) of the odds of each diagnoses among cases compared with their controls. For comparisons in which the prevalence was 0 for either cases or controls, we used the Fisher exact test. No adjustments were made for multiple comparisons.26

RESULTS

CHARACTERISTICS OF CASES

The sample of substance abuse cases was 58% men (n=433) and 42% women (n=314) admitted to treatment. Almost 3 in 4 (73%) were white; the mean (SD) age was 37.6 (10.4) years; 43% were married or living as married; 65% were employed; 31% had household incomes of $40000 or more; 58% had at least some college education; 40% were alcohol dependent only; 29% were drug dependent only; 19% met criteria for alcohol and drug dependence; and 12% had a diagnosis of alcohol or drug abuse only (ie, they were not dependent). A total of 4+0 cases (59%) were dependent on alcohol, 24% on stimulants (eg, methamphetamine), 17% on marijuana, 9% on cocaine, and 8% on narcotic analgesics (eg, hydrocodone bitartrate, propoxyphene hydrochloride, codeine, or meperidine hydrochloride), 3% on tranquilizers (eg, diazepam, alprazolam, or lorazepam), and 1% or fewer on each of the remaining drugs for which dependence was assessed (heroin, hallucinogens, inhalants, phencyclidine, or other, or were polydrug dependent). Thus, we conducted analyses on each of the subgroups dependent on 1 of the 5 most prevalent drugs (these subgroups were not mutually exclusive because some individuals were dependent on more than 1 substance). We also examined the subgroup with combined alcohol and drug dependence (the 138 individuals who were dependent on both alcohol and 1 of the other 4 high-prevalence drugs). Each of these subgroups was similar to the overall sample with regard to age, although the groups dependent on stimulants, marijuana, and the combination of alcohol and drug(s) were younger (mean age, 32, 30, and 33 years, respectively). With regard to sex, the groups dependent on marijuana (36%) and cocaine (29%) had a lower proportion of women than the overall sample and the group dependent on narcotic analgesics had a much higher proportion of women (62%).

The Table presents the 1-year prevalence for the medical conditions examined, for the total sample of cases (n=747) and controls (n=3690), as well as ORs (and 95% CIs) for the odds that cases were diagnosed relative to controls. More than 1 in 4 (25.6%) of the substance abuse patients had been diagnosed with injury/overdose during the 1-year period, compared with only 12% of the matched controls (OR, 2.47; 95% CI, 2.03-2.99). With regard to psychiatric conditions, there were large differences between cases and controls for depression (29% vs 3%; OR, 14.91; 95% CI, 11.25-19.75), anxiety disorder (17% vs 2%; OR, 8.87; 95% CI, 6.58-11.97), and psychoses (7% vs 0.4%; OR, 18.64; 95% CI, 10.11-34.37).

For the subgroup of patients dependent on marijuana (n=125) and their matched controls (n=625), the pattern was similar to that of the the full sample, although in this subgroup neither the cases nor their controls had diagnoses of cirrhoses of the liver or chronic obstructive pulmonary disorder. There was also no significant difference in hepatitis C or hypertension prevalences for this subgroup.

Among patients dependent on stimulants (n=182) vs their controls (n=899), the pattern was similar to that of the the full sample, although in this subgroup neither the cases nor their controls had diagnoses of cirrhoses of the liver or chronic obstructive pulmonary disorder. There was also no significant difference in hepatitis C or hypertension prevalences for this subgroup.

For the subgroup of patients dependent on marijuana (n=125) and their matched controls (n=625), the pattern was similar to that of the full sample except that prevalences of acid-related disorders or arthritis were not significantly higher among the cases, and there were no diagnoses of cirrhosis; this result was also true for patients with combined alcohol and other drug dependence (n=138) compared with their matched controls (n=683). The same pattern was true among patients de-
Compared with their matched controls (n = 331), and there was also no difference among them in the prevalence of asthma or hepatitis C. However, the cocaine-dependent cases had a much higher prevalence of benign conditions of the uterus than their controls (7.5% vs 2.4%; OR, 3.46; 95% CI, 1.04-11.53). Such a difference was also found among the narcotic analgesic–dependent cases compared with their matched controls (14.3% vs 4.6%; OR, 3.70; 95% CI, 1.44-9.53).

Among the individuals dependent on narcotic analgesics, there were heightened odds of being diagnosed with pneumonia relative to their controls (4.8% vs 0.3%); OR, 12.42; 95% CI, 1.26-122.41), but no cirrhosis (in these cases or their controls), and no increased odds of hepatitis C.

### COMPARISON OF PREVALENCES OF MEDICAL CONDITIONS FOR DEMOGRAPHIC SUBGROUPS

For men, there were increased odds of pneumonia diagnoses among cases (1.2%) relative to controls (0.3%) (OR, 4.17; 95% CI, 1.27-13.65). The same was true for a diagnosis of hepatitis C (0.9% vs 0.05%; OR, 20.0; 95% CI, 2.24-178.94); for women there was no difference between cases and controls in the odds of receiving this diagnosis.

We also compared cases with controls among 3 age subgroups (patients aged 18-39 years, 40-54 years, and ≥55 years). Only in the youngest group were benign conditions of the uterus more common among cases than among controls (6.3% vs 4.1%, respectively; OR, 1.61; 95% CI, 1.02-2.54). Only among the 40- to 54-year-old group were there differences in hepatitis C between cases and controls (1.4% vs 0.3%; OR, 5.00; 95% CI, 1.25-20.0). There were very few significant differences between cases and controls among individuals 55 years and older—only ischemic heart disease, depression, and anxiety were heightened among the cases in this older group.

Finally, we reran all analyses (those pertaining to the overall sample as well as those of the substance type and demographic subgroups) on patients who used KP services (ie, those who had at least 1 outpatient visit or 1 inpatient hospitalization during the study period) (n = 658 for cases; n = 3248 for controls) to examine whether the findings for this subgroup differed.
We found no difference in the pattern of results when examining the patients who used services, with only 2 exceptions: toxic effects of alcohol was no longer significantly more prevalent among cases—although the difference approached significance ($P=0.09$); and, among women, hypertension was significantly more prevalent among cases (6%) than controls (3%) (OR, 1.85; 95% CI, 1.01-3.39).

**COMMENT**

This study broadens the literature on the medical problems of individuals treated for substance use disorders because it includes substances other than alcohol and a private population, and it makes use of health plan data collected in the course of medical care. The sample of cases comes from a largely middle-class, consistently insured population from an HMO substance abuse treatment program. Compared with public populations, it has a higher socioeconomic status: about 32% of the patients had incomes above $40000 and about 60% of them had at least 1 year of college education. The controls were drawn from the same HMO and demographically matched.

One limitation to our study is that, because of the heightened use of services by substance abuse patients during the time preceding treatment entry, the cases had greater opportunity to be diagnosed than the controls. However, we replicated our analyses for all patients who had at least 1 outpatient visit or 1 inpatient stay. Moreover, an important purpose of our study was to describe the diagnosed medical conditions of a substance abuse treatment sample compared with the average demographically comparable health plan member.

This study’s findings suggest that patients who are admitted to substance abuse treatment programs have heightened needs for medical and psychiatric services. Of the medical conditions we examined, one third were found to be significantly more prevalent among the treatment cases than among their matched controls. The most prevalent medical condition (aside from psychiatric disorders) among cases was injury/overdose, for which we found a large difference between cases and controls.

We also found large differences between cases and controls for the next 2 most prevalent medical conditions, lower back pain and headaches, as well as a third pain-related condition, arthritis. These pain-related conditions were especially prevalent (and of heightened prevalence, compared with controls) among patients dependent on narcotic analgesics (who were predominantly women). For example, compared with their controls, the odds that these patients received a headache diagnosis were 16 times higher; that they received an arthritis diagnosis were 18 times higher; and that they received a lower back pain diagnosis were 6 times higher. Although the case-control differences were most striking in the narcotic analgesic group, the heightened odds of receiving pain diagnoses were also found among each of the other drug-dependent groups with the exception of the cocaine group. These data cannot answer the question of whether patients self-medicate for their pain, and then become addicted to pain medications (or other drugs or alcohol), or whether individuals with a dependence on narcotic analgesics report pain to obtain prescriptions for these medications. Both scenarios may be true, even for the same individuals. The study’s findings highlight the importance of linkages between substance abuse treatment and primary care. Coordination with patients’ medical providers may benefit treatment outcome and prevent prescription of contraindicated medications. Concerns about patient confidentiality need to be considered in the context of recent evidence of the benefits of such linkages when policies are developed that encourage sharing substance abuse treatment and diagnostic information with medical providers. Moreover, there is evidence that many physicians are unaware that their patients have alcohol or drug problems, this lack of awareness may be particularly problematic for patients dependent on prescription medications, or when prescription medications may interact with alcohol or other substances of abuse to cause adverse effects. The findings also indirectly highlight the importance of screening to detect individuals with alcohol or drug problems, especially in emergency departments or trauma centers where the prevalence of alcohol and drug problems is particularly high.

The study’s findings also suggest that there may be a need for assessment of the role of self-medication within substance abuse treatment programs, and education or referral regarding alternative pain management strategies. While the CDRP where this study was conducted includes such an approach, that approach could be adopted more universally. Further, there may be a need for more education among medical care professionals regarding the role of narcotic analgesic prescriptions in substance abuse patients and, more broadly, regarding treatment of alcohol and drug problems within primary care. Studies have suggested that graduating residents feel less prepared to treat substance abuse patients than patients with other medical conditions, and that physicians desire additional education regarding the treatment of patients who abuse prescription drugs and other substances.

In addition to injuries and overdoses, we found differences for 4 other costly medical conditions: hypertension, congestive heart failure (among alcohol-dependent patients), pneumonia (among narcotic analgesic-dependent patients), and ischemic heart disease (among patients 55 years and older). These 5 conditions were among the 6 that contributed the most to the health plan’s direct medical expenses in a 1-year period.

Also of heightened prevalence were asthma, acid-related peptic disorders, chronic obstructive pulmonary disorders, cirrhoses, and hepatitis C, which were all more prevalent among cases than controls in the full sample. Although there was a relatively low prevalence of cirrhoses and diseases of the pancreas, their prevalence was significantly higher among cases than among matched controls, particularly, as expected, within the alcohol-dependent subgroup.

The prevalence of psychiatric conditions, including depression, anxiety and neurotic disorders, and major psychoses, was strikingly higher among the substance abuse patients than among their controls. This is
consistent with a large body of research indicating a high prevalence of psychiatric comorbidity among those with substance abuse problems. The need for treatment of psychiatric comorbidities is important; female patients with higher levels of psychiatric severity are at increased risk of early dropout, and patients with psychiatric problems have generally poorer treatment outcomes.

Conditions whose prevalences were not found to be different between cases and controls included cancer of the breast, lung, prostate, or colon, as well as diabetes, renal failure, cerebrovascular diseases, and benign conditions of the prostate. These conditions were of low prevalence for both groups, probably because patients were young, as the mean age in this sample was 38 years for both cases and controls.

Neither cases nor controls were diagnosed with alcoholic neuropathy, alcoholic cardiomyopathy, excessive blood alcohol levels, or poisoning by alcohol. Small numbers of cases were diagnosed with alcoholic gastritis and toxic effects of alcohol, no controls were diagnosed with any of these conditions, and the differences were statistically—but perhaps not clinically—significant. These findings were not unexpected, given the known low prevalence of these conditions, the young age of the sample studied, and the requirement that a physician detect an alcohol or drug problem in a patient to diagnose these conditions.

The findings highlight the need for medical screening and treatment as well as health education among substance abuse patients regarding medical consequences of substance abuse. Many substance abuse treatment programs, including the one where cases were recruited for this study, include group sessions of medical education and psychiatric consultations. In our study, the sample included cases recruited in a specialty setting, with the requirement that a psychiatrist diagnose these conditions, and the differences were statistically—but perhaps not clinically—significant. These findings were not unexpected, given the known low prevalence of these conditions, the young age of the sample studied, and the requirement that a physician detect an alcohol or drug problem in a patient to diagnose these conditions.

The findings highlight the need for medical screening and treatment as well as health education among substance abuse patients regarding medical consequences of substance abuse. Many substance abuse treatment programs, including the one where cases were recruited for this study, include group sessions of medical education as a required part of treatment. There is some evidence that the proportion of substance abuse treatment programs offering primary care services is increasing; however, such services are still less common in private than in public treatment programs. The lack of medical services and lower likelihood of medical referrals may be a particular deficit in programs within “carved-out” behavioral health plans.

Our findings on the heightened prevalence of several medical conditions in substance-abusing individuals point to the importance of examining comorbid medical and substance abuse in both primary care and specialty care. This may be particularly important for patients with injuries, hypertension, pain-related diagnoses, congestive heart failure, acid-related peptic disorders, asthma, and psychiatric disorders. The optimal treatment of many common medical conditions may require identification, intervention, and treatment of an underlying substance use disorder.

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