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Alcohol-induced psychotic disorder and delirium in the general population

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Background
Epidemiological data on alcohol-induced psychotic disorder and delirium (alcohol-induced psychotic syndrome, AIPS) are scarce.

Aims
To investigate the epidemiology of AIPS, the risk factors for developing AIPS among people with alcohol dependence, and mortality associated with alcohol dependence with or without AIPS, in a sample drawn from the general population of Finland.

Method
A general population sample of 8028 persons were interviewed with the Composite International Diagnostic Interview and screened for psychotic disorders using multiple sources. Best-estimate diagnoses of psychotic disorders were made using the Structured Clinical Interview for DSM–IV Axis I Disorders and case notes. Data on hospital treatments and deaths were collected from national registers.

Results
The lifetime prevalence was 0.5% for AIPS and was highest (1.8%) among men of working age. Younger age at onset of alcohol dependence, low socioeconomic status, father's mental health or alcohol problems and multiple hospital treatments were associated with increased risk of AIPS. Participants with a history of AIPS had considerable medical comorbidity, and 37% of them died during the 8-year follow-up.

Conclusions
Alcohol-induced psychotic disorder is a severe mental disorder with poor outcome.

Declaration of interest
None.

Alcohol has a central role in substance use disorders,[1] and alcohol use disorders are associated with a considerable burden in terms of morbidity and mortality.[2,3] Psychotic symptoms can occur in several clinical conditions related to alcohol such as intoxication, withdrawal, alcohol-induced psychotic disorder and delirium. In alcohol-induced psychotic disorder, the psychotic symptoms should be prominent and in excess of those usually associated with alcohol intoxication or withdrawal with perceptual disturbances, and severe enough to warrant clinical attention. Delirium is associated with disturbance of consciousness. The relationship between alcohol-induced psychotic disorder and delirium still needs clarification, but the two have been assumed to be different manifestations of the same process.[4] Delirium has been associated with high rates of morbidity and mortality, whereas the prognosis of alcohol hallucinosis has been thought to be better.[5] Despite the central role of alcohol in substance use disorders,[6] recent studies on substance-induced psychotic disorders have generally focused on psychoses induced by illicit drug use. Earlier data on alcohol-induced psychotic disorders are based on clinical samples,[7–11] collected typically in alcohol treatment units.[7–9] Epidemiological studies on the prevalence of alcohol-induced psychotic disorders are lacking. Therefore, using data from a comprehensive general population survey, we estimated the lifetime prevalence, sociodemographic and clinical characteristics, and mortality of alcohol-induced psychotic disorder and delirium – hereinafter called alcohol-induced psychotic syndrome (AIPS) – in the general population. Finally, we compared alcohol-dependent participants with and without a lifetime history of psychosis.

Method

The Health 2000 study is based on a nationally representative sample of 8028 persons aged 30 years and over.[12] A two-stage stratified cluster sampling procedure was used to select 80 areas in Finland, after which a random sample of individuals from these areas was drawn from the national population register. Individuals 80 years old or over were oversampled (2:1). Homeless persons and individuals staying in an institution were also included. The fieldwork took place in 2000–1 and consisted of a home interview and health examination at the local health centre or (for those unable to attend) a condensed interview and health examination at their place of residence. The response rate was 93%.[12] The health examination included the Munich Composite International Diagnostic Interview (CIDI).[13] As the CIDI is inadequate for diagnosing psychoses,[14,15] a second-phase investigation – the Psychoses in Finland study – was performed to find and diagnose people with psychotic disorders.[15] The ethics committees of the National Public Health Institute and the Hospital District of Helsinki and Uusimaa approved the Health 2000 survey and the Psychoses in Finland reassessment. Participants provided written informed consent.

Screening and diagnostic assessment of psychotic disorders

Details of the Psychoses in Finland study are described elsewhere.[15] First, the Health 2000 sample was screened for psychotic disorders. Second, those in the screen-positive subgroup were interviewed with the Structured Clinical Interview for DSM–IV Axis I Disorders (SCID–I).[16] Finally, lifetime best-estimate diagnoses were made based on the SCID–I responses and/or case notes (lifetime). The psychosis screen comprised the following elements: hospital treatment for any psychotic disorder or delirium (the national Hospital Discharge Register); reimbursed antipsychotic medication for severe mental disorder (Medication Reimbursement Register of the Finnish Social Insurance Institution); disability

pension awarded for psychotic disorder or depression (Pension Register of the Finnish Centre for Pensions); mood-stabilising medication use without a somatic indication such as epilepsy (Finnish National Prescription Register of the National Insurance Institution); symptoms suggesting psychotic or bipolar type 1 disorder in the CIDI interview; self-reported treatment for psychotic disorder; or possible or definite psychotic disorder according to the physician conducting the health examination in the Health 2000 survey.[15]

The screening process identified 746 persons of whom 444 were successfully interviewed with the SCID–I during 2002–4. We collected case notes from all lifetime hospital and out-patient treatments for mental health or substance-related problems, including individuals not interviewed. The final best-estimate DSM–IV diagnoses,[17] based on all available systematically evaluated information from the SCID–I and/or case notes, were made by three clinicians (J.P., J.S. and S.S.) for 692 participants. We did not contact or collect case notes for those who had refused to participate in Health 2000 ($n = 32$) and we did not find case records for 22 individuals. None of these 54 non-respondents had a diagnosis of alcohol-induced psychosis in the above-mentioned registers. Only definite DSM–IV psychotic disorders and other lifetime comorbid disorders were diagnosed.[15] Kappa values between the raters were 0.74–0.97 for different psychotic disorders. The lifetime prevalence rates of psychotic disorders were estimated at the time of the Health 2000 baseline survey.

Assessment of alcohol-induced psychotic disorder and delirium

Diagnostic assessment of alcohol-induced psychotic disorders and delirium followed the guidelines of DSM–IV: a diagnosis of primary psychotic disorder was given if there was no evidence of heavy substance use or withdrawal, or if the psychotic symptoms were established before heavy substance use, or if the symptoms persisted for more than a month during a substance-free period. Alcohol-induced psychotic disorder was diagnosed only if a primary psychotic disorder had been ruled out. In alcohol-induced psychotic disorder, prominent psychotic symptoms occurred during or shortly after periods of heavy alcohol use. During these periods the psychotic symptoms were in excess of those usually associated with alcohol intoxication or withdrawal with perceptual disturbances, and severe enough to warrant clinical attention. To improve reliability the psychotic symptoms had to last at least 1 day, which is the minimum duration of brief psychotic disorder. The minimum duration of psychotic symptoms in substance-induced psychotic disorders is not defined in DSM–IV.

Alcohol withdrawal with perceptual disturbances is diagnosed instead of alcohol-induced psychotic disorder if hallucinations occur with intact reality testing, a criterion that has been criticised.[18] However, we were not always able to evaluate whether the person had insight that the psychotic symptoms were alcohol-induced. Therefore, if the person had specifically sought help for psychotic symptoms related to alcohol use, the symptoms were judged to be in excess of the expected effects of intoxication and withdrawal. As disentangling the relationship between substance use disorders and psychotic disorders is a major diagnostic challenge, the SCID–I data and case notes of the possible cases of substance-induced psychotic disorders were once more reviewed with a senior psychiatrist (K.K.), an expert in this area. The best-estimate diagnoses were changed based on this review in the case of disagreement. The DSM–IV allows comorbidity of substance-induced psychotic disorders and psychotic disorders induced by general medical condition with other psychotic disorders, even though there is diagnostic hierarchy in other psychotic disorders. In this study the diagnosis of alcohol-induced psychotic disorder was not assigned if a participant with a diagnosis of a primary psychotic disorder developed an alcohol-induced episode of psychosis relapse. However, people who had an episode of alcohol-induced psychotic disorder followed by symptom-free years and later developed a primary psychotic disorder were given both lifetime diagnoses.

The best-estimate data were the source of information on the age at onset of the first psychotic symptoms, type of symptoms, age at first treatment for mental health and addiction problems and age at first episode of alcohol-induced psychosis. We assessed psychiatric hospital admissions according to Hospital Discharge Register information since 1969 and on case records before this. Age at onset of alcohol use disorders was the earliest age indicated by one of the following sources: SCID–I, CIDI, case notes and alcohol-related treatments in the national Hospital Discharge Register.

Assessment of alcohol dependence in the whole study population

For the remaining Health 2000 study sample, the lifetime diagnoses of alcohol dependence were based on the CIDI interview ($n = 6005$).[19] It covered 12-month diagnoses of mood, anxiety and substance use disorders, and lifetime diagnoses of alcohol dependence ($n = 482$) and other substance dependence ($n = 35$). Participants were asked at what age they took their first drink of alcohol. Current weekly consumption of alcohol, and parental alcohol use and mental health problems, were derived from a questionnaire. Of the participants with a best-estimate diagnosis of AIPS, 74.4% had participated in the CIDI interview. Those who had not did not differ in terms of age, gender or number of hospital treatments, but were older (mean 38.5 years, 95% CI 31.6–45.4) at first hospital treatment for an alcohol-related disorder than those who attended the interview (mean 30.0 years, 95% CI 27.5–32.5).

Sociodemographic variables

Information on age, gender and place of residence was obtained from the National Population Register. Household income was derived from the registers on taxes and welfare benefits, and adjusted for household size using the Organisation for Economic Cooperation and Development equivalence scale.[20] Information on marital status, level of education, and employment status was collected during the Health 2000 health interview.

Variables related to medical health and mortality

Data on the number of hospital treatments and the age at first hospital treatment for alcohol-related disorder and trauma (online Table DS1) were collected from the national Hospital Discharge Register (from 1969 to 2002). Information on deaths was obtained from the census data of the Social Insurance Institution of Finland (until March 2008). Cause of death was available for deaths occurring before the end of 2006 from the Causes of Death Register of Statistics Finland, and these were classified into natural and unnatural deaths. Alcohol-related deaths consisted of all deaths where either the underlying cause or one of the contributory causes was attributed to alcohol.[21]

Statistical analysis

All analyses were conducted using SUDAAN release 9.0 for Windows.[22] The two-stage cluster sampling design was included in all statistical analyses. Sample weights were used to adjust for the oversampling of individuals aged 80 years and over. When

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information was obtained from the CIDI or health examination in the baseline Health 2000 survey, post-stratification weights were applied to adjust for missing data.[23] All weights were used to obtain figures representing the Finnish general population. Different analyses were conducted on the largest possible number of participants for whom data were available.

We present means and prevalence rates adjusted for age and gender, calculated as predicted margins in regression models. Linear regression was used for continuous variables. Logistic regression was also used to calculate odds ratios for categorical variables. All the models were adjusted for age and gender. Cox proportional hazards models were used to examine the effect of AIPS on mortality, controlling for age and gender. These models, as well as analysis of alcohol-related hospital treatments, were restricted to the population under 70 years old, because only one participant with AIPS was over that age at the time of baseline study. Hazard ratios (HR) for mortality among participants with alcohol-induced psychotic disorder and/or delirium, those with alcohol dependence and the rest of the sample were calculated. Scaled score residuals were used to assess influence of an observation on the maximum partial likelihood estimate of a coefficient upon deleting each observation in turn.[24] The magnitudes of the scaled score residuals were similar, indicating that none of the observations was too influential individually.

Results

Alcohol-induced psychotic syndrome was diagnosed in 39 participants. Of these, 31 were diagnosed with alcohol-induced psychotic disorder and 14 with delirium, including 6 people who had both diagnoses. Other substance-induced psychotic disorder was found in two participants. Multiple sources of information were needed to find people with AIPS. The proportion of people with AIPS identified by different screening methods from the Health 2000 sample to the Psychosis in Finland reassessment are presented in Table 1. Even though 28 of the 39 individuals with AIPS attended the CIDI interview used as a psychosis screen, only half of them reported psychotic symptoms. Only 18 participants with AIPS attended the SCID–I interview. Thus, case notes were essential for accurate diagnosis for over half of these participants.

Lifetime prevalence and demographic characteristics

The lifetime prevalence was 0.41% (95% CI 0.29–0.57) for alcohol-induced psychotic disorder and 0.18% (95% CI 0.11–0.32%) for delirium. When each individual was counted once only, the lifetime prevalence for the combined syndrome was 0.51%. Nearly all of those with AIPS were men, among whom the highest lifetime prevalence (1.8%) was found in the age group 45–54 years (Table 2). Demographic characteristics for the AIPS group and the rest of the sample are shown in online Table DS2. Participants with AIPS were younger (mean age 46.3 years) than the rest of the sample (mean age 52.6 years). After adjustment for age and gender, the odds ratio of having a lifetime diagnosis of AIPS was significantly higher in the never married and widowed or divorced, pensioned and unemployed, and middle- to low-income groups. Significant differences in demographic characteristics between alcohol-induced psychotic disorder and delirium were not found (data available on request).

Clinical characteristics

Of participants with alcohol-induced psychotic disorder, 30 (97%) had the subtype 'with hallucinations' according to predominant

Table 1 People with a diagnosis of alcohol-induced psychotic syndrome[a] ($n = 39$) identified by specific screens in Psychosis in Finland study

	Alcohol-induced psychotic syndrome	
Screen	*n*	%
National registers		
All registers[b]	29	74
Psychotic disorder in Hospital Discharge Register	23	59
Psychotic disorder in other registers[c]	9	23
CIDI		
CIDI all sections	14	36
CIDIG psychotic symptoms	13	33
CIDIF manic symptoms	3	8
CIDIP other symptoms related to psychosis	8	21
Baseline study		
Psychosis assessed by physician	1	3
Self-reported psychoses	1	3

CIDI, Composite International Diagnostic Interview; CIDIG, CIDI section G; CIDIF, CIDI section F; CIDIP, CIDI section P.
a. Alcohol-induced psychotic syndrome includes alcohol-induced psychotic disorders and delirium. Each individual might have been identified through several screens.
b. Includes the Hospital Disharge Register, the Medication Reimbursement Register, the Pension Register and the Prescription Register.
c. Includes the Medication Reimbursement Register, the Pension Register and the Prescription Register.

Table 2 Lifetime prevalences of alcohol-induced psychotic syndrome[a] by age group and gender

		All		Men		Women	
Age group	*n*	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	39	0.51	(0.38–0.70)	0.96	(0.68–1.35)[b]	0.12	(0.05–0.29)
30–44	15	0.56	(0.34–0.92)	0.99	(0.58–1.67)[b]	0.15	(0.04–0.59)
45–54	20	1.04	(0.66–1.65)	1.77	(1.06–2.94)[b]	0.31	(0.10–0.97)
55+	4	0.13	(0.05–0.35)	0.32	(0.12–0.84)[b]	0	

a. Includes alcohol-induced psychotic disorder and delirium.
b. Difference between men and women significant at the 0.05 level.

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symptoms, but 16 (53%) of them had had delusions in addition to hallucinations. Of participants with delirium, 12 (86%) had had hallucinations, 6 (43%) delusions and 5 (42%) both. Considered as a single group, 37 (95%) participants had had hallucinations and 20 (51%) had had delusions. There was no information on the type of the hallucinations for 9 participants; of those with information available, 11 (28%) had had auditory hallucinations, 5 (14%) visual hallucinations and 22 (59%) both during the psychotic episodes. Most participants (87%) had had multiple episodes of alcohol-induced psychosis with full recovery between the episodes.

In the participants with AIPS, the mean age at the time of the first drink was 15.5 years (95% CI 14.4–16.7) according to the CIDI data. The mean duration of alcohol use was 29.5 years (range 14–50, 95% CI 26.8–32.2). According to best-estimate data the mean onset ages were 24.6 years (95% CI 22.2–27.1) for alcohol use disorder and 34.3 years (95% CI 31.3–37.2) for psychotic symptoms. The time between the first drink and the onset of psychotic symptoms was 18.4 years (range 6–34, 95% CI 15.4–21.4) and the time between the onset of alcohol use disorder and psychotic symptoms was 10.4 years (range 1–28, 95% CI 7.8–12.7).

Lifetime comorbid mental health disorders in AIPS

Most ($n = 25$, 64%) participants with AIPS had lifetime comorbid mental health disorders, participants with alcohol-induced psychotic disorder having higher rates ($n = 19$, 76%) than those with delirium ($n = 6$, 43%) (Table 3). Other substance use disorders were found in 10 (26%) participants: 6 with sedative dependence or misuse, 2 with polysubstance misuse, 1 with sedative and polysubstance misuse and 1 with opioid, cannabis and polysubstance dependence. However, during episodes of the alcohol-related psychosis, no evidence was found for concurrent substance use. At some point after the alcohol-induced psychotic episode, five participants (13%) developed a primary psychosis. One participant with alcohol-induced psychotic disorder developed schizophrenia, one schizophreniform disorder and one psychotic disorder not otherwise specified. One participant with delirium developed bipolar disorder with psychotic features and another had a later episode of brief psychotic disorder. The time between the onset of alcohol-induced psychosis and primary psychosis varied from 5 to 10 years (mean 7.8, 95% CI 6.0–9.6).

Alcohol-induced psychotic syndrome in alcohol dependence

The lifetime prevalence of AIPS among participants who were alcohol-dependent was 4.83% (95% CI 3.23–7.17): 4.00% (95% CI 2.61–6.08) for alcohol-induced psychotic disorder and 1.89% (95% CI 0.98–3.60) for delirium. Among those with alcohol dependence, the odds of having had AIPS were higher in participants having low income, being never married, unemployed, and belonging to the age group 45–54 years (online Table DS2). There was no difference in age between those with and those without psychosis (mean age 45.0 years *v.* 46.8 years). Those with AIPS reported more parental – specifically paternal – alcohol problems than participants with alcohol dependence only. Association with paternal mental health problems was also found. The results were similar when primary psychotic disorders were excluded.

The mean age at first drinking alcohol (15.5 years, 95% CI 14.4–16.7 *v.* 16.2 years, 95% CI 15.8–16.6) and at the onset of alcohol dependence (27.3 years, 95% CI 22.3–32.3 *v.* 28.7 years, 95% CI 27.6–29.7) were similar for participants with AIPS and those with alcohol dependence respectively, according to the CIDI data. However, as mentioned earlier, the AIPS group had earlier onset of alcohol use disorder according to the best-estimate data (24.6 years). The groups did not differ in remission rates (the criteria of alcohol dependence diagnosis had not been fulfilled within the past 12 months) of alcohol dependence at the time of the CIDI interview (AIPS 31.7%, 95% CI 17.6–50.2; alcohol dependence 49.1%, 95% CI 44.6–53.6). When only those with active dependence were included, the groups did not differ by the maximum number of drinks on a single occasion during the previous 12 months (15.0 drinks *v.* 15.8 drinks) or in alcohol consumption (318.2 g *v.* 299.1 g per week).

Treatment and alcohol-related morbidity in AIPS

The time from onset of alcohol use disorder to first treatment contact for alcohol problems was 6.8 years (95% CI 4.5–9.1) and to first treatment for psychosis 10.4 years (95% CI 7.9–12.9) in participants with AIPS. The first treatment place for alcohol-induced psychosis was distributed as follows: psychiatric hospital 46%, general hospital 3%, psychiatric out-patient care 3%, alcohol treatment settings 8%, primary healthcare centre 28%; 13% had received no treatment for the first episode. During their lifetime, all participants with AIPS had had some mental health or alcohol treatment contact and 82.1% had psychiatric hospital treatment. However, only 59% had sometimes been treated in psychiatric hospital with a diagnosis of any psychotic disorder.

Alcohol-related hospital treatments in participants with AIPS, alcohol dependence only and the rest of the study population are presented in Table 4. Hospital treatment for any alcohol-related cause identified from the national Hospital Discharge Register was found for 91% of the participants with AIPS, 16% of those with alcohol dependence and 3% of the rest of the sample. Among those receiving alcohol-related treatment, participants with AIPS were younger (mean age 32.9 years, 95% CI 30.2–35.6) at first

Table 3 Lifetime comorbid disorders in people with alcohol-induced psychotic disorder and delirium in the Psychosis in Finland study

	All alcohol-induced psychotic syndrome ($n = 39$)		Alcohol-induced psychotic disorder ($n = 25$)		Alcohol-induced delirium ($n = 14$)			
	%	(s.e.)	%	(s.e)	%	(s.e)	χ^2	*P*
Comorbid disorders[a]								
Affective disorder	30.8	(7.66)	40.0	(10.12)	14.3	(9.43)	3.11	0.08
Anxiety disorder	23.1	(6.68)	24.0	(8.59)	21.4	(10.20)	0.04	0.85
Other substance use disorder	25.6	(7.38)	20.0	(8.14)	35.7	(11.86)	1.29	0.26
Other mental disorder	12.8	(4.96)	20.0	(7.48)	0	(0)	4.96	0.03
Personality disorder[b]	28.2	(6.98)	36.0	(9.29)	14.3	(8.71)	2.86	0.09
Any diagnosis	64.1	(7.44)	76.0	(8.27)	42.6	(12.22)	4.62	0.03

a. Based on best-estimate diagnoses.
b. Personality disorder diagnosis used if the diagnosis has been made during treatment.

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Table 4 Lifetime hospital treatment for alcohol-related disorders according to the Finnish Hospital Discharge Register[a]

	Population without alcohol dependence ($n = 5891$)		Alcohol dependence ($n = 443$)		Alcohol-induced psychotic syndrome ($n = 38$)					
	% Adjusted	(95%CI)	% Adjusted	(95%CI)	% Adjusted	(95%CI)	OR1	(95%CI)	OR2	(95%CI)
Any alcohol-related disorder	2.61	(2.15–3.16)[a]	16.40	(13.05–20.41)	90.76	(74.57–97.05)[a]	∞		61.60	(18.82–198.39)
Alcohol use disorder	1.91	(1.51–2.40)[a]	13.05	(9.88–17.04)	87.71	(71.01–95.41)[b]	∞		65.60	(17.62–244.21)
Alcohol intoxication	0.20	(0.11–0.38)	1.11	(0.46–2.63)	12.71	(4.54–30.83)	71.38	(20.30–250.91)	17.74	(4.44–70.81)
Alcohol-related liver disease	0.26	(0.20–0.50)	0.89	(0.34–2.33)	8.44	(3.56–25.86)	35.19	(6.93–178.78)	23.62	(4.36–128.04)
Alcohol-induced pancreatitis	0.49	(0.32–0.74)	3.37	(2.06–5.47)	11.03	(3.48–29.94)	25.76	(6.77–98.99)	3.15	(0.85–11.66)
Epilepsy[c]	1.08	(0.84–1.39)	1.14	(0.49–2.65)	2.97	(0.42–18.55)	2.80	(0.37–20.94)	2.65	(0.30–23.42)
Other intoxications	1.84	(1.48–2.29)	3.37	(2.03–5.54)	27.27	(14.71–44.91)	20.51	(9.01–46.71)	9.44	(3.68–24.17)
Any intoxications	1.95	(1.57–2.42)	4.04	(2.56–6.30)	36.63	(21.79–54.52)	29.84	(13.72–64.90)	12.72	(5.27–30.70)
Other substance-related use/disorder	0.75	(0.56–1.00)	3.19	(1.86–5.44)	27.33	(14.81–44.88)	50.77	(21.78–118.33)	14.26	(5.71–35.65)
Arrhythmias	2.11	(1.75–2.54)	3.15	(1.81–5.45)	6.47	(1.58–22.92)	3.43	(0.70–16.73)	2.32	(0.44–12.33)
Gastritis	0.81	(0.60–1.08)	2.65	(1.41–4.92)	7.50	(2.45–20.74)	9.99	(2.88–34.64)	3.79	(1.01–14.24)
Head injuries	3.50	(3.06–3.99)	6.06	(4.13–8.80)	17.77	(8.96–32.17)	6.11	(2.72–13.75)	4.12	(1.70–10.02)
Any fractures	8.79	(8.00–9.65)	16.96	(13.65–20.88)	32.35	(19.06–49.28)	5.13	(2.45–10.76)	2.80	(1.30–6.01)

OR1, alcohol-induced psychotic syndrome compared with population without alcohol dependence; OR2, alcohol-induced psychotic syndrome compared with alcohol dependence.
a. Individuals over 70 years were excluded. Prevalences and ORs adjusted for age and gender.
b. Unadjusted figures shown, adjusted % could not be calculated.
c. Includes epilepsy, alcoholic polyneuropathy, and degeneration of nervous system due to alcohol. Unadjusted figures calculated due to the small sample size.

treatment and had a higher number of treatments (mean 6.5, 95% CI 2.8–10.2) compared with those with alcohol dependence (mean age 39.8 years, 95% CI 37.6–42.1; mean treatment number 2.8, 95% CI 1.9–3.7) or those without (mean age 40.9 years, 95% CI 38.9–42.9; mean treatment number 2.5, 95% CI 1.8–3.3). The odds of having had hospital treatment for alcohol or other intoxication, other substance use, alcohol-related liver disorder, gastritis, fractures or head injury were higher in participants with history of AIPS compared with participants with alcohol dependence and the study population without alcohol dependence. Pancreatitis was not more common in participants with AIPS compared with other alcohol-dependent participants, but it was more common than in those without alcohol dependence.

Mortality and AIPS

Mortality of participants with AIPS was high (Table 5). More than a third (37%) of participants with AIPS had died during the follow-up period. There was no difference in mortality rates between participants with alcohol-induced psychotic disorder (40.0%) and delirium (30.8%) (HR = 1.38, 95% CI 0.43–4.48). The risk of death during the follow-up period was substantially higher among participants with AIPS compared with those with alcohol dependence (HR = 12.33, 95% CI 6.28–24.21) and with the rest of the study population (HR = 19.91). The underlying cause of death was available for ten participants with AIPS: four of the deaths were natural (two cardiovascular and two other somatic diseases), two were suicide and four were other unnatural deaths. Six of these deaths were coded as alcohol-related.

Discussion

Lifetime prevalence of AIPS

The most striking feature in the lifetime prevalence of AIPS was the high prevalence (1.8%) in men of working age, higher than the prevalence of schizophrenia in the same group.[15] Consistent with previous findings,[7,8] people with a history of AIPS had low income, were often unemployed or living on their pension, and lived alone. These associations were found in comparison with the general population, but most were also markedly clear in comparison to people who were alcohol-dependent without AIPS. Previous information on alcohol-induced psychotic disorder and delirium has been based on clinical samples such as patients in alcohol treatment units.[7–9] Among patients with alcohol dependence treated in psychiatric hospitals in Germany, the annual prevalence of alcohol-induced psychotic disorders and delirium was 0.6–0.7% and 4.9–7.4% respectively.[10,11] In alcohol treatment settings, 2–7% of patients with alcohol dependence had alcohol hallucinosis,[8,9] 5–11% delirium tremens,[5,8] and a quarter subclinical psychotic symptoms in their lifetime.[7]

Contrary to previous research, we found a higher lifetime prevalence of alcohol-induced psychotic disorder (4.0%) than delirium (1.9%) among people with alcohol dependence. This could partly be explained by the age distribution: people with a history of delirium might not have lived long enough to be selected in the study. This could also explain the low prevalence in the oldest age groups, as well as the lack of difference in mortality rates between people with a history of alcohol-induced psychotic disorder and those with delirium. Another possibility is the effect of service systems on prevalence estimates in previous studies. There is considerable variation in the way alcohol and drug services are organised.[25] In some countries the psychiatric sector has a large role in alcohol and drug treatment, whereas in others (such as Finland) many services belong to the social service sector. Although delirium is a life-threatening condition that

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Table 5 Deaths and hazard ratios for death among individuals with alcohol dependence, alcohol-induced psychotic disorder and delirium compared with the rest of the sample[a]

	Deaths between 2000 and 2008			Model[b]	
	n	%	(95%CI)	HR	(95%CI)
Population without alcohol dependence	242	4.11	(3.57–4.72)	1	
Persons with alcohol dependence without alcohol-induced psychotic syndrome	29	6.54	(4.51–9.41)	1.61	(1.05–2.45)
Alcohol-induced psychotic syndrome[c]	14	36.84	(22.13–54.50)	19.91	(11.48–34.53)

a. Individuals over 70 years were excluded. Age and gender adjusted.
b. Post-stratification weights used in the Cox model.
c. Includes alcohol-induced psychotic disorder and delirium.

usually requires intensive hospital care, there may be more variation in treatment services for people with alcohol dependence with alcohol-induced psychotic disorder. Accordingly, only a third of participants with a first episode of alcohol-induced psychosis were treated in a psychiatric hospital, whereas the corresponding figure was over 70% for people with delirium.

Clinical features

The variability of psychotic symptoms in alcohol-induced psychotic disorder seemed to be higher than described in DSM–IV. Concurrent delusions and auditory and visual hallucinations seem to be more common than described there. Congruently with a previous clinical study,[7] we found earlier onset of alcohol problems and more other drug use in alcohol-dependent people with related psychotic disorder than in those without. We also found a high prevalence of sedative and hypnotic misuse, and a large number of medical problems and psychiatric symptoms that have been associated with a history of severe alcohol withdrawal episodes.[8] These results also agree with earlier studies reporting that heavy alcohol use over many years precedes alcohol-induced psychosis and delirium.[7,8] Although not all participants sought treatment for the first psychotic episode, all had had some treatment contact for alcohol or mental health problems. Overall, there was enormous variability in the place of treatment.

Comorbidity

The finding that two-thirds of participants with AIPS had comorbid psychiatric disorders is congruent with earlier findings that psychiatric problems are common in this syndrome.[8] It is possible that the central nervous system of people with comorbid psychiatric disorders is generally more sensitive to effects of alcohol withdrawal and intoxication compared with those without psychiatric comorbidity. However, it is also possible that psychiatric comorbidity is just another indicator of a history of more intense alcohol use or more severe withdrawal.[8] The participants with AIPS had had more alcohol-related disorders than those with alcohol dependence without AIPS. We found no evidence of organ-specific vulnerabilities of alcohol damage, which has been supported by twin studies.[26,27] These findings are concordant with previous reports indicating that severe alcohol dependence and alcohol-related psychoses are associated with severe medical comorbidity.[2,28]

The participants with alcohol-induced psychotic disorder had more comorbid mental health disorders than participants with delirium. Although we expected to find higher medical comorbidity and mortality in participants with delirium,[5] we found no difference between the groups. Clinical characteristics were also similar (data not shown). The results support earlier hypotheses that the two conditions are different manifestations of the same process.[4] However, the number of participants did not allow the detection of small differences.

Mortality

Mortality was strikingly high in participants with AIPS: more than a third of participants died during 8 years of follow-up, and the age- and gender-adjusted hazard ratio was 20 compared with the rest of the population and 12 compared with alcohol-dependent participants without AIPS. Our results are not directly comparable with prior studies conducted in clinical samples with the follow-up starting from the index episode.[28–31] In our sample the mean time from the onset of psychotic symptoms to the sample selection was 10.7 years (range 0–29). However, these high figures inform us about the long-term mortality of participants with prior history of alcohol-induced psychotic syndrome. The mortality risk found in this study is comparable to mortality associated with several cancers.[32]

Limitations

Prevalence figures presented here are still underestimates; there were most probably some participants with AIPS but no hospital treatment who did not complete the CIDI, or who did so but did not report their symptoms. Screening of AIPS was challenging: the national registers were the best source of information, but even the Hospital Discharge Register was only able to find 59% of the participants compared with 81% of those with non-affective psychoses.[15] Even with multiple sources of information for screening and personal interviews with SCID–I, we would not have been able to make specific diagnoses for most of the participants without the information from the case notes.

The exclusion of young adults limits the comparison with clinical studies. However, as exposure to intense and chronic alcohol use is usually needed in AIPS, supported by the high age at onset of psychotic symptoms found here, the prevalence of AIPS in people under 30 years old is likely to be lower than in older groups.

The lifetime prevalence of other substance-induced psychoses in Finland is low,[15] reflecting the low levels of illegal drug use among people over 30 years old.[2] Because of their rarity we did not include other substance-induced psychoses here. This relatively homogeneous population allowed us to study the specific effect of alcohol on psychosis. We did not always have enough information on insight related to psychotic symptoms during the psychotic episode; thus, we included participants who had sought help specifically for psychotic symptoms. This could have raised the lifetime prevalence of alcohol-induced psychotic disorder found here compared with clinical studies. However, seeking help indicates clinical significance and need for treatment,[18] which is also shown by the high morbidity and mortality rates seen in the results.

The validity of the substance-induced psychosis diagnosis seems to be controversial. Half of those with cannabis-induced psychotic disorders treated in hospital turned out to have a diagnosis of schizophrenia-spectrum disorder when followed

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up.[33] In our study, 13% of participants with alcohol-induced psychotic syndrome developed another psychosis, and one individual developed schizophrenia. Although we could not assess the effect of psychotic disorders in relatives,[34] we found that paternal alcohol problems and paternal mental health problems were associated with developing alcohol-induced psychosis in participants with alcohol dependence. The result is in agreement with earlier studies finding an association between alcohol disorders in parents and offspring.[35,36] That the association related specifically to paternal problems suggests that the elevated risk might be related to the family environment instead of genetic predisposition only.[37] Family-related genetic and environmental factors in developing psychosis related to alcohol and other substances are important themes that warrant future studies.

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