Mental illness and accidental death

Case–control psychological autopsy study

SUSAN S. F. GAU and ANDREW T. A. CHENG

Background Few studies have systematically investigated the psychiatric antecedents of accidental death.

Aims To examine the patterns of psychiatric morbidities contributing to accidental death in three ethnic groups (Han, Ami and Atayal) in Taiwan.

Method A case–control psychological autopsy was conducted among 90 accidental deaths (randomly selected from a total of 413) and 180 living controls matched for age, gender, ethnicity and area of residence in Taiwan.

Results The risk of accidental death was significantly associated with alcohol use disorder and with other common mental disorders. When jointly considered, it was greatest when these two types of disorders co-existed, followed by common mental disorders alone. The risk of accidental death increased with the number of comorbid conditions.

Conclusions The prevention of accidental death should be incorporated into preventive psychiatry, not just for alcohol use disorder, but also for all other common mental disorders.

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Accident is a major cause of death in most countries, and road traffic accidents have been projected to be the third leading contributor to the burden of disease for the world in 2020, after ischaemic heart disease and major depression (Murray & Lopez, 1996). People with mental illness have high mortality rates for both natural and unnatural deaths (e.g. Hiroeh *et al*, 2001). Although the association between mental illness and suicide has been extensively documented (e.g. by Harris & Barraclough, 1997), few studies have systematically investigated major psychiatric disorders preceding accidental death (Holding & Barraclough, 1977), and no study has examined the individual and combined effects of psychiatric disorders with the same assessments for cases and controls. Using a matched case–control psychological autopsy, we aimed to examine the pattern of psychiatric morbidity contributing to accidental death across three ethnic groups in East Taiwan.

METHOD

Study sample

The study took place in Hualien County, East Taiwan, between July 1990 and June 1991 among two aboriginal groups, the Atayal and the Ami, and the Han Chinese population of Taiwan. Aboriginal people in Taiwan have experienced rapid acculturation in the past three decades with tremendous socio-economic pressure and psychosocial stress from the dominant Han Chinese population; the Ami are the most acculturated group and the Atayal the least acculturated (Cheng & Chen, 1995). Previous studies have found considerably higher rates of suicide (Cheng, 1995) and alcoholism (Cheng & Chen, 1995) in the Atayal compared with the Ami and Han populations.

Based on the number of accidental deaths occurring in each country in the year

before the study, 30 cases were randomly selected with probability proportional to size for each type of accidental death in people aged 15 years or over in each of the three ethnic groups. The total numbers of accidental deaths were 59, 80 and 274 among the Atayal, Ami and Han, respectively, during the study period. Overall, 81% of the deaths were men, and 66% were the result of road traffic accidents. The distributions of age, gender and accident type were similar in the study sample and in the total group of accidental deaths, with no statistically significant difference. Every case was matched with two living controls for age (plus or minus 5 years), gender, ethnicity and area of residence (same village or district) during the year before the death, randomly selected from the census record for the relevant area of residence.

Ascertainment of accidental death

In Taiwan, a death verdict of unnatural cause is jointly assigned by a prosecutor and a coroner, whose main concern is the possibility of homicide. They usually carefully inquire for any evidence of suicide and accident, because such a verdict helps to exclude the possibility of homicide. As previously reported (Cheng, 1995), accident is often recorded as the cause of unnatural deaths that were actually suicide (e.g. by drowning, poisoning or falling) on the official death certificates to avoid any argument with insurance agencies and the dead person's relatives. However, the officials do quite accurately differentiate between suicide, accident and homicide, and record the actual cause of death in their confidential inquest notes.

In view of this, in the first stage of ascertainment of accidental death the research team jointly examined the inquest notes of consecutive unnatural deaths (including post-mortem reports) and interviewed prosecutors and coroners within a few days after the death to collect relevant information, including any suicidal behaviour (threats, warnings and notes), mental illness, serious life events and the circumstances in which the incident occurred. The team then reclassified all unnatural, non-homicidal deaths during the research period as suicide (n=47), accident (n=413) or undetermined (n=2), by joint discussion on a weekly basis. The second stage of case identification was the random selection of cases from the accident group.

Fieldwork

The review board of the National Science Council, Taiwan, approved this study. Key informants in the sample cases, including close relatives of the dead person and significant others, were contacted approximately 1 month after the death occurred. A direct home visit, introduced by a public health nurse or local civil servant, was arranged in order to conduct a psychological autopsy interview. Informed consent was obtained from the key informants after detailed explanation of the purpose and interview procedures of this study, and confidentiality about interview records was assured. After the completion of the interview for each accidental death, two controls were selected from the local census record, and their key informants were briefly interviewed, with informed consent. A research psychiatrist (A.T.A.C.) and two clinical psychologists (one of them from an aboriginal ethnic group) conducted the interview separately. All interviewers had years of experience in field interviews related to mental illness and had participated in the previous psychological autopsy study of suicide among the same groups (Cheng, 1995; Cheng *et al*, 2000).

Two deaths in the sample (both of men: one drowned) were judged to be suicide from our psychological autopsy interview. Both men were found to have had major depression with clear suicidal ideation and communication before death. These cases were replaced by two subsequent cases of accidental death, randomly drawn from the same ethnic group.

Several key informants were identified for most cases and controls. The mean number interviewed was 13 for cases (s.d.=2.2) and 12 for controls (s.d.=2.1). In 97.8% of both accidental deaths and controls, we interviewed family members who had lived with the individual before death. We were able to interview at least two key informants for each of the cases and the controls.

Psychological autopsy interview

The psychological autopsy interview was modified from a version used in our earlier suicide study among the same ethnic groups in East Taiwan (Cheng, 1995). In this modification, we retained several parts of the original interview, including questions on medical and psychiatric history and clinical conditions (including the use of alcohol and drugs) at the time of death (122 items), and associated demographic and psychosocial factors (146 items). Additional sections were designed to obtain information about personal and environmental conditions for various types of accidents in cases (43 items), as well as the previous history of accidents in both cases and controls (4 items), making a total of 315 items. A space was provided for descriptive information about the scene of the accident. Audiotape recordings of several interviews were made, with the interviewees' informed consent.

The interview records of cases and controls were jointly reviewed by the interviewers to reach a consensus. Any residual disagreement was then clarified by reference to the tape-recordings and/or further visits to the interviewees.

Reliability of psychiatric assessment

The interrater reliability of the psychological autopsy interview was investigated in the earlier suicide study (Cheng, 1995). Using the results of a pre-test among 10 suicides from all three groups, the kappa coefficients between the three raters at item level were found to range from 0.78 to 1.00. Psychiatric diagnoses of cases and controls were made according to DSM–III–R (American Psychiatric Association, 1987) by A.T.A.C., who was not masked to case–control status. However, the clinical data for 15 suicides and 15 controls randomly selected from the three groups were given to another senior psychiatrist, who was masked to their case–control status, for independent diagnoses. Interrater reliability between the two psychiatrists was satisfactory, with 100% agreement for major depression, substance use disorder, adjustment disorder, schizophrenia and organic mental disorder.

Statistical analysis

First, descriptive statistics were used to present incidence of accidental death, the distribution of demographic characteristics and types of accident, and frequencies of psychiatric diagnoses in cases and controls. Since our cases and controls were individually matched, conditional logistic regression was next applied to assess the risk of accidental death. Univariate regression analysis was then performed to calculate the odds ratios and 95% confidence intervals of accidental death for individual diagnostic categories. Finally, multivariate regression analysis was used to examine the interactive effects of all the significant mental disorders and to test whether the effect of mental disorders varied across the three ethnic groups. Statistical analyses were performed using SAS version 8.2 (SAS Institute Inc., Cary, NC, USA). The pre-selected alpha level was defined as $P < 0.05$.

RESULTS

The age-standardised incidence rate of accidental death in the Atayal group (431.4 per 100 000) was significantly higher than in the Ami (199.0 per 100 000) and Han (122.4 per 100 000) groups. Rates were also significantly higher in men than in women in all three groups (676.0, 285.6 and 181.2 per 100 000 in men, and 150.7, 93.2 and 51.9 per 100 000 in women, among Atayal, Ami and Han, respectively).

Characteristics of the study sample

Among the case group, there were more men than women in all three ethnic groups, ranging from 70% in the Han group to 83% in the Atayal group (Table 1). There was a tendency for those in the Atayal group to be younger than in the Ami and Han groups, whereas there were more older people in the Han group. The difference was, however, only marginally significant ($\chi^2 = 8.91$, d.f.=4, $P=0.063$). No statistically significant difference was observed among the three groups in terms of gender distribution ($\chi^2 = 1.67$, d.f.=2, $P=0.434$) and accident type ($\chi^2 = 0.38$, d.f.=2, $P=0.828$). In nearly two-thirds of the cases death was due to a traffic accident, across all three groups. Falling was the second most common cause in all three groups, and its incidence was highest in the Atayal, who live in mountainous areas.

Distribution of mental illness

Table 2 presents the percentages of individual DSM–III–R Axis I diagnoses among cases and controls. In all three ethnic groups, the most prevalent diagnoses were substance use disorders (largely alcohol), followed by depressive disorders (mainly major depression) in both cases and controls. The main difference between cases and controls was the generally higher rates of morbidity in all diagnostic categories in the former, especially substance use disorders. Comorbid conditions were more prevalent than single illnesses among cases, whereas single illness was more prevalent

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Table 1 Characteristics of study sample: cases of accidental death in three Taiwanese ethnic groups

	Atayal (*n*=30)	Ami (*n*=30)	Han (*n*=30)	Total (*n*=90)
	n (%)	*n* (%)	*n* (%)	*n* (%)
Age, years				
15–29	11 (37)	4 (13)	6 (20)	21 (23)
30–59	15 (50)	18 (60)	12 (40)	45 (50)
⩾60	4 (13)	8 (27)	12 (40)	24 (27)
Gender				
Male	25 (83)	24 (80)	21 (70)	70 (78)
Female	5 (17)	6 (20)	9 (30)	20 (22)
Type of accident				
Traffic	20 (67)	18 (60)	18 (60)	56 (62)
Other	10 (33)	12 (40)	12 (40)	34 (38)
Falling	9 (30)	5 (17)	4 (13)	18 (20)
Drowning	0	3 (10)	3 (10)	6 (7)
Compression	1 (3)	1 (3)	3 (10)	5 (6)
Fire	0	2 (7)	1 (3)	3 (3)
Poisoning	0	1 (3)	0	1 (1)
Burning	0	0	1 (3)	1 (1)

Inter-ethnic comparisons on distribution of age, gender and types of accident (traffic *v.* other) all non-significant.

than comorbidity among controls in all groups.

In both cases and controls, rates of total psychiatric morbidity were significantly higher in the two aboriginal groups than in the Han group; this difference was evident mainly for depressive disorders and substance use disorders, and was not seen in anxiety and adjustment disorders. The two aboriginal groups also had significantly higher rates of comorbid conditions than the Han group.

Mental illness and the risk of accidental death

Table 3 lists the odds ratios of accidental death for the major DSM–III–R diagnostic categories. For the whole group, the risk of accidental death was significantly higher for all diagnostic categories (depressive, anxiety, adjustment and substance use disorders). Substance use disorders (largely alcohol) were significantly associated with the risk of accidental death in all three ethnic groups, whereas the effect of depressive disorders was significant only in the Atayal group; the odds ratios for anxiety and adjustment disorders were not significant in all three groups. The odds ratios for any mental disorder other than substance use disorders were mainly significant in the two aboriginal groups. However, the presence of any mental disorder significantly increased the odds ratios of accidental death in all three groups. The effects of individual diagnostic categories on the risk of accidental death did not differ significantly across the three groups. However, the magnitude of association between accidental death and any mental disorder other than substance use disorder was significantly greater in the Atayal than in the Ami and Han groups. There was no significant interaction between either the

Table 2 Prevalence of DSM–III–R diagnoses: cases *v.* controls

DSM–III–R diagnosis[1]	Accidental deaths (*n*=90)				Controls (*n*=180)			
	Atayal (*n*=30) (%)	Ami (*n*=30) (%)	Han (*n*=30) (%)	Total (*n*=90) (%)	Atayal (*n*=60) (%)	Ami (*n*=60) (%)	Han (*n*=60) (%)	Total (*n*=180) (%)
Organic and psychotic mental disorders (291, 293, 294, 295, 318)	3	0	0	1	2	2	2	2
Depressive disorders	53	43	13	37***	30	30	7	22***
Major depression (296)	40	40	10	30**	27	23	3	18***
Dysthymic disorder (300.4)	20	10	3	12	5	3	3	4
Depression, NOS (311)	3	0	0	1	0	5	0	2
Anxiety disorders (300.00, 300.01, 300.02)	17	13	7	12	5	5	5	5
Adjustment disorders (309)	17	20	17	18	7	13	3	8
Substance use disorders	70	63	30	54***	37	37	12	28***
Alcohol (305.00, 303.90)	70	63	30	54***	37	35	12	28***
Other substance (305, 304)	17	7	3	9	2	2	0	1
Any disorder other than substance use disorders	83	70	33	62****	38	47	17	34***
Any mental disorder	87	80	50	72***	55	58	27	47****
Comorbidity								
No cormobid disorder	20	27	33	27****	30	32	25	29****
Comorbid disorders	67	53	17	46	25	27	2	18

NOS, not otherwise specified.
1. Each individual may have more than one diagnosis.
*P<0.05, **P<0.02, ***P<0.01, ****P<0.001.

Table 3 Odds ratios of accidental death for mental disorders in the three ethnic groups

DSM–III–R category	Atayal			Ami			Han			Total		
	Control n	Case n	OR (95% CI)	Control n	Case n	OR (95% CI)	Control n	Case n	OR (95% CI)	Control n	Case n	OR (95% CI)
Depressive disorder												
No	42	14	1.0	42	17	1.0	56	26	1.0	140	57	1.0
Yes	18	16	2.7 (1.0–6.8)*	18	13	1.8 (0.7–4.5)	4	4	2.3 (0.5–10.4)	40	33	2.2 (1.2–4.00)***
Anxiety disorder												
No	57	25	1.0	57	26	1.0	57	28	1.0	171	79	1.0
Yes	3	5	3.3 (0.8–13.9)	3	4	2.7 (0.6–11.9)	3	2	1.3 (0.2–8.0)	9	11	2.4 (1.0–5.9)*
Adjustment disorder												
No	56	25	1.0	52	24	1.0	58	25	1.0	166	74	1.0
Yes	4	5	3.7 (0.7–19.9)	8	6	1.8 (0.5–6.9)	2	5	8.6 (1.0–74.9)	14	16	3.3 (1.3–8.2)**
Substance use disorder												
No	38	9	1.0	38	11	1.0	53	21	1.0	129	41	1.0
Yes	22	21	8.5 (1.9–38.1)***	22	19	3.1 (1.2–8.2)*	7	9	4.2 (1.1–16.2)*	51	49	4.4 (2.2–8.7)****
Any mental disorder												
No	27	4	1.0	25	6	1.0	44	15	1.0	96	25	1.0
Yes	33	26	13.7 (1.8–106.2)**	35	24	3.0 (1.0–8.8)*	16	15	3.2 (1.1–9.1)*	84	65	4.1 (2.1–8.1)****
Any disorder other than substance use disorders[1]												
No	37	5	1.0	32	9	1.0	50	20	1.0	119	34	1.0
Yes	23	25	21.5 (2.8–163.1)***	28	21	2.6 (1.0–6.6)*	10	10	2.5 (0.9–7.1)	61	56	4.0 (2.1–7.3)***
Substance use and other disorders												
No disorder	27	4	1.0	25	6	1.0	44	15	1.0	96	25	1.0
Other disorders only	11	5	6.3 (0.5–79.0)	13	5	1.7 (0.4–6.8)	9	6	2.2 (0.6–7.7)	33	16	2.4 (1.0–5.5)*
Substance use disorder only	10	1	2.6 (0.1–47.3)	7	3	2.0 (0.4–10.8)	6	5	3.6 (0.7–17.6)	23	9	2.3 (0.8–6.5)
Both disorders	12	20	–[2]	15	16	4.5 (1.4–14.8)*	1	4	13.8 (1.3–141.9)*	28	40	11.7 (4.5–30.5)****
Single and comorbid disorders												
No morbidity	27	4	1.0	25	6	1.0	44	15	1.0	96	25	1.0
Single disorder	18	6	5.8 (0.6–52.1)	19	8	1.9 (0.5–6.6)	15	10	2.3 (0.7–7.1)	52	24	2.4 (1.1–5.2)*
Comorbidity	15	20	37.4 (3.5–395.4)***	16	16	4.3 (1.3–14.1)**	1	5	14.2 (1.5–132.0)*	32	41	9.1 (3.8–21.9)****
Number of morbidities (0,1,≥2)			6.2 (2.0–18.9)****			2.1 (1.2–3.8)**			3.0 (1.3–7.2)**			3.0 (1.9–4.7)****

1. Interaction between any other disorder and Atayal v. Ami and Han groups: $\chi^2 = 3.79$, d.f.=1, $P = 0.05$.
2. The OR and 95% CI could not be calculated by the statistical software used.
*$P < 0.05$ **$P < 0.02$, ***$P < 0.01$, ****$P < 0.001$.

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number of informants or the type of accident (traffic *v.* non-traffic) and each of the diagnostic groups, including alcoholism, with regard to the risk of accidental death.

The risk of accidental death was examined for various combinations of substance use disorders and other mental disorders. The magnitude of association was greatest if both types of disorder coexisted, and was also significant for other mental disorders alone, but was not significant for substance use disorders alone (Table 3). The rate if substance use and other disorders coexisted was highest among the Atayal (66.7%), followed by the Ami (53.3%) and Han (13.3%) groups ($\chi^2=18.72$, d.f.=2, $P<0.001$). In multivariate analysis, there was no significant interaction between substance use disorders and other mental disorders, or between the former and any of the other three diagnostic categories, with regard to the risk of accidental death.

When the risk of accidental death was examined for single and comorbid psychiatric conditions, the odds ratios were found to be significant for both in the total group. The risk of accidental death when comorbidity was present was nearly four times that for single morbidity, and nine times that for no morbidity. The risk of accidental death if comorbidity was present was significant in all three groups. When the effect from the comorbidity status was treated as a linear variable in the order no morbidity, single morbidity and comorbidity, the result showed no departure from linear trend (goodness-of-fit test statistics=0.48, d.f.=1, $P=0.488$). Therefore, the presence of one more disorder was associated with a three times higher likelihood of accidental death. This apparent linear trend effect from the number of comorbid psychiatric disorders was noted in all three ethnic groups (Table 3).

DISCUSSION

Findings in this study have indicated that in nearly three-quarters of accidental deaths the person involved had at least one form of mental disorder before the accident occurred. The risk of accidental death was significant for substance use disorders (largely alcoholism) and other major categories of mental disorders, and was greatest for comorbidity of substance use disorders with other mental disorders. The latter (but not the former) alone also exerted a

significant effect. Moreover, the risk of accidental death increased with the number of comorbid conditions.

Previous research on accidents and accidental death has investigated general population birth cohorts (Neeleman *et al*, 1998), psychiatric patients (Black *et al*, 1985; Martin *et al*, 1985; Hiroeh *et al*, 2001) and individuals with a history of accidents or a verdict of accidental death (e.g. Holding & Barraclough, 1977; Ruschena *et al*, 1998) by retrospective review of coroners' inquest notes and/or medical records. To our knowledge, this is the first case–control psychological autopsy study that has systematically investigated the individual and combined effects of psychiatric morbidity on the risk of accidental death using the current diagnostic system.

Magnitude of psychiatric morbidity in accidental deaths

The high frequency of total psychiatric morbidity among accidental deaths in this study (50.0–86.7% in the three ethnic groups) is comparable with the figure from an earlier study in London (Holding & Barraclough, 1977). The latter assigned psychiatric diagnoses in a total of 110 cases of accidental death based on coroners' inquest notes; medical (psychiatric) records were available for 50% of the cases. The percentages of those who were mentally ill, mentally fit and undiagnosable were 60%, 18% and 22%, respectively. It is speculated that the rate of mental illness in that study might have been higher if a psychological autopsy had been carried out. Although the rates of depressive illness are similar in the two studies, we found a much higher rate of alcohol use disorder; this is possibly due to the fact that the earlier study only made a primary diagnosis with no report on comorbidity. In fact, high blood alcohol levels were found postmortem in 55% of their cases.

Alcoholism and other mental disorders

Our finding that alcohol use disorder was the most significant mental disorder related to accidental death was consistent with previous studies (e.g. Brewer *et al*, 1994; Smith *et al*, 2001). Accident victims with alcoholism might not have been drunk at the time of the accident, but the impairment of attention and driving performance due to recent or long-term use of alcohol could have put them in danger of traffic and

non-traffic accidents (Albery *et al*, 2000; Cremona, 1986).

The effect of other common mental disorders on the risk of accidents has been relatively underestimated (Ruschena *et al*, 1998; Hiroeh *et al*, 2001). Our finding of a higher incidence of accidental death and a greater effect of other common mental disorders on the risk of accidental death in the Atayal sample may suggest that the prevention of mental disorder should be the target of prevention of accidental death in this population. It is likely that common mental disorders may exert a significant risk for accident either by themselves, or act as a risk factor for and coexist with substance use disorders.

Suicide *v.* accidental death

This study and the previous suicide study (Cheng, 1995) were conducted in the same Taiwanese population using the same methods and the same research team. Both studies showed high rates of mental disorders in those who died as a result of suicide or accident, the two types of unnatural non-homicidal deaths (Rorsman *et al*, 1982; Cheng, 1995; Harris & Barraclough, 1997; Ruschena *et al*, 1998; Hiroeh *et al*, 2001). Although rates of alcoholism were similar in cases of suicide (44%) and accidental death (54%), the corresponding figures for major depression were apparently higher in suicide (87%) than in accidental death (30%). Moreover, both adjustment disorders (18%) and anxiety disorders (12%) were more prevalent in cases of accidental death than in suicide. In case–control analysis, only major depression and alcoholism were significant antecedents for suicide, whereas alcoholism and all types of common mental disorders were predictive of accidental death. It is likely that certain core symptoms of common mental disorders, including poor sleep, fatigue and poor concentration, are the key psychopathological features precipitating accidents.

Ethnic differences

Among the three ethnic groups, the odds ratios for substance use disorders and other mental disorders on the risk of accidental death were greater in the Atayal than in the Ami and Han samples. Among the three groups, rates of comorbidity were also highest in the Atayal (Table 3). Conversely, the Han sample had the lowest morbidity rates of nearly all kinds of psychiatric

disorders among both accidental death and control groups. The excess of alcohol use disorder in the Atayal was also found in the earlier study of suicide among the same groups (Cheng, 1995). The evidence has suggested that poor mental health in the Atayal may have substantially contributed to their having the highest risk for both accidental death and suicide.

Strengths and limitations of the study

The major strengths of this study include its matched case–control design, with a representative sample randomly selected from the original population of accident victims in the three ethnic groups; the use of the same design and assessments for cross-ethnic comparisons; the careful ascertainment of the causes of death by examining the confidential inquest notes and the immediate interview with the coroner; and the optimal strategy for psychiatric diagnosis made by research psychiatrists with extensive experience and good reliability in studies of suicide and alcoholism (Cheng, 1995; Cheng & Chen, 1995), based on information gathered by interviewing key informants, who nearly all had lived with the accident victims before the incident occurred. These strengths are believed to have given this study good internal validity.

Findings in this study must be interpreted in the light of the methodological limitations of psychological autopsy. These include the accuracy of coroners' reports, the possibility of the underreporting of psychiatric symptoms and illness by informants, and any systematic bias from the interviewers. The main problem regarding the use of coroners' verdicts on unnatural death is that a proportion of deaths by suicide have often been misclassified as accidental death, for a number of reasons (Neeleman & Wessely, 1997). The strategy for the ascertainment of the causes of death employed in this study is believed to have satisfactorily overcome this problem. Our in-depth psychological autopsy interview further identified two deaths as suicide among the case group. Previous studies have proved that information from proxy respondents is a valid source of data in determining psychiatric diagnosis (Kelly & Mann, 1996; Conner *et al*, 2001*a*) and other correlates (Nelson *et al*, 1990; Conner *et al*, 2001*b*). In a case–control study, the optimal strategy to minimise any systematic bias is to interview all

informants using the same assessments. Only a few studies (Cheng, 1995; Gould *et al*, 1996) apart from ours have done so. The satisfactory *ad hoc* and *post hoc* inter-rater reliability studies are believed to have substantially reduced the possibility of systematic bias from the interviewers (Cheng, 1995). However, in view of the purposeful sampling of accidental deaths in three ethnic groups in East Taiwan, the external validity of this study for the entire Taiwanese population needs to be examined.

Implications of findings

Findings in this study imply that the prevention of accident or accidental death is likely to be closely related to the prevention of mental illness. Apart from the well-established policy of placing restrictions on alcohol drinking while driving or performing other activities that carry a high risk of physical harm, we should also emphasise the importance of early recognition, accurate diagnosis and effective treatment of substance use disorders (especially alcoholism) and all common mental disorders. In addition to potential environmental risk factors, the possible effect of common mental illnesses should be examined for any society or ethnic group with a high incidence of accidental deaths, so that preventive measures can be considered.

REFERENCES

Albery, I. P., Strang, J., Gossop, M., et al (2000) Illicit drugs and driving: prevalence, beliefs and accident involvement among a cohort of current out-of-treatment drug-users. *Drug and Alcohol Dependence*, **58**, 197–204.

American Psychiatric Association (1987) *Diagnostic and Statistical Manual of Mental Disorders* (3rd edn, revised) (DSM–III–R). Washington, DC: APA.

Black, D. W., Warrack, G. & Winokur, G. (1985) The Iowa record-linkage study. I. Suicides and accidental deaths among psychiatric patients. *Archives of General Psychiatry*, **42**, 71–75.

Brewer, R. D., Morris, P. D., Cole, T. B., et al (1994) The risk of dying in alcohol-related automobile crashes among habitual drunk drivers. *New England Journal of Medicine*, **33I**, 5I3–5I7.

CLINICAL IMPLICATIONS

■ The effect of common mental disorder is just as important as that of alcohol use disorder on the risk of accidental death.

■ Such risk significantly increases with the number of comorbid conditions.

■ The prevention of accident or accidental death should be incorporated into preventive psychiatry.

LIMITATIONS

■ The external validity of this study needs to be examined.

■ The numbers of cases and controls might have limited the examination of possible interactions between psychiatric diagnostic groups on the risk of accidental death.

■ The possible information bias derived from the use of psychological autopsy should be considered.

SUSAN S. F. GAU, MD, PhD, Department of Psychiatry, College of Medicine, National Taiwan University and National Taiwan University Hospital, Taipei; ANDREW T. A. CHENG, MD, PhD, DSc(London), FRCPsych, Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan

Correspondence: Professor Andrew T. A. Cheng, Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan. Tel: +886 2 2789 9119; fax: +8862 2782 3047; e-mail: bmandrew@gate.sinica.edu.tw

Cheng, A. T. (1995) Mental illness and suicide. A case–control study in east Taiwan. *Archives of General Psychiatry*, **52**, 594–603.

Cheng, A. T. & Chen, W. J. (1995) Alcoholism among four aboriginal groups in Taiwan: high prevalences and their implications. *Alcoholism: Clinical and Experimental Research*, **19**, 81–91.

Cheng, A. T., Chen, T. H., Chen, C. C., et al (2000) Psychosocial and psychiatric risk factors for suicide. Case–control psychological autopsy study. *British Journal of Psychiatry*, **177**, 360–365.

Conner, K. R., Duberstein, P. R. & Conwell, Y. (2001a) The validity of proxy-based data in suicide research: a study of patients 50 years of age and older who attempted suicide. I. Psychiatric diagnoses. *Acta Psychiatrica Scandinavica*, **104**, 204–209.

Conner, K. R., Conwell, Y. & Duberstein, P. R. (2001b) The validity of proxy-based data in suicide research: a study of patients 50 years of age and older who attempted suicide. II. Life events, social support and suicidal behavior. *Acta Psychiatrica Scandinavica*, **104**, 452–457.

Cremona, A. (1986) Mad drivers: psychiatric illness and driving performance. *British Journal of Hospital Medicine*, **35**, 193–195.

Gould, M. S., Fisher, P., Parides, M., et al (1996) Psychosocial risk factors of child and adolescent completed suicide. *Archives of General Psychiatry*, **53**, 1155–1162.

Harris, E. C. & Barraclough, B. (1997) Suicide as an outcome for mental disorders. A meta-analysis. *British Journal of Psychiatry*, **170**, 205–228.

Hiroeh, U., Appleby, L., Mortensen, P. B., et al (2001) Death by homicide, suicide, and other unnatural causes in people with mental illness: a population-based study. *Lancet*, **358**, 2110–2112.

Holding, T. A. & Barraclough, B. M. (1977) Psychiatric morbidity in a sample of accidents. *British Journal of Psychiatry*, **130**, 244–252.

Kelly, T. M. & Mann, J. J. (1996) Validity of DSM–III–R diagnosis by psychological autopsy: a comparison with clinician ante-mortem diagnosis. *Acta Psychiatrica Scandinavica*, **94**, 337–343.

Martin, R. L., Cloninger, C. R., Guze, S. B., et al (1985) Mortality in a follow-up of 500 psychiatric outpatients. II. Cause-specific mortality. *Archives of General Psychiatry*, **42**, 58–66.

Murray, C. J. L. & Lopez, A. D. (1996) *The Global Burden of Disease*, pp. 376–381. Geneva: World Health Organization.

Neeleman, J. & Wessely, S. (1997) Changes in classification of suicide in England and Wales: time trends and associations with coroners' professional backgrounds. *Psychological Medicine*, **27**, 46–472.

Neeleman, J., Wessely, S. & Wadsworth, M. (1998) Predictors of suicide, accidental death, and premature natural death in a general-population birth cohort. *Lancet*, **351**, 93–97.

Nelson, L. M., Longstreth, W. T., Koepsell, T. D., et al (1990) Proxy respondents in epidemiologic research. *Epidemiologic Reviews*, **12**, 71–86.

Rorsman, B., Hagnell, O. & Lanke, J. (1982) Violent death and mental disorders in the Lundby Study. Accidents and suicides in a total population during a 25-year period. *Neuropsychobiology*, **8**, 233–240.

Ruschena, D., Mullen, P. E., Burgess, P., et al (1998) Sudden death in psychiatric patients. *British Journal of Psychiatry*, **172**, 331–336.

Smith, G. S., Keyl, P. M., Hadley, J. A., et al (2001) Drinking and recreational boating fatalities: a population-based case–control study. *JAMA*, **286**, 2974–2980.