

# Alcohol consumption and smoking dose-dependently and synergistically worsen local pancreas damage

Chronic pancreatitis (CP) is characterised by irreversible damage to the pancreas causing endocrine and exocrine dysfunction which results in decreased quality of life and reduced life expectancy.<sup>1</sup>

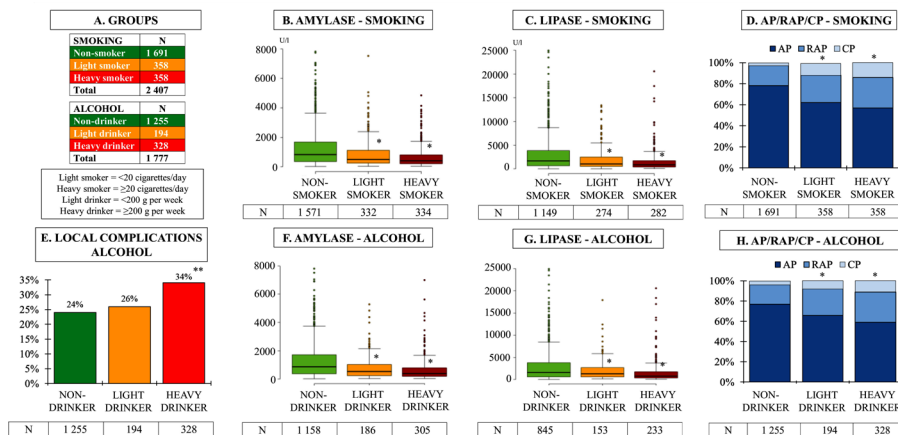
Adam *et al* recently published an interesting study on a possible diagnostic tool for CP based on metabolomic profiles of patients and controls.<sup>2</sup>

Our previous international cohort analysis showed that the proportion of patients developing CP is exponentially and directly associated with the number of acute pancreatitis (AP) episodes, thus strengthening the focus on the challenging task of diagnosing CP early.<sup>3,4</sup> However, in addition to diagnosing early, we should also focus on preventive interventions, before the damage becomes irreversible.

Alcohol is the main aetiological factor for CP and both alcohol consumption and smoking increase the risk for recurrence of AP and the development of CP. According to Ahmed Ali *et al*, in a follow-up study of 669 AP patients, smoking represented the dominant risk factor for recurrent AP (RAP) and a combination of alcohol consumption and smoking was the main risk factor for the progression to CP.<sup>5</sup> Therefore, cessation programmes and patient education are extremely important means to intervening and lowering the recurrence of AP and the progression to CP.<sup>6,7</sup> However, total cessation and abstinence often seems impossible for patients and they do not even try. Is it also possible to reduce recurrence and progression by decreasing the amount consumed?

Basic research evidence clearly suggests that alcohol and smoking amplify each other's harmful effects.<sup>8,9</sup> However, large cohorts are lacking to determine whether smoking and alcohol consumption dose-dependently, mutually exacerbate the damage to the pancreas caused by each.

We have used the international cohort in the Acute Pancreatitis Registry initiated by the Hungarian Pancreatic Study Group. Data were collected from 13 countries and 30 medical centres, with 2441 cases included in the analysis. Further characteristics of the cohort and information on methods are available in online supplemental file 1.

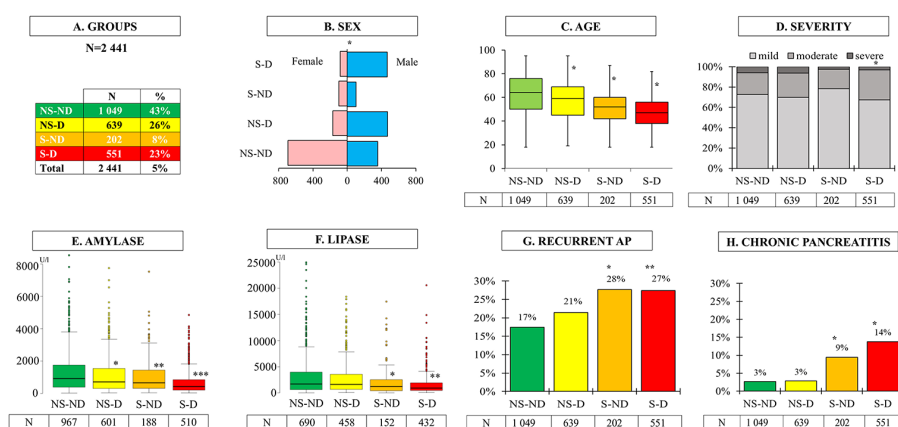


**Figure 1** Dose dependency in alcohol consumption and smoking in AP. (A) Light and heavy alcohol consumption and smoking groups and definitions. (B, C) Amylase and lipase levels on admission. (D) Prevalence of RAP and CP (%). (E) Proportion of local complications (%). (F, G) Amylase and lipase levels on admission. (H) Prevalence of RAP and CP (%). \* $P<0.001$ , \*\* $p=0.003$ . Pearson's  $\chi^2$  test and the Kruskal-Wallis rank sum tests were used. AP, acute pancreatitis; CP, chronic pancreatitis; RAP, recurrent AP.

The patient population was divided into groups according to current amounts of smoking and alcohol consumption. We found that both smoking and alcohol consumption are dose-dependently associated with amylase and lipase levels and with the prevalence of RAP and CP among AP patients. Alcohol consumption was also linked to a higher rate of local complications (figure 1).

Second, we examined the possible synergistic effect of these two risk factors. We arranged the cohort population into four groups based on current smoking and alcohol consumption status (figure 2). Smoking and drinking together are associated with the


male sex and linked to the first AP episode 15 years earlier than non-smoking and non-drinking are. Analysing on-admission and outcome parameters between groups, we found that amylase and lipase levels are the lowest and the proportion of moderately severe cases are the highest in the smoking–drinking group, suggesting the most pancreatic tissue damage and local complications here. The highest proportion of patients with RAP was found in both smoking groups, and the largest percentage of CP patients was observed in the smoking–drinking population, suggesting a clear synergising effect of alcohol consumption and smoking and



**Figure 2** Combined alcohol consumption and smoking groups in AP. (A) Groups. (B) Sex. \* $P<0.001$  in all comparisons. (C) Age. \* $P<0.001$  or  $p=0.001$  in all comparisons. (D) Severity. Moderately severe \* $p=0.003$  vs NS–ND.  $P=0.022$  vs S–ND. (E) On admission amylase level. \* $P<0.001$  vs NS–ND. \*\* $P<0.003$  vs NS–ND. \*\*\* $p<0.001$  vs NS–ND, NS–D and S–ND. (F) On-admission lipase level. \* $P<0.003$  vs NS–ND,  $p<0.006$  vs NS–D. \*\* $P<0.001$  vs NS–ND and NS–D. (G) Prevalence of recurrent AP. \* $P=0.003$  vs NS–ND. \*\* $p=0.04$  vs NS–D.  $p<0.001$  vs NS–ND. (H) Prevalence of chronic pancreatitis. \* $P<0.001$  vs NS–ND, NS–D. Pearson's  $\chi^2$  test and the Kruskal-Wallis rank sum tests were used. AP, acute pancreatitis; NS–D: non-smoking–drinking; NS–ND: non-smoking–non-drinking; S–D: smoking–drinking; S–ND: smoking–non-drinking.

a highlighted importance of smoking in progression.

Our analysis confirms in a clinical setting that both smoking and alcohol are dose-dependently associated with pancreatic tissue damage and the prevalence of RAP and CP. Moreover, they mutually exacerbate each other's harmful effect. In addition to the development of prognostic and therapeutic measures, further clinical trials on cessation programmes and patient education are needed. Communication to all stakeholders of the importance of at least quitting smoking or cutting the amount of smoking and alcohol consumption is crucial.

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