Title page

Title:
Motivation to reduce drinking and engagement in alcohol misuse treatment in alcohol-related liver disease: a national health survey

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Abstract

Objectives:

Identify predictors of motivation to reduce alcohol consumption, and whether motivation predicts engagement in alcohol misuse treatment in alcohol-related liver disease (ALD).

Methods:

Data from health surveys and healthcare registries were combined.

Results:

Of 674 ALD patients, 65% consumed alcohol. Recent hospital admission and severe alcohol problems were associated with motivation to reduce. Two-year probability for engagement in misuse treatment was 29% for patients with motivation to reduce versus 6.5%.

Conclusions:

ALD patients with recent hospital admission were more motivated to cut down, and motivation predicted engagement in alcohol misuse treatment. This insight can help us target brief interventions.

Introduction

It is crucial to help with alcohol cessation to improve the prognosis after diagnosis of alcohol-related liver disease (ALD).[1] To succeed with alcohol cessation, patients must be motivated to change drinking behavior.[2,3] Some studies have investigated motivation to change in individuals with alcohol use disorder,[4–6] but results from these studies may not apply to patients with ALD, as illness increases motivation to change drinking behavior.[5,7] Chang et al.[8] investigated motivation to change drinking behavior in 87 ALD patients and found that severe alcohol problems, high self-stigma, and depression predicted a strong motivation to change. Chang et al. did not find an association of liver disease severity with motivation to change, but the impact of hospitalization was not investigated. Another important factor in succeeding with alcohol cessation is engagement in alcohol misuse treatment, which improves survival in patients with ALD.[9] Alcohol misuse treatment is underutilized in ALD patients, and a recent study found that lack of motivation was an important barrier.[10]

Knowledge about factors associated with motivation to reduce alcohol consumption in patients with ALD may help with the proper timing of brief interventions and offering of alcohol misuse treatment. Therefore, this study had two aims. First, to perform an exploratory analysis of multiple potential associations between clinical characteristics and the motivation to reduce alcohol consumption in ALD patients. Second, to assess whether such motivation predicted subsequent engagement in alcohol misuse treatment.

Patients and Methods

The study was a historical cohort study of patients with ALD who participated in one of three Danish National Health Surveys (DNHS) conducted in 2010, 2013, and 2017.[11] We included answers from DNHS regarding alcohol habits, CAGE-questionnaire[12], health-related quality of life (12-item Short Form questionnaire)[13], and motivation to reduce alcohol consumption. We obtained data on ALD, recent hospital care, alcohol misuse treatment, and socioeconomic status from national registries. Patients who reported active alcohol consumption were followed for two years for engagement in alcohol misuse treatment after DNHS participation. The engagement, identified through registries, was defined as attending specialized alcohol misuse treatment and/or redeeming a drug prescription to treat alcohol use disorder.

First, in alcohol-consuming ALD patients, we used a generalized linear model to calculate prevalence ratios (PR) for being motivated to reduce alcohol consumption according to multiple clinical characteristics. We performed a uni- and a multivariable analysis for each characteristic. All clinical characteristics were included in the model simultaneously in the multivariable analysis. Second, we used the competing risk method to compute the cumulative incidence of engagement in alcohol misuse treatment until two years after DNHS participation. In addition, we investigated whether the study cohort was representative of all ALD patients in Denmark (see Supplemental Digital Content 3).

For details about methods, see Supplemental Digital Content 1.

Results

We included 674 patients with ALD who participated in the DNHS. Of those, 387 (57%) had cirrhosis, and 436 (65 %) reported weekly alcohol consumption (Figure 1). Only 30% of the 436 alcohol consumers reported motivation to reduce alcohol consumption (See Supplemental Digital Content 2). Among abstainers, 66% had cirrhosis, and 60% had a recent outpatient visit. Among alcohol consumers, those proportions were lower: 53% and 45%, respectively. The included patients were representative of Danish ALD patients according to age, sex, sociodemographics, and ALD stage (see Supplementary Digital Content 3).

In the group of active alcohol consumers, a hospital admission three months before participation in DNHS was associated with the motivation to reduce alcohol consumption with a prevalence ratio (PR) of 1.8 (95% CI 1.3-2.6) compared to patients admitted more than twelve months before participation (Table 1). A weekly alcohol consumption above 14 units and a CAGE score ≥ 2 was associated with motivation to reduce alcohol consumption when compared to a lower weekly alcohol consumption and a lower CAGE score, respectively. Poor mental quality of life was associated with motivation to change with a PR of 1.7 (95% CI 1.3-2.3) compared to better mental quality of life.

Within two years after DHNS participation, 65 of the 436 ALD patients (15 %) engaged in alcohol misuse treatment. This 2-year probability was higher among patients expressing motivation to reduce alcohol consumption (29% [95% CI, 23-39] vs. 6.5% [95% CI, 3.9-11]) (Figure 2).

Discussion

In the total cohort, 436 (65%) ALD patients had active alcohol consumption, and 30% of those were motivated to cut down. In the alcohol-consuming patients, a recent hospital admission, high weekly alcohol consumption, a CAGE score indicating alcohol use disorder, and poor mental quality of life were associated with increased motivation, whereas severity of liver disease was not. The motivated patients were more likely to engage in alcohol misuse treatment during two years of follow-up.

In line with our results, prior studies, mainly in individuals with alcohol use disorder without ALD, have shown that severity of alcohol consumption and dependence symptoms affect the motivation to change.[4,6,8] One study also found that hospitalization strengthened motivation to change in individuals with alcohol use disorder.[5]

We found that our study cohort was representative. Even so, the included patients may drink less than the general Danish ALD population, as a study found higher alcohol-related mortality in non-respondents compared with respondents in DNHS.[14] Consequently, because heavy drinking is associated with increased motivation to reduce alcohol consumption,[4,6,8] we may have underestimated the true proportion of motivated ALD patients. We note, however, that the proportion of ALD patients consuming more than 28 units of alcohol per week was similar to that reported by Lucey et al.[1] Further, self-reported alcohol consumption has some limitations, and to improve this in future studies, we could apply an objective alcohol biomarker. Moreover, we excluded patients who had lived over ten years with ALD before survey participation and our results may not apply to them.

Our study highlights the high proportion of ALD patients who continue to drink alcohol and the low proportion of these who engage in alcohol misuse treatment. Moreover, it showed that recent hospital admission was associated with motivation to reduce drinking. These findings underline the

importance of motivational interviews and appropriate interventions as part of daily clinical care – and, in particular, shortly after discharge from the hospital.

Figure legends

Figure 1. Self-reported alcohol consumption in units per week in patients with alcohol-related liver disease, participating in the Danish National Health Survey 2010, 2013, and 2017. n=674

Figure 2: Cumulative incidence (%) of engagement in alcohol misuse treatment according to motivation to reduce alcohol consumption in patients with alcohol-related liver disease who drank alcohol, participating in the Danish National Health Survey 2010, 2013, and 2017. Motivation was assessed by this question: “Do you want to reduce your alcohol intake”, with the possible responses of “yes”, “no” or “don’t know”. n=436

Table 1. Prevalence ratios (95% confidence intervals, CI) for being motivated to reduce alcohol consumption among patients with alcohol-related liver disease (ALD) who are active alcohol consumers and participating in the Danish National Health Survey 2010, 2013, and 2017. n = 436.

	Number of patients (column percentages)			Prevalence ratios, PR (95% CI)[a]	
	Total	***The response to "do you want to reduce your alcohol intake?"***		**Univariable PR**	**Multivariable PR**
		Yes	Don't know or No		
Total	436	132	304	-	-
Sex					
Men	304 (70)	100 (76)	204 (67)	Reference	Reference
Women	132 (30)	32 (24)	100 (33)	0.7 (0.4-1.0)	0.9 (0.6-1.4)
Age					
< 60 years	189 (43)	68 (52)	121 (40)	Reference	Reference
≥ 60 years	247 (57)	64 (48)	183 (60)	0.6 (0.4-0.9)	1.1 (0.8-1.5)
Severity of liver disease					
Non-cirrhotic	208	60 (45)	148 (49)	Reference	Reference
Liver cirrhosis	228	72 (55)	156 (51)	1.1 (0.8-1.7)	1.3 (1.0-1.8)
Time since ALD diagnosis [c]					
<5 years	299 (69)	93 (70)	206 (68)	1.1 (0.8-1.5)	1.0 (0.8-1.4)
5-10 years	137 (31)	39 (30)	98 (32)	Reference	Reference
Time since last hospital admission					
≤ 3 months	80 (18)	34 (26)	46 (15)	2.0 (1.2-3.5)	1.8 (1.3-2.6)
4-12 months	130 (30)	38 (29)	92 (30)	1.1 (0.7-1.8)	1.2 (0.8-1.7)
>12 months	226 (52)	60 (45)	166 (55)	Reference	Reference
Time since last outpatient visit					
<3 months	197 (45)	53 (40)	144 (47)	0.8 (0.5-.1.3)	0.8 (0.5-1.1)
4-12 months	138 (32)	47 (36)	91 (30)	1.1 (0.6-1.9)	0.8 (0.6-1.3)
>12 months	101 (23)	32 (24)	69 (23)	Reference	Reference
Weekly alcohol amount					
1-13	162 (37)	14 (11)	148 (49)	Reference	Reference
14-27	112 (26)	35 (27)	77 (25)	4.8 (2.4-9.5)	3.3 (1.7-6.5)
28-41	65 (15)	32 (24)	33 (11)	10.3 (4.9-21.3)	4.9 (2.6-9.5)
≥42	97 (22)	51 (39)	46 (15)	11.7 (6.0-23.0)	3.2 (1.6-6.5)
CAGE score [b]					
Score 0-1	282 (65)	29 (22)	253 (83)	Reference	Reference
Score ≥ 2	154 (35)	103 (78)	51 (17)	17.6 (10.6-29.3)	3.8 (2.5-5.9)
Health-related quality of life (mental) [c]					
Poor mental quality of life	91 (26)	43 (42)	48 (19)	2.0 (1.5-2.8)	1.7 (1.3-2.3)
Moderate to good mental quality of life	259 (74)	60 (58)	199 (81)	Reference	Reference
Health-related quality of life (physical) [c]					
Poor physical quality of life	149 (43)	43 (42)	106 (43)	1.0 (0.7-1.3)	0.7 (0.6-1.0)
Moderate to good physical quality of life	201 (57)	60 (58)	141 (57)	Reference	Reference
Cohabitation status					
Cohabitation	217 (50)	53 (40)	164 (54)	Reference	Reference
Living alone	219 (50)	79 (60)	140 (46)	1.7 (1.2-2.6)	1.0 (0.7-1.3)
Educational level					
High and medium-high	95 (22)	31 (23)	64 (21)	Reference	Reference
Medium-low	172 (39)	48 (36)	124 (41)	0.9 (0.6-1.2)	0.9 (0.7-1.3)
Low	169 (39)	53 (40)	116 (38)	1.0 (0.7-1.4)	0.9 (0.6-1.2)
Occupational status					
Employed	99 (23)	29 (22)	70 (23)	Reference	Reference
Unemployed	94 (22)	31 (23)	63 (21)	1.1 (0.7-1.7)	1.0 (0.7-1.5)
Permanently outside labor market	243 (56)	72 (55)	171 (56)	1.0 (0.7-.15)	0.8 (0.6-1.2)

CI, Confidence Interval; PR, Prevalence Ratio; ALD, Alcohol-related Liver Disease

[a] Prevalence ratios for responding "yes" to "do you want to reduce your alcohol intake?" compared to responses of "don't know" and "no".
[b] Measured by CAGE-questionnaire. A value of ≥2 is considered significant for alcohol use disorder.
[c] Measured by Short Form 12. Data on quality of life were available for 350 (80 %) ALD patients.

References

1. Lucey MR, Connor JT, Boyer TD, Henderson JM, Rikkers LF. Alcohol consumption by cirrhotic subjects: patterns of use and effects on liver function. *Am J Gastroenterol*. 2008;103(7):1698-1706. doi:10.1111/j.1572-0241.2008.01837.x

2. Cook S, Heather N, McCambridge J. Posttreatment motivation and alcohol treatment outcome 9 months later: Findings from structural equation modeling. *J Consult Clin Psychol*. 2015;83(1):232-237. doi:10.1037/a0037981

3. Bertholet N, Cheng DM, Palfai TP, Samet JH, Saitz R. Does readiness to change predict subsequent alcohol consumption in medical inpatients with unhealthy alcohol use? *Addict Behav*. 2009;34(8):636-640. doi:10.1016/j.addbeh.2009.03.034

4. Williams EC, Kivlahan DR, Saitz R, et al. Readiness to change in primary care patients who screened positive for alcohol misuse. *Ann Fam Med*. 2006;4(3):213-220. doi:10.1370/afm.542

5. Rumpf HJ, Hapke U, Meyer C, John U. Motivation to change drinking behavior: Comparison of alcohol-dependent individuals in a general hospital and a general population sample. *Gen Hosp Psychiatry*. 1999;21(5):348-353. doi:10.1016/S0163-8343(99)00032-8

6. Krenek M, Maisto SA, Funderburk JS, Drayer R. Severity of alcohol problems and readiness to change alcohol use in primary care. *Addict Behav*. 2011;36(5):512-515. doi:10.1016/j.addbeh.2010.12.023

7. Sarich P, Canfell K, Banks E, et al. A Prospective Study of Health Conditions Related to Alcohol Consumption Cessation Among 97,852 Drinkers Aged 45 and Over in Australia. *Alcohol Clin Exp Res*. 2019;43(4):710-721. doi:10.1111/acer.13981

8. Chang C, Wang TJ, Chen MJ, Liang SY, Wu SF, Bai MJ. Factors influencing readiness to change in patients with alcoholic liver disease: A cross-sectional study. *J Psychiatr Ment*

Health Nurs. 2020;(June):1-12. doi:10.1111/jpm.12677

9. Rogal S, Youk A, Zhang H, et al. Impact of Alcohol Use Disorder Treatment on Clinical Outcomes Among Patients With Cirrhosis. *Hepatology*. 2020;71(6):2080-2092. doi:10.1002/hep.31042

10. Mellinger JL, Scott Winder G, DeJonckheere M, et al. Misconceptions, preferences and barriers to alcohol use disorder treatment in alcohol-related cirrhosis. *J Subst Abuse Treat*. 2018;91(May 2018):20-27. doi:10.1016/j.jsat.2018.05.003

11. Christensen AI, Lau CJ, Kristensen PL, et al. The Danish National Health Survey : Study design , response rate and respondent characteristics in 2010 , 2013 and 2017. 2020;(July):1-9. doi:10.1177/1403494820966534

12. Dhalla S, Kopec JA. The CAGE questionnaire for alcohol misuse: A review of reliability and validity studies. *Clin Investig Med*. 2007;30(1):33-41. doi:10.25011/cim.v30i1.447

13. WARE, JOHN; KOSINSKI, MARK; KELLER, SUSAN. A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. *Med Care*. 1996;34(3):220-233. https://journals.lww.com/lww-medicalcare/Fulltext/1996/03000/A_12_Item_Short_Form_Health_Survey__Construction.3.aspx.

14. Christensen AI, Ekholm O, Gray L, Glümer C, Juel K. What is wrong with non-respondents ? Alcohol- , drug- and smoking-related mortality and morbidity in a 12-year follow-up study of respondents and non-respondents in the Danish Health and Morbidity Survey. 2015:1507-1514. doi:10.1111/add.12939

Supplemental Digital Content

Supplemental Digital Content 1. A detailed description of patients and methods. docx

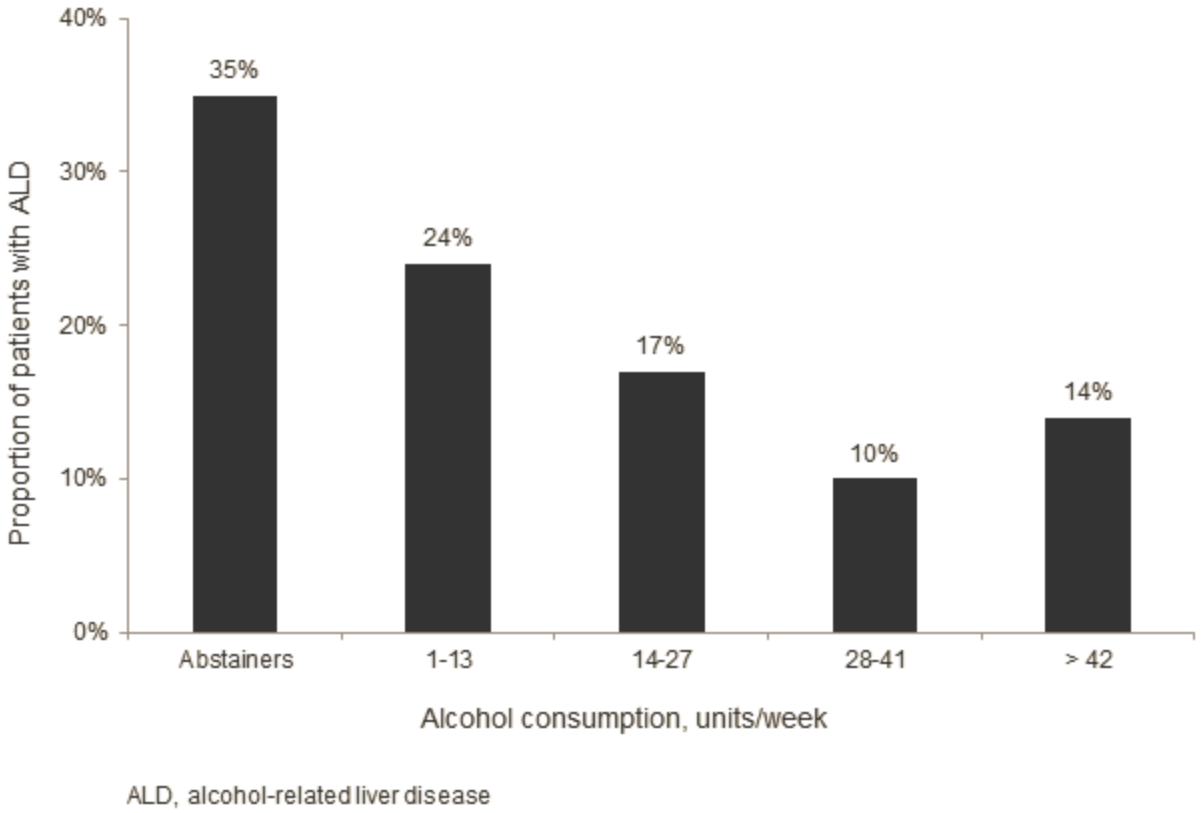
Supplemental Digital Content 2. Patient characteristics for abstainers and alcohol users. docx

Supplemental Digital Content 3: Comparison of the included patients and all Danish ALD patients. docx

Supplemental Digital Content 4. Applied diagnostic codes in the study. docx

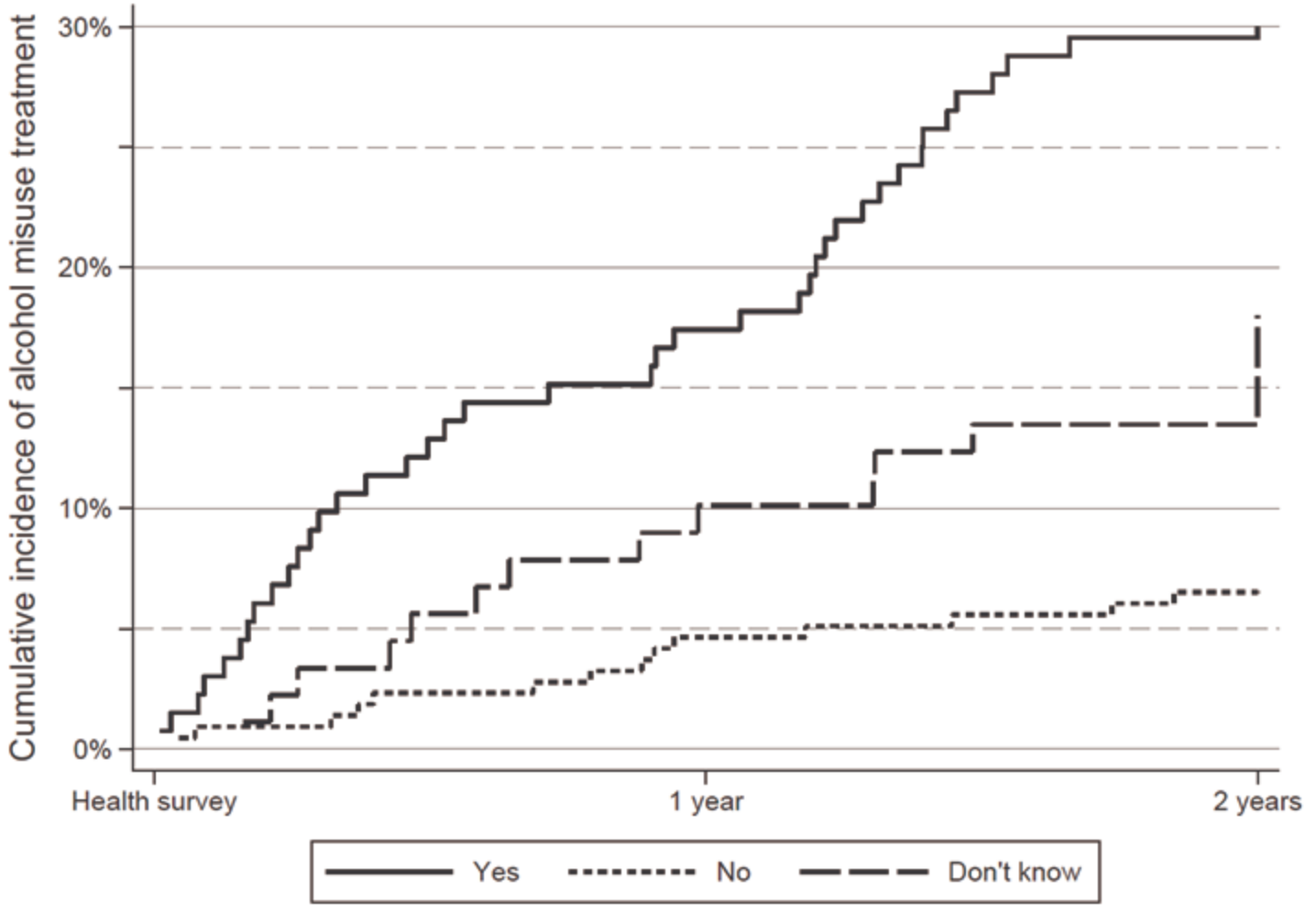
Supplemental Digital Content 5. Creation of the cohort. docx

Figure 1



ALD, alcohol-related liver disease

Figure 2


Cumulative incidence of alcohol misuse treatment
30%
20%
10%
0%
Health survey
1 year
2 years
Yes
No
Don't know