



Concomitant alcohol and sedative-hypnotic drug use among the elderly in Norway

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Elin Kristin Bye

Norwegian Institute of Public Health, Norway

Ingeborg Rossow

Norwegian Institute of Public Health, Norway

Abstract

Background: Sedative-hypnotic drugs (i.e., tranquilizers and sleeping pills) are more often used among the elderly compared to other age groups. Concomitant use of alcohol and sedative-hypnotic drugs constitutes a particularly high risk factor for accidental injuries among the elderly. However, few studies have addressed the prevalence of concomitant alcohol and sedative-hypnotic drug use and knowledge about the characteristics of such use is meagre. **Aim:** To assess the prevalence of concomitant alcohol and sedative-hypnotic drug use among elderly people and to explore the characteristics of such concomitant use. **Data and method:** Data stemmed from cross-sectional population surveys in Norway, conducted in the period 2012–2015 (sub-sample 60–79 years: $N = 1920$). **Results:** Respondents reported frequencies of use of sedatives (tranquilizers), hypnotics (sleeping pills) and alcohol consumption in the preceding 12 months. Sedative-hypnotic drug use was reported by 25%, and 19% reported both such drug use and alcohol use in the past year. Concomitant use, suggesting simultaneous intake of alcohol and drugs, was reported by 6%. **Conclusions:** Concomitant use was more often reported by women, hazardous alcohol users, non-working respondents, and by those in the lower income groups and those living alone. Health personnel need to take into consideration the risks associated with concomitant use and to inform their patients accordingly.

Keywords

alcohol, concomitant use, elderly, hypnotic, Norway, sedatives

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Corresponding author:

Elin Kristin Bye, Norwegian Institute of Public Health, Postboks 4404 Nydalen, 0403 Oslo, Norway.

Email: elin.bye@fhi.no



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Psychotropic prescription drugs, such as hypnotics and tranquilizers (sedatives) are commonly used by people in high-income countries and more so among the elderly than among young and middle-aged people (Donoghue & Lader, 2010; Ilomäki et al., 2013). Recent reviews have shown that among the elderly (differently defined across studies, but often >65 years), the prevalence of current sedative-hypnotic drug use (or benzodiazepine use) is between 6% and 30% (Ilomäki et al., 2013). While these drugs may indeed have beneficial effects and improve life quality by relieving or reducing insomnia, tension, or anxiety for most users, their use may have adverse effects in various respects. Both sedatives and hypnotics may enhance central nervous system (CNS) depression, leading to drowsiness and increased risk of falls and other accidental injuries in elderly people (Hartikainen, Lönnroos, & Louhivuori, 2007; Woolcott et al., 2009), which themselves are often accompanied by medical complications, care needs and loss of wellbeing. These drugs also have an addictive potential and thus excessive use or dependence is another problem frequently observed among users (Casati, Sedefov, & Pfeiffer-Gerschel, 2012).

In a similar vein, use of alcohol may also enhance CNS depression and hamper motor skills and thereby increase the risk of accidental injuries, especially in elderly people (Anderson, Scafato, & Galluzzo, 2012; Taylor et al., 2010). Moreover, when sedative-hypnotic drugs and alcohol are consumed simultaneously, the pharmacological interaction between the substances may increase the risk of various adverse outcomes (Moore, Whiteman, & Ward, 2007). Thus, among users of sedative-hypnotic drugs, alcohol intake can potentiate the sedative drug effects and impair motor skills and judgement (Moore et al., 2007), which again adds to the risk of accidental injuries (Ilomäki et al., 2013). Thus, there are clear indications that simultaneous drug and alcohol use in elderly people constitutes a particular risk factor for accidental injuries. In this study, we address the likelihood of such

simultaneous use of sedative-hypnotic drugs and alcohol, focusing on elderly people.

The literature demonstrating how much such simultaneous use actually impacts on accidental injuries and other adverse outcomes seems very sparse (Anderson et al., 2012), but a study using blood screens of injured patients may serve as an illustration. Among injured patients above 65 years of age admitted to a hospital emergency department (Bogstrand et al., 2011), a third (31%) tested positive for medicinal drugs such as benzodiazepines and z-hypnotics and among these, 12% tested positive also for alcohol. As admissions occurred often many hours after the injury and thus after alcohol being detectable, the latter figure is likely biased downward.

Despite its potential for harmful consequences, concomitant drug and alcohol use is not widely researched, according to previous literature reviews (Ilomäki et al., 2013; Moore et al., 2007). In a systematic review, Ilomäki and colleagues (2013) identified 16 primary studies from nine high-income countries which employed general population samples, including elderly or middle-aged people (Ilomäki et al., 2013). In their review, the authors defined the concept *concomitant alcohol and drug use* as “use of both alcohol and sedative-hypnotics during the same or overlapping recall periods, [meaning] that concomitant use was not necessarily restricted to simultaneous use arising from co-administration” (Ilomäki et al., 2013). Primary studies have operationalised the concept in various ways; some reported the prevalence of drug use by alcohol consumption categories and some reported the prevalence of alcohol use by drug use categories (as illustrated in Table 1). Thus, studies have described any use of both substance categories in the preceding year and/or heavy use of one substance category among past year users of the other. In effect, the term *concomitant alcohol and drug use*, as used in the literature, is ambiguous. However, in the present study, we use the term to delineate simultaneous use implying pharmacological interaction.

Table 1. Overview of studies from the Nordic countries on co-occurring alcohol and sedative-hypnotic drug use.

Study: First author, year, country	How was co-occurring alcohol and drug use operationalised?	Sample size and age range	Data collection year(s)
Aira, 2005, Finland	Any sedative-hypnotic drug use by three alcohol use categories (<1, 1–7, >7 drinks/week)	523 75+ yrs	1998
Bakken, 2006, Norway	Any hypnotics use in past four weeks by three alcohol use frequency categories (none, <1/week, 2+/week)	12378 36–79 yrs	2002–2004
Blennow, 1994, Sweden	Any sedative-hypnotic drug use in past two weeks, three+ times/week in past three months by high alcohol use (>35/25 grams per day)	4094 18–64 yrs	1984
Ilomäki, 2008, Finland	Frequent drinking (>2x/week) among regular sedative-hypnotic drug users	1774 53–73 yrs	1998–2001
Immonen, 2013, Finland	Sedative-hypnotic drug use (frequency not clear) by three alcohol use categories (little/no, 1–7 drinks/week, >7 drinks/week)	1395 75+ yrs	2007
Österling, 1996, Sweden	Any sedative-hypnotic drug use by alcohol use categories (teetotallers, sporadic, weekend, and problem drinkers)	844 55 yrs	1984
Skurtveit, 2008, Norway	Prevalence of problem drinkers among any sedative-hypnotic drug users past month	13390 40–42 yrs	1985–1989
Støver, 2012, Norway	Alcohol use categories (abstainers, high consumers, intoxication >1/month, problem drinkers (CAGE+)) in 2007 by sedative-hypnotic drug use categories (none, occasional, periodic, chronic) during the period 2004–2011. Thus, co-occurring use is not clear	17 922 60+ yrs	2004–2011

Note. Some studies include a broader range of psychotropic drugs, not only sedative-hypnotic drugs. Studies in alphabetical order by first author.

From the Nordic countries, we have identified – on the basis of the review by Ilomäki et al. (2013) and further literature searches – a total of eight studies that have addressed some aspect of co-variation in use of alcohol and sedative-hypnotic (and other alcohol-interacting) drugs. These studies include three from Finland (Aira, Hartikainen, & Sulkava, 2005; Ilomäki, Korhonen, Enlund, Hartzema, & Kauhanen, 2008; Immonen, Valvanne, & Pitkälä, 2013); three from Norway (Bakken, Melhus, & Lund, 2006; Skurtveit, Furu, Bramness, & Tverdal, 2008; Støver, Bratberg, Nordfjern, & Krokstad, 2012); and two from Sweden (Blennow, Romelsjö, Leifman, Leifman, & Karlsson, 1994; Österling & Berglund, 1996) (Table 1). Among the eight studies, only three (all from Finland) had a main focus on alcohol–drug

co-variation (Aira et al., 2005; Ilomäki et al., 2008; Immonen et al., 2013) and these three studies described such co-variation in substance use among elderly people (defined as 75+ years in two studies – Aira et al., 2005; Immonen et al., 2013 – and 53–73 years in one study – Ilomäki et al., 2008). Co-variation in alcohol and drug use was operationalised in different ways across the eight studies and only one of these studies (Ilomäki et al., 2008) described categories of alcohol and drug use combinations that could be inferred as likely simultaneous use implying alcohol–drug interaction. In the study by Ilomäki and colleagues (2008), frequent drinking (twice a week or more often) was reported by 29% of the regular users of sedative-hypnotics (who constituted 5.6% of the sample) and thus, 1.6% of the total sample

(aged 53 to 73 years) had likely used alcohol and sedative-hypnotic drugs simultaneously (our calculations based on reported figures in Ilomäki et al., 2008). There was also only one study (Immonen et al., 2013) that reported distributions of socio-demographics and self-reported health among elderly people (aged 75+ years) reporting both use of alcohol in the past year and current use of any drugs that may interact with alcohol. The study by Immonen and colleagues (2013) found that such co-occurring alcohol and drug use was more likely among respondents who were younger, male, married, with medium/high education and income, and in good health. Thus, our knowledge about the extent and characteristics of concomitant alcohol and drug use among elderly people in the Nordic countries is still sparse and in need of updating.

Against this backdrop, our study aim was to assess the prevalence of concomitant alcohol and sedative-hypnotic drug use among elderly people in Norway and to explore socio-demographic and lifestyle characteristics of such use.

Data and methods

The data stem from annual national surveys on alcohol and drug use in Norway conducted in the period 2012–2015 by Statistics Norway (SSB). In each of these four years, a sample of 3700 participants aged 16–79 years was drawn from The Norwegian Population Register (random one-stage selection). Only non-institutionalised persons were eligible for sample inclusion. The surveys were conducted according to the Personal Data Act and the Statistics Act.

Prior to the interview, the respondents received a letter and a brochure providing information about the study, about the survey themes, the data collection procedures and privacy protection. The data were collected by computer-assisted telephone interviews. The average interview time was 20 minutes.

The average response rate for all four surveys was 58% and the total sample comprised 8427 respondents. Among respondents aged 60

years and over, the response rate was on average 71% and the sub-sample of 60–79 year olds from the four surveys comprised 1920 respondents. The data were weighted to correct for differences between the sample and the Norwegian population in distribution of age, gender, educational level and geographic region.

Measures

Our measure of concomitant alcohol and sedative-hypnotic drug use was based on information about past-year use of three substances. The respondents were asked whether they had used hypnotic drugs in the past year (any use) and if so, whether they had used these drugs daily or almost daily over a continuous period of at least one week. Those who responded affirmatively, were asked about the duration of the longest continuous period of daily/almost daily use and the response options were: “1–2 weeks”, “3–4 weeks”, “1–3 months”, and “more than 3 months”. Corresponding questions applied to sedative drugs. When asking about use of hypnotics and sedatives, the interviewer presented the brand names of the five most sold hypnotics (which are z-hypnotics and nitrazepam) and the three most sold sedatives (which are diazepam and oxazepam). Responses to these questions were collapsed and sedative-hypnotic drug use was categorised into “No use or infrequent use” (of either drug in the past year), “Short continuous use” (i.e., 1–4 weeks of either or both drugs) and “Long continuous use” (at least one month of either or both drugs). Also with respect to frequency of alcohol consumption in the past year, the respondents were asked whether they had consumed alcohol in the past 12 months, and if so, how often they drank alcohol. We distinguished between “Seldom/no use” (in the past year), “Infrequent use” (1–3 times a month) and “Frequent use” (at least once a week). Those categorised as *concomitant alcohol and drug users* comprised three groups with respect to frequency of alcohol and drug use: (i) short continuous drug use and frequent alcohol use, (ii) long continuous drug use and infrequent

alcohol use, and (iii) long continuous drug use and frequent alcohol use. In the first two groups, simultaneous use likely occurred at least once during the past year. Because sedatives and hypnotics are often long-acting agents, particularly in older people (Ramchandani et al., 2015), pharmacological interaction with alcohol may also occur when drinking the day after drug intake. In the third group, simultaneous use likely occurred several or many times during the past year.

Socio-demographic and lifestyle characteristics

Socio-demographic characteristics included the following variables: Gender, Age (60–67 years versus 68–79 years), Partner status (married/cohabitant versus unmarried/divorced/widowed), Living alone (no versus yes), Educational level (primary school versus senior high school/college/university), Personal income level, i.e., respondent's gross income in thousand NOK (Norwegian kroner) last year (0–399 vs 400+), Urban dwelling (urban versus rural), and Working status (full/part time work versus not working, i.e., these were in most cases retired).

Lifestyle characteristics included the following variables: Perceived health status (good/very good versus poor/very poor or neither good nor poor) and Smoking status (non smoker versus daily/occasional smoker). We also included the Alcohol Use Disorders Identification Test (AUDIT) score, based on all 10 items, ranging from 0 to 40 (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). Total scores of eight or more indicate hazardous or harmful alcohol use and we separated those with eight or more from those with lower AUDIT scores.

Statistical analyses

Bivariate associations between the outcome measure and socio-demographic and lifestyle characteristics were analysed using cross-tabulations with Pearson's χ^2 test. Next, the

likelihood of concomitant use was analysed in conventional multivariate logistic regression models. Explanatory variables that were associated with concomitant use in bivariate analyses ($p < .05$) were included based on model fit criteria (log likelihood ratio). All analyses were conducted in SPSS version 23.

Results

Among the elderly respondents, 25% reported that they had used sedatives and/or hypnotics in the preceding 12 months, 4% had used these drugs daily/almost daily over a period of 1–4 weeks and 10% reported such use over a period of one month or more (most of these, 8% of the sample, reported such use over a period of more than three months) (Table 2). A majority (81%) reported any alcohol use in the past year, 18% drank alcohol 1–3 times a month, and two out of five elderly (41%) reported frequent alcohol use (at least once a week). Almost four out of five sedative-hypnotics users (79%) also reported alcohol use in the past year, and thus 19% of all elderly respondents reported use of both alcohol and sedative-hypnotics during the past year. Furthermore, 6% of the elderly respondents were categorised as likely concomitant alcohol and drug users (Table 2).

As shown in Table 3, concomitant use of alcohol and sedative-hypnotic drugs in the past year was statistically significantly associated with most of the examined socio-demographic and lifestyle characteristics. Thus, such use was more prevalent among respondents who were: female, unmarried/divorced/widowed, living alone, not working (i.e., mainly retired), in the lower income category, living in urban areas, reporting poor subjective health, smokers, and at-risk drinkers (Table 3).

There was some inter-correlation between explanatory variables, for instance women were more likely to live alone and they were less likely to be working and have a high AUDIT score. We therefore took the analyses to the next step and we explored which socio-demographic and lifestyle characteristics best

Table 2. Sedative-hypnotic drug use and alcohol consumption frequency by age group.

	60–67 years <i>n</i> (%)	68–79 years <i>n</i> (%)	Total <i>n</i> (%)
Sedative-hypnotic drug use (<i>n</i> = 1903)			
Any use in past year	247 (22)	222 (28)	469 (25)
Daily/almost daily use over a period of 1–4 weeks	36 (3)	30 (4)	66 (4)
Daily/almost daily use over a period of at least one month	96 (9)	93 (12)	189 (10)
Alcohol consumption (<i>n</i> = 1920)			
Any use in past year	943 (85)	603 (75)	1547 (81)
1–3 times a month	222 (20)	121 (15)	343 (18)
Once a week or more often	503 (45)	292 (36)	795 (41)
Any use of both drugs and alcohol in past year			
Concomitant use in past year	67 (6)	44 (5)	111 (6)

explained variation in concomitant use by specifying a multivariate logistic regression model (using log likelihood as model fit criteria) (Table 4). As partner status and living alone were strongly correlated, the former was not included in the multivariate analysis. Out of the remaining eight variables that were statistically significantly associated with the outcome measure (as shown in Table 3), five variables contributed to improve model fit and thus explain variance in the outcome measure. Thus, concomitant users were mainly characterised by the following: female gender, living alone, not working (retired), lower income category, and hazardous alcohol use (Table 4).

Discussion

This study found that almost one in five elderly persons (over 60 years of age) reported use of both alcohol and sedative-hypnotic drugs in the previous year. About 6% of the elderly respondents had – most probably – used both substances concomitantly in the past year and were thus likely exposed to alcohol–drug interaction. Such concomitant use was in particular more prevalent among women, hazardous alcohol users, respondents in the lower income category, non-working respondents, and those living alone. The prevalence of likely simultaneous use was higher in our study compared to

a previous study from Finland (Ilomäki et al., 2008), but due to different measurements and age distributions in these studies, the prevalence figures are not directly comparable. To our best of knowledge, no previous study has addressed characteristics of simultaneous use, as we have done here. Our findings in this respect mirror to some extent reported characteristics of frequent use or abuse of sedative-hypnotic drug use in the elderly, including female gender and living alone (Simoni-Wastila & Yang, 2006) and reported characteristics of frequent/heavy alcohol use among elderly, including smoking and living alone (Merrick et al., 2008).

From a sociological point of view, our finding that prevalence of concomitant use was higher among women than among men is particularly intriguing. Studies of sedative-hypnotic drug use in the Nordic countries in the 1970s and 1980s also found that women were more frequent users of these drugs than men, whereas for alcohol use the situation was opposite. Riska (1993) offered a substitution hypothesis to explain these observations, suggesting that women, due to gendered informal social control and stigmatisation of drinking, turned to tranquilizers as an invisible substitution for alcohol as an intoxicating agent. The current picture, demonstrating that women are more likely to use both substances, rather suggests

Table 3. Prevalence of concomitant alcohol and drug use by socio-demographic and lifestyle characteristics. Percentages and *p*-values.

	Concomitant use		
	No	Yes	<i>p</i> -value from chi-square test
<i>Gender</i>			
Male (942)	96	4	<0.001
Female (978)	92	8	
<i>Age</i>			
60–67 years (1110)	94	6	0.580
68–79 years (809)	95	5	
<i>Partner status</i>			
Married/cohabitant (1311)	96	4	<0.001
Unmarried/divorced/widowed (599)	91	9	
<i>Living alone</i>			
Yes (499)	90	10	<0.001
No (1410)	96	5	
<i>Working status</i>			
Employed/working (542)	98	2	<0.001
Not working/retired (1369)	93	7	
<i>Education level</i>			
Primary school (508)	95	5	0.333
High school/university/college (1412)	94	6	
<i>Personal income level (in 1000 NOK)</i>			
0–399 (1134)	92	8	<0.001
≥400 (663)	97	3	
<i>Urban/rural dwelling</i>			
Rural (330)	97	3	0.036
Urban (1589)	94	6	
<i>Subjective health</i>			
Very good/good (1401)	95	5	0.004
Poor/very poor, or neither good nor poor (517)	92	8	
<i>Smoking status</i>			
Non-smoker (1587)	95	5	0.024
Daily/occasional smoker (333)	92	8	
<i>AUDIT score</i>			
<8 (1768)	95	5	<0.001
≥8 (97)	86	16	

that the validity of this hypothesis has lost empirical support.

Our finding that three out of four elderly people using sedative-hypnotics are also alcohol users, suggests that medical doctors and other health personnel, when prescribing these medications, should ask their patients about alcohol use and explain the potential risks associated with combined use. As we have seen in this study, about 1 in 20 elderly persons reported using drugs and alcohol so frequently that

simultaneous use is very likely and therefore the risk of injuries is elevated. In particular, this seems most important for those living alone and with impaired mobility, as they are even more vulnerable for loss of health and wellbeing in the event of hip fracture or other accidental injury.

Strengths and limitations

By collapsing data from four surveys, we obtained a fairly large sample of elderly people.

Table 4. Estimated associations between socio-demographic and lifestyle characteristics and likelihood of concomitant alcohol and drug use. Logistic regression model,^a regression coefficients, standard error of the estimates, adjusted odds ratios and confidence intervals (95% CI).

	<i>b</i>	<i>SE</i>	<i>OR</i> (95% <i>CI</i>)	
Gender				
Male (reference group)				
Female	0.60	0.23	1.8**	(1.2–2.9)
Living alone				
No (reference group)				
Yes	0.59	0.21	1.8**	(1.2–2.8)
Working status				
Working (reference group)				
Not working/retired	0.78	0.34	2.2*	(1.1–4.2)
Personal income level (in 1000 NOK)				
≥400 (reference group)				
0–399	0.63	0.30	1.9*	(1.0–3.4)
AUDIT score				
<8 (reference group)				
≥8	1.43	0.33	4.2***	(2.2–8.0)
Constant	–4.54	0.35		

^aLogistic regression model was specified using model fit criteria. Each parameter estimate is adjusted for the other explanatory variables included in the model.

****p* < .001. ***p* < .01. **p* < .05.

This allowed for exploring characteristics of likely simultaneous alcohol and drug use, which adds to the sparse literature. One may ask whether respondents in general and elderly people in particular, provide valid responses in surveys of prescription drug use. In some previous studies participants were asked in advance to make a list of the drugs they were using or bring the drugs to the examination (e.g., Ilomäki, et al., 2008; Immonen et al., 2013), which enhances valid drug classification. In this study, we have compared age-specific rates of sedative-hypnotic drug use in the surveyed sample with national register data on number of persons who had filled prescriptions for sedatives or hypnotics in a single year. Data from the Norwegian Prescription Register showed that on average for the years 2012–2015, the proportion of people who filled prescriptions for hypnotics and/or anxiolytics, increased with increasing age: among those 60–64 years old, 20% filled a prescription, whereas in the age group 75–79 years almost

a third (32%) filled a prescription for these drugs. The corresponding figures in our dataset with self-reported drug use were 20% and 28% and we assume that this high correspondence at the aggregate level indicates good validity.

However, frequencies of use of both substances may be subject to response bias, in particular frequent alcohol use is likely biased by social desirability and therefore under-reported. If so, we may assume that our estimates of concomitant use are biased downward. Moreover, non-participation in the study may also contribute to downward-biased estimates as heavy drinkers and sick people with frequent drug use may be less available – or willing – to participate. Notably, our categorisation of likely simultaneous use builds on combinations of frequency measures of alcohol and drug use, rather than a direct and unambiguous measure of actual simultaneous intake of these substances. Thus, our category of concomitant use includes a range of substance use patterns and varying frequency of simultaneous use. It is also

possible that the category is too inclusive and includes some individuals who did not use alcohol and sedative-hypnotic drugs concomitantly.

Conclusion

A fairly substantial fraction of elderly Norwegians reported use of both sedative-hypnotic drugs and alcohol to an extent that implies likely pharmacological interaction and thereby elevated injury risk. Such use was also reported by a considerable fraction of elderly people living alone, who constitute a more vulnerable group in the event of an injury. Further studies in this area are needed, both for validation of the findings in the present study and for assessment of patients' and health personnel's awareness of the risks of concomitant alcohol and drug use in elderly people.

Declaration of conflicting interests

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