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Substance Use and Abuse Among Older Adults: A State of the Art

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1. Introduction

Substance abuse, defined here as the abuse of alcohol, cannabis, cocaine and heroin, in older adults is often neglected, both in science and in practice. Substance abuse is a serious public health issue as it not only affects physical and mental health of the abusers, it also leads to increased costs for society (Adams et al., 1993). Older adults with addiction problems deserve special attention. Compared to younger people, smaller amounts of substance may lead to intoxication and organ damage because of greater use of contraindicated medications, less efficient liver metabolism and decreases in lean body mass and total body water (Dufour & Fuller, 1995).

Substance use and abuse among people aged 50 and over is rapidly increasing in Europe and the United States (Beynon, 2009). For Europe, the number of older people with substance use problems is estimated to more than double between 2001 and 2020 (Gossop, 2008). This is partly due to the size of the baby-boom cohort (born between 1946 and 1964) and the higher rate of substance use among this group (Gfroerer et al., 2003). Estimates from the United States suggest that the number of adults aged 50 and over will double from 2.8 million (annual average) in 2002–06 to 5.7 million in 2020 (Han et al., 2009).

To reduce the negative trend in substance abuse, effective prevention is required. Cuijpers and Willemse (2005) distinguish four types of prevention in this context; universal prevention, selective prevention, indicated prevention and care based prevention. For each level of prevention, specific knowledge is needed. For universal prevention, targeted at the entire population regardless of the risk of addiction, knowledge about the prevalence, causes and adverse consequences of risk-full use are important. In selective prevention, aimed at groups at risk of becoming addicted, knowledge of risk factors is essential to identify the groups. For indicated prevention, aimed at people with limited symptoms, it is important to recognize signs of addiction and have knowledge of appropriate treatments. Finally, care based prevention, referring to people with an addiction according to DSM criteria, it is important to have insight into factors that influence the course of the disease. Insufficient knowledge of one or more levels of prevention can lead to under-recognition of addiction problems by social workers (Adams et al., 1992), lack of agreement between doctors on the causes and treatment of addiction (Brown, 1982), and people are still insufficiently aware of the importance and effects of proper treatment (McInnes & Powell, 1994).

In this chapter, an overview is given of what is known about the prevalence and the bio-psycho-social characteristics of older people who abuse substances. In addition, we will describe the known risk factors for the development and course of substance abuse.

2. Methods

2.1 Review

In addressing the aim of this chapter, three databases (PubMed, PsychINFO, and Socindex) were investigated for potentially relevant studies using the following keywords: “Alcohol”, “drug abuse”, “heroin”, “cocaine”, “cannabis”, “substance abuse” each combined with AND (elderly OR older adults). Based on the title and abstract of each retrieved article the potential relevance for the current study was investigated. We selected only articles that were written in English, have appeared in peer-reviewed journals, were based on original quantitative empirical research, aiming at the older population (aged 50 years or older). Relevant information for answering the research questions was extracted from each selected article. For information on the prevalence and the bio-psycho-social characteristics of older people who abuse substances, studies containing information on one or more of the following characteristics were selected: prevalence, trends in use with age, bio-psycho-social characteristics of users, and risk-full use or addiction. For information on risk factors for the development and course of substance abuse, only longitudinal studies or case-control studies were selected.

2.2 Definitions

Substance abuse is defined in accord with the Diagnostic and Statistical Manual of Mental Disorders (DSM) if three or more of the following criteria were met: 1) tolerance, as defined by either a need for markedly increased amounts of the substance to achieve intoxication or the desired effect or markedly diminished effect with continued use of the same amount of the substance; 2) withdrawal, as manifested by the characteristic withdrawal syndrome for the substance or the same (or closely related) substance is taken to relieve or avoid withdrawal symptoms; 3) the substance is often taken in larger amounts or over a longer period than intended; 4) there is a persistent desire or unsuccessful efforts to cut down or control substance use; 5) a great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from its effects; 6) important social, occupational, or recreational activities are given up or reduced because of substance use; and 7) the substance use is continued despite knowledge of having a persistent physical or psychological problem that is likely to have been caused or exacerbated by the substance.

A limitation of the DSM classification is that it does not take account of the specific circumstances and life stage in which older people reside. The consequences of substance abuse are more visible in people who are still employed than in people who live alone, which is more prevalent among older people. Also milder forms of abuse or risky use can significantly affect the physical, cognitive and mental health of older adults. Therefore, also risk-full substance use will be addressed in this study.

3. Results

The literature search resulted in 432 studies potentially relevant to this investigation. Based on the title and abstract 81 studies were subsequently selected for further study and

data extraction. Of the 81 selected studies, 75 studies were on alcohol consumption, 7 studies on alcohol use in combination with medicines and one study on cocaine and heroin use. Only a small fraction of all studies ($n = 10$) focused on addiction according to DSM-IV criteria. The results will be summarized around 6 themes: recognition of alcohol abuse, prevalence, changes in substance use with aging, bio-psycho-social characteristics of older substance users, risk factors, and consequences of abuse. In addition, also study results for risk-full of alcohol that does not fit the DSM criteria for an addiction will be summarized. The results will be described separately for alcohol, cannabis, heroin and cocaine.

3.1 Recognition of alcohol abuse

Assessing correct diagnosis regarding alcohol abuse is complicated (Aartsen et al., 2009). This is partly due to the reluctance of abusers and health care practitioners to discuss the drinking behavior. However, even without explicitly asking, there are signs that may indicate an underlying alcohol problem. For example, in some cases the breath of people can smell like alcohol, there may be complaints from the social environment of people about alcohol consumption, there may be convictions for driving with too much previous alcohol intake, and people may become annoyed once the subject is brought up to alcohol. Also, certain physical problems may indicate alcohol problems, such as hypertension, gastrointestinal problems, unexplained falls and psychological symptoms as anxiety and depression. There are screening instruments especially developed for older people that can help professionals to make a more deliberated diagnose. A simple, but not always adequate way is to ask how much alcohol is consumed on average per day. Besides the danger of under-reporting (people tend to underestimate their own drinking behavior), the average number of drinks per day is not always informative. Whether you drink two glasses a day, or once a week, 14 units, the average remains the same, but the social and physical consequences can vary widely. Moreover, one factor that affects the harmful effects of alcohol intake is the fat-moisture balance, and whether there are any concurrent medications or other chronic diseases that does not tolerate alcohol intake. A good alternative is the Alcohol Related Problem Survey (ARPS: Fink et al., 2002). The ARPS is a comprehensive questionnaire which not only questions drinking behavior, but also assesses health, life style, drug use and risky behaviors such as driving after alcohol use. Other screenings instruments are the Alcohol Use Disorders Identification Test (AUDIT), the Short Michigan Alcohol Screening Test-Geriatric (SMAST-G) and the Cut down, Annoyed, Guilty, Eye-opener test (CAGE).

3.2 Prevalence of substance use and abuse

Prevalence of risk-full alcohol consumption in the community ranged from 3 to 22% in men and 1 to 4% in women (Table 1). Men are two to five times more often risk-full alcohol consumers. The number of cannabis, heroin and cocaine users in the U.S. population is low (Blazer & Wu, 2009), of which the use of cannabis was the most prevalent. The annual prevalence of cannabis for people aged 50-64 year was 3,9%, and for people aged 65 0.7%. The annual prevalence of cocaine use by 50-64 year olds and 65 + was, respectively 0.68% and 0.04%. Heroin was used by 0.08% of 50-64 year old people. Heroin use is not observed among people aged 65 and over.

Prevalence rates of substance abuse, however, should be taken with caution. Taking into account that substance abuse among older adults is often under-diagnosed (Stewart & Oslin, 2001), and given the fact that only a small fraction of those with disorders related to substance abuse seek treatment, the actual number of older people with an alcohol use disorder in the general population must be much higher.

Alcohol		
First author and year of publication		Country
Breslow 2003	Prevalence of heavy drinking ranged from 9 to 10% in men and from 2% to 3% in women	US
Merrick 2008	16% of the men and 4% of the women are risk-full users	US
Du 2009	15% risk-full drinking, and 8% benzodiazepine and alcohol use	DE
Ganry 2001	3% of the 75+ women drank more than 30 grams per day	FR
Halme 2009	20% of the men and 1% of the women are heavy drinkers (more than 8 standard glasses per week)	FI
La Greca 1988	6% heavy users	US
Lang 2007	22% of the men and 4% of the women are heavy drinkers	GB
Rodgers 2005	7% of the men and 6% of the women drink hazardous amounts of alcohol	AU
Mirand 1996	13% of the men and 2% women were heavy drinkers	US
Cannabis, Cocaine, Heroin		
Blazer 2009	Prevalence of cannabis use: 3,9% for people aged 50-64 Prevalence of cannabis use: 0,7% 65 year old people Prevalence of cocaine use: 0,7% for people aged 50-64 Prevalence of cocaine use: 0,04% for 65 year old Prevalence of heroin use: 0,08% for people aged 50-64 Prevalence of heroin use: 0,0% 65 year old people	US

Table 1. Prevalence of alcohol, cannabis, cocaine and heroin use in society

In patient populations, prevalence rates of alcohol use were higher (Table 2). Estimates of the incidence of risk-full drinking range from 2% in women to 17% in men. Alcohol addiction in France varies in different patient populations from 3% in women and 18% in men (Lejoyeaux et al., 2003). Also Speckens et al., (1991) found high prevalence of alcohol in a university hospital in the Netherlands.

3.3 Developments in alcohol use with aging

Trends in alcohol use with aging were estimated in a number of longitudinal studies. Research in the United States (Adams et al., 1990) shows that older people generally reduce the number of drinks as they become older (each year a decrease of 2% drinkers). There is an indication for a gender effect. Men who drink heavily, but continue to drink, reduce drinking as opposed to heavily drinking women whose alcohol consumption remained stable (Breslow et al., 2003).

First author and year of publication		Country
Adams 1992	Prevalence of lifetime alcohol abuse: 24% Prevalence of current alcohol abuse: 14%.	US
Blow 2000	Prevalence of risk-full drinkers: 7%	US
Kahn 2001	Prevalence of risk-full alcohol use: 5%. Prevalence of lifetime alcohol abuse: men 37%, women 12%. Prevalence for last year alcohol abuse: 0.5%	NZ
Ganry 2000	Prevalence of risk-full alcohol use: men 17%, women 3%	FR
Kirchner 2007	Prevalence of risk-full drinkers: 5%	US
Lawley 1996	Prevalence of risk-full use: 12% Prevalence of abuse: 3%	GB
Lejoyeux 2003	Prevalence of alcohol abuse: 18% men and 3% women	FR
Onen 2005	Prevalence in Emergency Departments of alcohol abuse: 5,3%	BE
Speckens 1991	Prevalence of alcohol abuse: men 13%, women 7% women	NL

Table 2. Prevalence of alcohol abuse in patient population

3.4 Bio-psycho-social characteristics of older substance users

3.4.1 Alcohol

Older adults who are addicted to alcohol constitute a heterogeneous group consisting of people who have been addicted to alcohol before the age of 25 (early onset), people whose addiction started between the 25th and 45th year of life (late onset), and people who could remain at moderate levels of drinking till the age of 45, and became addicted at higher ages (very late onset). It is currently believed that the etiology and the course of alcohol disorders or risk-full drinking is complex and includes both genetic and environmental factors and the interaction of the two (Edenberg & Foroud, 2006). Genetic factors leading to differential risk for alcoholism were demonstrated using twin and family studies. In addition, functional polymorphisms of alcohol dehydrogenase (ADH2) and aldehyde dehydrogenase (ALDH2) genes have been shown to have a significant impact on alcohol metabolism in the liver, and thus, may contribute to vulnerability to alcohol abuse and dependence (Yokoyama & Omori, 2003). Antisocial personality is found to be a frequent cause of early onset (Watson et al., 1997), whereas very late onset seems to be more often induced by stressful life events (Hurt, 1988). Furthermore, early onset is more often seen among people who are homeless, who have family members with alcohol problems, and who have low socio-economic status, and people with very late onset often show better social functioning, have normal family lives and professional careers, rarely have a criminal history; furthermore, the course of very late onset is more favorable compared to early onset or late onset (Liberto & Oslin, 1995; Rigler, 2000).

Studies consistently show that there is a U-shaped relationship between alcohol use and mental and physical health. Abstainers, high-risk users and addicts have a poorer physical and mental health than moderate users (Blow et al., 2000; Brideveaux et al., 2004, Mukamal et al., 2001; Rodgers et al., 2005). Alcohol use appears to be related to prevailing beliefs about alcohol (Akers et al., 1989, Preston & Goodfellow, 2006; Graham & Braun, 1999).

Catholics, white people and non religious people drink significantly more than other ethnic groups or religions (Breslow et al., 2003; Forster et al., 1993; Merrick et al., 2008; Ruchlin, 1997). Higher education is associated with more, but also risk-full alcohol use (Breslow et al., 2003, Forster et al., 1993; Goodwin et al., 1987; Merrick et al., 2008; Ruchlin, 1997). Alcohol consumers smoke more than non-users (Mirand & Welte, 1996; Ganry et al., 2001), and alcoholics often live alone (Brennan, 2005; Onen et al., 2002).

First author	Main findings
Adlaf 1995	Men report more alcohol related problems than women
Aira 2005	Most alcohol drinkers used medications on a regular basis (86.9%) or as needed (87.8%).
Akers 1989	Drinking is related to the norms and behavior of one's primary groups, one's own attitudes toward (definitions of) alcohol, and the balance of reinforcement for drinking
Blow 2000	Low-risk drinkers were significantly better off than abstainers on the following domains: general health, physical functioning, bodily pain, vitality, mental health, emotional role, and social functioning. At-risk drinkers had significantly poorer mental health functioning than low-risk drinkers.
Brennan 2005	Nursing home residents with alcohol use disorders were more likely to have lived alone before admission and to have obtained mental health and social services. Residents with alcohol use disorders had somewhat better performance of basic activities than did residents in the demographically-matched sample group. Men with alcohol use disorders had shorter lengths of stay than did men without alcohol use disorders; women with alcohol use disorders had longer lengths of stay than did women without such disorders.
Breslow 2003	White people had the highest prevalence of moderate and heavier drinking compared with other racial/ethnic groups. Higher education was related to higher drinking levels. Moderate drinking was related to living with a partner.
Brideveaux 2004	Drinkers have a better health status than nondrinkers. Problem drinkers had lower health status than drinkers without drinking problems
Christie 2008	Controlling for age, gender, and vascular health, global Cerebral Blood Flow was greater in the lightest alcohol consumption group (<1 per week) and lower in the heaviest (>15 per week).
Forster 1993	Drinking is related to male gender, higher education, Catholic or no organized religious affiliation.
Ganry 2001	Smoking, good health status, higher socioeconomic status or single marital status are related to higher levels of alcohol use.
Gao 2009	Moderate current and lifetime alcohol consumption were found to be associated with reduced chronic atrophic arthritis compared to alcohol.
Geroldi 1994	Male gender, poorer cognitive function, and income dissatisfaction were significantly associated with alcohol problems.

First author	Main findings
Goodwin 1987	Alcohol intake was positively associated with male gender, income, cognitive functioning and amount of education and negatively associated with age.
Graham & Schmidt 1999	Depression was correlated with heavier drinking.
Graham & Braun 1999	Having a drinking spouse (versus an abstinent spouse) was associated with higher levels of drinking.
Kirchner 2007	Heavy drinking showed significant positive association with depressive/anxiety symptoms and less social support. Heavy drinking combined with bingeing was similarly positively associated with depressive/anxiety symptoms and perceived poor health.
Lang 2007	For both men and women, better cognition and subjective well-being, and fewer depressive symptoms, were associated with moderate levels of alcohol consumption than with never having drunk any.
Mattace-Raso 2005	Moderate alcohol consumption is associated with lower arterial stiffness in women but not in men independently of cardiovascular risk factors and atherosclerosis
Merrick 2008	Unhealthy drinking is associated with higher education and income; better health status; male sex; younger age; smoking; being white; and being divorced, separated, or single. were associated with higher likelihood of unhealthy drinking. Among drinkers, in addition to socio-demographic variables, self reported depressive symptoms were positively associated with unhealthy drinking. Among unhealthy drinkers, race and ethnicity variables were associated with likelihood of heavy episodic drinking.
Midanik 1992	Sense of Coherence was a significant negative predictor of alcohol problems while controlling for alcohol consumption level, frequency of drunkenness and demographic characteristics.
Mirand 1996	Positive associations between heavy drinking and being male, having suburban residency, and currently using cigarettes. Negative relationships between heavy drinking and socioeconomic status, rural residency, and degree of health orientation.
Mukamal 2001	Moderate alcohol consumption is associated with a lower prevalence of white matter abnormalities and infarcts, thought to be of vascular origin, but with a dose-dependent higher prevalence of brain atrophy on MRI among older adults.
Mukamal 2004	Alcohol intake is associated with lower levels of inflammatory markers in older adults free of cardiovascular disease
Musick 2000	Alcohol use had no effect on depressive symptoms. One exception to this latter finding was that among rural Baptists who rarely attended religious services, using alcohol was associated with more depressive symptoms.

First author	Main findings
Onen 2002	Being homeless, living alone, being divorced and never married and being a man was associated with alcohol use disorders. Drinkers more commonly presented with gastrointestinal disorders.
Oslin 2005	Among people with alcohol use disorders, 22,3% has current depressive disorder, 44,9 physical disabilities, 13,6 anxiety disorder, 70,8% have college or higher education, 57% married. Compared to younger patients, they have less mental health problems, less severe alcohol use, and less outpatient treatment experience.
Preston 2006	Frequency of drinking and abuse is positively associated with personal approval of daily alcohol use and number of peers who use alcohol.
Rapuri 2000	Moderate alcohol intake was associated with higher bone mineral density in postmenopausal elderly women.
Rice 1995	Alcohol consumption was negatively associated with General Practitioners visits, controlling for gender and health
Riserus 2007	In men: self-estimated alcohol intake was not related to insulin sensitivity, early insulin response, or BMI, but was positively related to Waist Circumference.
Rodgers 2005	Abstainers have poorer cognitive function than light drinkers.
Ruchlin 1997	Everyday drinkers are more likely to being male, white, higher educated, living in the city centre and less likely to be in less than in excellent health, having diabetes, and believing that drinking has negative health consequences.
Schuckit 1978	Compared to younger alcoholics, older alcoholics had relatively more stable lives in early years and had developed alcohol-related problems in later years
Sheahan 1995	Alcohol use is not related to falls
Steunenberg 2008	Depression and alcohol use are not related in this very old, mostly female population. Alcohol use was related to extraversion and openness to experience. Chronic diseases was related to non-alcohol use and parental problem drinking was found to be a risk factor for late life problem drinking.
Sulander 2004	Higher alcohol use was more common among retired office workers than other former employees.
Westerterp 2004	Alcohol intake does not lead to increased body weight, probably due to the higher physical activity level

Table 3. Bio-Psycho-Social characteristics of older people who (ab)use alcohol

The relationship between cognitive functioning, cognitive pathology and drinking is more complicated. Risk-full use seems to be associated with worse cognitive function (Geroldi et al., 1994) and moderate use with better cognitive function (Goodwin et al., 1987; Lang et al., 2007; Rodgers et al., 2005). There are indications that the relationship is actually spurious, as the relation disappears when controlling for other potential influences (Cooper et al., 2009; Goodwin et al., 1987).

Several studies found a relationship with physical characteristics. Women who drink moderate levels of alcohol have a higher density of mineral in bone (Ilich et al., 2002; Rapuri et al., 2000). A positive correlation between alcohol use, reduced inflammation, lower prevalence of strokes

and white matter pathology, and the quality of blood vessels is found by Christie et al. (2008), Gao et al. (2009), Mattace-Raso et al. (2005) and Mukamal et al. (2001, 2004).

Risk-full drinkers appear to be more often depressed (Blow et al., 2000, Graham & Schmidt, 1999; Oslin et al., 2005), while moderate drinkers have fewer levels of depressive symptoms (Blow et al., 2000, Graham & Schmidt, 1999; Kirchner et al., 2007; Lang et al., 2007, Merrick et al., 2008). A relationship between alcohol and depression was however not found in very old nursing home residents (Steunenberg et al., 2008) and older Baptists (Musick, 2000).

3.4.2 Cannabis, cocaine and heroin

One study reported information on older cannabis, cocaine and heroin users. These users are more often male, single, and have depressive symptoms, but no differences in educational background are observed (Blazer & Wu, 2009).

3.5 Risk factors for substance abuse

Only one longitudinal study examined risk factors for risk-full drinking (Moos et al., 2010). The study revealed that a lower quality of marriage, lower participation in social activities, approval of drinking by friends and larger financial resources lead to an increased risk of risky alcohol use.

3.6 Consequences of substance use

In general, moderate consumption of alcohol has beneficial effects on physical and mental health, while risk-full use entails negative effects. Moderate alcohol use leads to higher bone density (Felson et al., 1995), longer life (Brideveaux et al., 2004; Colditz et al., 1985; Simons et al., 2000;), and reduced risk of Type 2 Diabetes (Djousse et al., 2007). Moderate alcohol consumption may also have some negative consequences as it may increase blood pressure, glycemia and body weight (Buja et al., 2010). Risk-full alcohol use leads to an increased risk of mental health problems (Friedman et al., 1999) and mortality (Gronbaek et al., 1998) and possibly an increased risk of acute pneumonia (Van der Horst Graat et al., 2007).

4. Conclusions

This study provides an overview of scientific knowledge in the field of substance abuse (alcohol, cannabis, heroin, and cocaine) in people aged 55 and older. Three databases were searched for relevant literature. There is useful information on alcohol use and risk-full use, but large gaps in knowledge about substance abuse exists. Research on alcohol addiction is limited and use of cannabis, cocaine and heroin in older adults is virtually absent. Moreover, many of the studies had a cross-sectional design, which limits conclusions about causes and effects. An additional problem is that most of the studies were conducted in the United States, while that information not necessarily applies to other countries because of cultural differences is (Vaz De Almeida et al., 2005).

Nevertheless, an outline of people who use risk-full amounts of alcohol became visible. First, there is a U-shaped relationship between amount of alcohol use and health. Moderate users are healthier than high-risk users and abstainers. The fact that abstainers were worse of than moderate users is possibly explained on the basis of the great heterogeneity in the non-using group. Not drinking is associated with certain medications and thus indicates the presence of disease, previous alcohol dependence, but also a healthy lifestyle.

High-risk alcohol users were more often male (2-5 times more), live in social environments where alcohol is not condemned, are higher educated, smoke more often, are more often single or depressed and may have poorer cognitive function. With age, the average consumption of alcohol decreases, except for risk-full drinking women. The consequences of risk-full alcohol use are decreased mental health and increased mortality. Very little is known about causes of alcohol addiction.

For information about use of cannabis, heroin and cocaine in older adults, we can only rely on one study conducted in the US. Of the three, cannabis is most often used, particularly 50-64 year olds (year prevalence 3.89% and 0.69% at 65). Less than 1 percent of older people use cocaine, while heroin use is not seen in people over 65 (Blazer & Wu, 2009).

In sum, it appears that knowledge of substance abuse in older adults is still mainly limited to the description of bio-psycho-social characteristics of older adults with alcohol abuse. Knowledge of prevalence, causes, consequences and characteristics of the elderly who according to DSM criteria are addicted to any of the tested agents is still virtually absent. The design of effective prevention of substance abuse in older adults, as well as effective therapies is therefore strongly hampered. With respect to universal and selective prevention at the population level, more research is required into causes and consequences of substance abuse. For effective care-oriented prevention research into the effects of treatments in patients populations such as in addiction clinics is needed in order to improve the effect of treatment programs.

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