Predictors of cognitive impairment in patients with substance use disorder in Kiambu County, Kenya

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ABSTRACT

Cognitive impairments induced by substance use contribute to poorer treatment outcomes among patients with substance use disorder (SUD). Neuropsychological assessments are often neglected during patient evaluation in SUD treatment programs owing to the fact that they require extensive time for evaluation and are resource intensive. This inattention is likely to compromise comprehensive treatments which would offer better prognosis for such patients undergoing treatment for SUD. The main objective of this study was to determine predictors of neuro cognitive disorders (NCD) in patients with substance use disorders enrolled in rehabilitation centers in Kiambu County, Kenya. A cross-sectional design was adopted and data collected between Oct-23 to Jan 2024, covering a total of 250 patients aged 18-65 years that consented to participate in the study. Consecutive non-probability sampling technique was deployed in the recruitment of the respondents into the study. A self-rated questionnaire was developed for data collection whereas the Montreal Cognitive Assessment (MoCA) Tool was employed in the screening for cognitive impairment. The prevalence of cognitive impairment was 34.8% (Prevalence per primary substance showed alcohol=37%, cannabis=22%, and khat=22%). Age (Coefficient=0.0852, P=0.013 CI= 0.018-0.152), education (Coefficient=0.0783, P<0.008 CI= 0.021-0.139), and anxiety disorder (Coefficient=0.4286, P<0.001 CI= 0.317-0.540) were found to be significantly associated with neurocognitive disorders at multivariate analysis. This shows that it is important to screen for cognitive impairments during early treatment stages considering the high prevalence rate. This will enhance the choice of treatment course and maximize on treatment outcomes.

Key words: *Neuro-cognitive disorder, predictors, impairment, substance use disorders.*

INTRODUCTION

Mental, neurological and substance use disorders have become widespread with 25% of all people affected during their lifetime (UNODC 2021). The chronic utilization of diverse substances (alcohol, opioids, and cannabinoids) has been widely linked to neural dysfunctions and associated cognitive deficits as they alter how our brain works. In the context of the mechanistic approach, it is held that neuro-adaptive and

neurotoxic pathways influence the impact of substances in the brain (Ekhtiari et al, 2016). Changes in the brain occur in diverse layers encompassing the neurons (alterations in dopamine discharge configurations), circuits (alterations in links between brain networks) as well as cognition (focus on substance linked stimuli) (Morley et al, 2016). This is reflected in user's subjective experiences such as cravings and behavior (engaging in risky behaviors to access substances) (Morley et al, 2016). Cognitive impairments are associated with chronic polysubstance use disorder (PSUD).

In Sub-Saharan Africa, the burden of SUDs has been projected to grow by an estimated 130% by 2050 (Ekhtiari et al, 2020). However, SUD treatment and prevention strategies in the region are lacking, with few resources and the treatment gap at 87% (Ekhtiari et al, 2020). In Kenya, there has been a marked rise in SUDs related to alcohol and drug abuse. A more recent study by Jaguga and Kwobah (2020) indicated that prevalence of alcohol use disorders for those aged 15-65 was 10%, tobacco 2.5%, with khat and bhang at below 2%. Similarly, the National Authority for the Campaign against Alcohol and Drug Abuse, NACADA (2012) reported that 10.4% of alcohol users suffer from alcohol related disorders.

Some of the known predictors of NCDs that have been reported in research include early use of drugs especially during adolescent and in young adults (Ekhtiari et al, 2020; Bruijnen et al, 2019), Polysubstance use, and history of mental illness (Bruijnen et al, 2019). In addition, Ramey and Regier (2019) identified a number of socio-economic and demographic factors that predict or precede NCDs namely: age, level of income (that determines type of drug used and access to intervention), parental abuse and neglect, and history of drug use among parents and peers.

It is notable that most of the studies indicating the predictors and the link between SUDs and NCDs have been undertaken in the West (Ekhtiari et al, 2020; Yucel et al, 2019; Ramey and Regier, 2018 Zilverstand et al, 2018). This study's major question was whether similar findings could be replicated within the Kenyan context, and/or whether the findings would differ considering the cultural differences as well as the differences in terms of the type of substance used by the research population. This study also sought to provide insights into the prevalence of neuro cognitive disorders among patients with substance use dependence and predictors of NCDs among patients with SUDs in Kiambu County, Kenya. It was hypothesized that there was no statistical association between demographic and socio-economic factors on NCDs among substance abuse disorder patients. In addition, that drug use risk factors have no effect on neurocognitive disorders (NCDs) among SUD patients.

METHODOLOGY

Study design

A cross-sectional study was conducted to gather data from the population using Montreal Cognitive Assessment Tool

(MOCA). Data was collected between Oct-23 to Jan 2024 in nine rehabilitation centres in Kiambu County. Ethical clearance was granted by Kenyatta University Ethics Review Committee (PKU/2825/I1948). Whereas research license was obtained from National Commission for Science, Technology, and Innovation (Ref No. 850822). Further clearance was secured from Kiambu County Research Committee. All study participants provided informed consent and ethical requirements governing participation of human subjects in research were adhered to in the entire process.

Sample and sampling techniques

The study sample size of 250 respondents was generated by (Fisher et al 1998) formula with 5% degree of precision and confidence level at 95%. The study adopted consecutive sampling method which is a non-random sampling technique that enabled data collection from participants as they were readily available.

Study participants

The study population were patients in recovery centers (Rehabilitation) in Kiambu County admitted due to substance abuse and dependency who agreed to participate in the study. The study sites had to be accredited by National Authority for the Campaign against Alcohol and Drug Abuse (NACADA). The inclusion criteria were (i) Age - between 18-65 years, (ii) dependency or abuse of a substance, (iii) Agreed to give consent. Exclusion criteria were (i) Inability to administer MoCA due to neurological instance such as stroke and dementia, (ii) acute psychiatric disorder, and decline to offer consent to study participation.

Instruments and procedures

Montreal Cognitive Assessment (MOCA) tool which consists of 13 items that measure 7 domains was used in this study. The 7 domains are: psychomotor function, naming, attention, language, abstraction, delayed recall and orientation. (Julayanont, 2017). (see www.mocatest.org). This is a tool administered in 10-15 minutes by clinicians and psychosocial counsellors. The tool score was calculated by summing scores of all items with a maximum score of 30 points. Patients with less than 12 years of school are awarded a single point to adjust for low level of education. A cutoff point of 26 is applied with those scoring 26 to 30 classified as normal, while a score of 25 and below is categorized as cognitive impairment.

Written informed consent was acquired from all participants. The study objectives and procedures were clearly explained before seeking consent. The MOCA tool was administered by clinicians and psychosocial counsellors offering services to collect vital information and interpret the results. All professionals were trained on the MOCA tool administering and interpretation, and a copy of MOCA instructions provided to help in understanding the domains, scoring and interpretation. Participants provided information such as age, sex, marital status, average income, employment status, education background setting and religion. Also, medical and drug history questions were administered including number of times enrolled in a rehabilitation center, use

of multiple drugs, age at substance abuse debut, continuous years of drug use, and history of mental illness.

Data analyses

Stata version 18 was used to conduct analysis of quantitative data. Chi-square test and Fishers exact tests was used to test for differences in categorical and binary variables. Prevalence of cognitive disorder was calculated per primary substance and the total sample. At inferential data analysis, bivariate and multivariate analysis was conducted to test for association between dependent variable (NCD) and predictor variables. Odds Ratio, adjusted Odds Ratio (AOR), coefficients, p-values and Confidence Intervals (CI) were used to interpret the strength of association and level of significance between dependent and predictor variables.

RESULTS

A total of 250 patients were enrolled into the study, majority being male (182; 72.8 %) as compared to females (68; 27.2 %). The median age of the participants was 30.0 years [range 18-58] with the largest proportion of the respondents aged between 25-34 years (94; 37.6%). Results on marital status show that, 66% were single, 22.8% married while 11.2% were either divorced or widowed. Only 31.6% had achieved university education, 39.6% tertiary education, 18.8% secondary 10% completing primary school education. About 27.2% were unemployed, 26.8% in white collar jobs, 22.0% in blue collar jobs, 16.4% students with the minority 7.6% self-employed. Christianity was the most dominant religion (86.4%), Muslim (4.8%), Atheist (4.8%), traditional beliefs (2.8%) and Hindu (1.2%).

Prevalence of neuro cognitive disorder among substance dependent patients was 34.8%. Per primary problematic substance, prevalence was 37% for alcohol, 27% for cannabis and 22% for khat as summarized

Table 1: Prevalence of neuro cognitive disorder per primary problem substance

Primary substance	Total	With NCD	Prevalence
Alcohol	202	75	37%
Cannabis	30	8	27%
Khat	18	4	22%
Total	250	87	35%

Table 2 shows findings from bivariate analysis to test the relationship between demographic characteristics and neuro cognitive disorder among SUD patients in Kiambu County. The results showed that age (Chi=12.6829, p=0.002) education level (Chi=47.6691, p<0.05), occupation (Chi=24.6773 p<0.005), religion (Chi=23.3852 p<0.005) and background setting (Chi=8.1346, p=0.004) were significant predictors of cognitive impairments at

bivariate level.

A further analysis on the relationship between NCD and age using the local polynomial smoothing highlighted progress in cognitive impairment with advanced age.

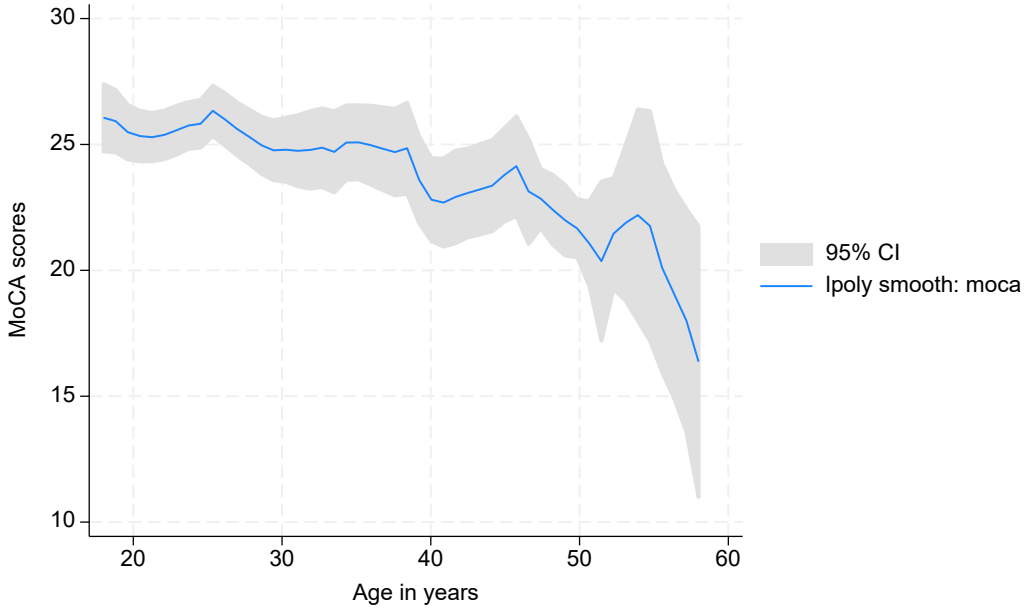

Figure 1: Figure of MOCA score by age.

Table 2: Association of neuro cognitive disorder and demographic characteristics

Variable	No NCD n (%)	NCD n (%)	Total	Chi-Square	P value
Sex					
Female	38 (55.9)	30 (44.1)	68	3.5741	0.059[a]
Male	125 (68.7)	57 (31.3)	182		
Age in Years					
<25	46 (75.4)	15 (24.6)	61	12.6829	0.002[a]
25-34	68 (72.3)	26 (27.7)	94		
35+	49 (51.6)	46 (48.4)	95		
Education level					
Primary	21 (84.0)	4 (16.0)	25	47.6691	<0.005[b]
Secondary	16 (34.0)	31 (66.0)	47		
Tertiary	41 (41.4)	58 (58.6)	99		
University	9 (11.4)	70 (88.6)	79		
Occupation					
White collar	50 (74.6)	17 (25.4)	67	24.6773	<0.005[a]
Blue collar	23 (41.8)	32 (58.2)	55		
Unemployed	47 (69.1)	21 (30.9)	68		
Student	34 (82.9)	7 (17.1)	41		
Self employed	9 (47.4)	10 (52.6)	19		
Average income (KES) per month					
0-50,000	126 (64.9)	68 (35.1)	194	0.6983	0.926[b]
51,000-100,000	25 (64.1)	14 (35.9)	39		
101,000-200,000	9 (75.0)	3 (25.0)	12		
>200,000	3 (75.0)	1 (25.0)	4		
Religion					
Christian	152 (70.4)	64 (29.6)	216	23.3852	<0.005[b]
Muslim	2 (16.6)	10 (83.3)	12		
Hindu	0 (0)	3 (100%)	3		
Traditional beliefs	3 (42.8)	4 (57.2)	7		
Atheist/Agnostic	6 (50.0)	6 (50)	12		
Background setting					
Urban	119 (71.3)	48 (28.7)	167	8.1346	0.004[a]
Rural	44 (53.0)	39 (47.0)	83		
Marital status					

Single	107 (64.8)	58 (35.2)	165	1.4320	0.489[a]
Married	40 (70.2)	17 (29.8)	57		
Divorced/widowed	16 (57.1)	12 (42.9)	28		

[a] -p values based on Chi-square test, [b] -p value based on Fishers exact test

An analysis of cognitive impairment and psychological disorders revealed that anxiety was significantly associated with neuro cognitive disorder (OR=8.2, p<0.001, CI 4.5-15.0). Other mental disorders were not associated with cognitive impairments (p>0.05).

Table 3: Association of cognitive impairment and mental disorders

Variable	NCD n(%)	No NCD n(%)	Total	OR	95% CI	P value
Anxiety disorder						
No	32 (19.2)	135 (80.8)	167	Ref		
Yes	55 (66.3)	28 (33.7)	83	8.2	4.5-15.0	<0.001
Mood						
No	48 (31.4)	105 (68.6)	153	Ref		
Yes	39 (40.2)	58 (59.8)	97	1.4	0.8-2.5	0.154
Addiction disorder						
No	33 (32.7)	68 (67.3)	101	Ref		
Yes	54 (36.2)	95 (63.8)	149	1.2	0.68-1.99	0.561
Personality disorder						
No	69 (34.3)	132 (65.7)	201	Ref		
Yes	18 (36.7)	31 (63.3)	49	1.1	0.58-2.12	0.751
Post trauma						
No	69 (34.5)	131 (65.5)	200	Ref		
Yes	18 (36.0)	32 (64.0)	50	1.1	0.55-2.03	0.842
Psychotic disorder						
No	71 (34.8)	133 (65.2)	204	Ref		
Yes	16 (34.8)	30 (65.2)	46	0.9	0.51-1.95	0.998

Factors that demonstrated significant association at bivariate analysis were included in regression modelling. The results in the regression analysis showed that MOCA score was related to age (Coefficient=0.0852, p=0.013, CI 0.018-0.152), level of education (Coefficient=0.0783, p=0.008, CI 0.021-0.139), and anxiety disorder (Coefficient=0.4286, p<0.001, CI 0.317-0.540). Polysubstance use, years of drug use, age at drug debut and other mental disorders were not correlated with cognitive disorders.

Table 4: Regression model on predictors of neurocognitive disorders

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	14.698	3	4.899	28.68	.000[b]
	Residual	42.025	246	0.1708		
	Total	56.724	249			

Table 5: Coefficient values of independent variables

					95% CI	
NCD	Coefficient	Std. error	t	P>t	Lower	Upper
Anxiety	0.4286	0.0566	7.57	P<0.001	0.317	0.540
Age	0.0852	0.0339	2.51	0.013	0.018	0.152
Education	0.0783	0.0292	2.68	0.008	0.021	0.139
_cons	-0.4501	0.100	-4.5	P<0.001	-0.647	-0.253

DISCUSSION

Prevalence of neuro cognitive disorders

This study found that prevalence of cognitive disorders was at 35% ranging from 37% for alcohol to 22% for khat. Other studies have shown a prevalence of between 30% to 80% (Bruijnen et al., 2019). In our study, the prevalence was 35% which is towards the lower range of other findings. However, this finding was significant considering cognitive impairments were found to affect treatment outcomes. Cognitive impairments such as impaired executive control, attention and working memory are known to affect information processing especially for substance dependent patients.

Predictors of Neuro cognitive disorders in patients with substance use disorders.

Age was found to have significant effect on MoCA performance (Coefficient=0.0852, P=0.013, CI=0.317-0.540). This finding aligned with a study by Corolien et al (2019) that showed age was correlated with MoCA total score (P<0.01) in Netherlands. In a study conducted in France (Alarcon et al., 2015), the findings stated that age was significantly higher among patients with low MoCA score (P<0.05). Education level was significantly associated with neuro cognitive disorder (Coefficient=0.0783, P=0.008, CI=0.021-0.139). Higher education level was associated with higher MoCA score. This concurs with the study on screening neuropsychological deficits with MoCA conducted in France (Alarcon et al., 2015) (P<0.05). In our study, anxiety disorder, which is categorized as an emotional disorder, was associated with neuro cognitive disorder (Coefficient=0.4286, P<0.05, CI=0.317-0.540). The findings were contrary to findings in Netherlands (Bruijnen et al., 2019) that showed no statistical significance between anxiety and MoCA outcomes. NACADA acknowledges mental health disorders such as anxiety are associated with higher risk of substance

use (NACADA 2021). Our study did not show any significant difference in cognitive impairment and other demographic characteristics. Other drug use risk factors such as polysubstance use, mental disorders such as mood disorders, personality disorders, post-traumatic stress, psychotic disorder and addiction disorders were not associated with neuro cognitive disorders. Similar findings were reported by (Alarcon et al., 2015) that polysubstance use was not related to MoCA score (P>0.05). However, a study conducted by (C. Valls-Serrano et al) in Spain reported that polysubstance use is associated with executive functioning. Igor Grant, et al in the collaborative neuropsychological study of polydrug users showed that 37% of subjects had neuropsychological deficits.

CONCLUSION

Prevalence of neuro cognitive disorder among patients with substance use disorders in Kiambu County was 34.8%. Alcohol, the most prevalent primary substance had the highest prevalence of cognitive impairment at 37%. These findings were significant considering cognitive impairments are found to affect treatment success and contribute to high rates of dropout and relapse. This study has further highlighted missed opportunities in the course of treatment of patients in rehabilitation centers. It is proposed that programs targeting addiction treatment for alcohol and other substances should incorporate screening for NCDs. Majority of the patients were dominantly male. Age was found to be significantly associated with neurocognitive disorders among SUD patients. Similarly, education was shown to have a positive effect on cognitive impairment. This implies that SUD treatment programs with targeted NCD screening approaches for men, low education level, and older population may be effective in addressing difficulties in information processing and improve treatment outcomes. Thus, incorporation of age and gender-sensitive approaches are likely to be impactful in the long run. Anxiety disorder was identified to be a predictor of neuro cognitive disorder among SUD patients. Cognitive impairments are not detected due to lack of screening at initiation of treatment. These results emphasize the importance of developing and adopting more innovative strategies for evaluating substance-induced neurocognitive disorders. Early identification of neurocognitive disorders among patients with substance use disorders may increase the chances for favorable treatment outcomes. As per our study findings, screening for neurocognitive disorders among SUD patients can be validly and timely done during addiction treatment.

Conflict of interest

The authors have no conflicts of interest.

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