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Structural Equation Model for a Relationship between Family Support Systems and Alcohol Addiction Recovery: Mediation Effect of Continuing Care Services

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Abstract

Purpose: Alcohol use disorder continues to be a public health concern, and even after treatment, the relapse rate is still high. The family support systems are closely related to alcohol addiction recovery. However, studies on psychological mechanisms between the two are rare. Therefore, we aimed to explore the mediating role of continuing care services in the pathway between family support systems and alcohol addiction recovery among individuals with alcohol use disorder.

Methods: A total of 196 participants from 5 treatment centers (Butabika National Referral Mental Hospital, Serenity Centre, Recovery Solutions, National Care Centre, and Hope and Beyond) were selected from a target population of 400 individuals. The structural equation modeling approach was used to assess the study objective.

Results: The average alcohol addiction recovery status score was 3.03 (SD = 0.95). The mediation analysis indicated that continuing care services mediated the pathway between family support systems and alcohol addiction recovery.

Unique Contribution to Theory, Practice and Policy: Motivational enhancement therapy, mutual health support, and cognitive behavioral therapy are key factors in the relationship between family support systems and alcohol addiction recovery.

Keywords: *Alcohol Use Addiction, Cognitive Behavioral Therapy, Family Support Systems, Motivational Enhancement Therapy, Mutual Health Support, Uganda.*

Introduction

Alcohol consumption and addiction remain a global problem with negative consequences, in 2016, the harmful use of alcohol resulted in 5.3% of all deaths worldwide (WHO, 2019). Alcohol misuse is a leading global risk factor for premature mortality, with 3 million alcoholattributable deaths (Park & Kim, 2020). Studies have shown alarming trends of risky drinking patterns among alcohol users in the region, including adolescents and young adults (Swahn et al., 2013). The proportion of Ugandans having an alcohol-use-related disorder was estimated at 10% in 2016 (Kabwama et al., 2016).

Alcohol consumption is still a prominent global risk factor for the disease burden (Sohi et al., 2021). A study revealed that alcohol consumption was associated with higher risks of 61 diseases, including 33 that were not previously reported as alcohol-related by the WHO (Im et al., 2023). Alcohol abuse affects the major organs of a human's physiological being (Varghese & Dakhode, 2022) and its long-term use is associated with cognitive impairment (Brennan et al., 2020). Alcohol consumption contributes to brain damage (Nutt et al., 2021), adversely impacts the developing fetus during pregnancy (Popova et al., 2021), is linked to cardiovascular diseases (Roerecke, 2021), causes about 4% of cancers globally (Rumgay et al., 2021), and its long-term misuse results in liver disease and over half of all deaths from chronic liver disease worldwide (Pohl et al., 2021).

Despite the negative effects, the World Health Statistics 2023 Report ranked Uganda among the leading countries with high alcohol consumption rates, currently consuming 12.2 liters of alcohol per person annually, which is much higher than the African region average of 6.3 liters, and the global average of 6.18 liters per person per year (WHO, 2023). The excessive alcohol consumption in the region has been partly linked to cultural norms that largely contribute to low help-seeking behavior or even recognizing alcohol abuse (Ssebunnya et al., 2020). Notably, lower-income countries like Uganda have limited access to adequate and evidencebased care (Nadkarni et al., 2023).

Family functioning is strongly connected to drinking outcomes (McCrady, 2021). Family functioning refers to the social and structural properties of the general family environment including; interactions, relationships, and adaptability (Lewandowski et al., 2010). Family behaviors and circumstances can influence changes in drinking (Chartier et al., 2017; McCrady, 2021) by providing benefits that undoubtedly affect family members' development of positive psychological experiences (Izzo et al., 2022) hence playing a key role in motivating persons with alcohol use disorder (AUD) to recognize the need to change by offering support for change and continued recovery (McCrady, 2021). On the contrary, dysfunctional family support is associated with risky alcohol consumption (Romero-Rodríguez et al., 2022). Notably, family communication influences alcohol use and later addiction to the same, for example, poorer communication by parents may lead to more alcohol use (Ohannessian et al., 2016) and drinking strategies (Litt et al., 2020).

Continuing care services in this study include motivational enhancement therapy, mutual health support, and cognitive behavioral therapy (CBT). Cognitive behavioral therapy is a fairly effective treatment for persons with alcohol addiction (Magill et al., 2019), and when combined with motivational intervention or pharmacotherapy, it is efficacious therapy for alcohol use disorder (Magill et al., 2023). Cognitive behavioral intervention improves the self-efficacy of individuals with AUD (Can Gür & Okanli, 2019). Besides, motivational enhancement therapy whether delivered by trained therapists, either in group sessions or via one-on-one sessions effectively reduces alcohol use (Nyamathi et al., 2010) by enhancing the self-efficacy of alcohol-dependents, which prevents relapse (Kumar et al., 2021). Motivational intervention with CBT improves motivation and self-efficacy among heavy drinkers, leading to a change in problem-drinking behavior (Kang & Kim, 2021).

Previous studies have assessed the mediating role of self-esteem and resilience in the pathway that family function impacts the relapse tendency (Xia et al., 2022), examined whether depressed mood mediates the relationship between family functioning and alcohol use (Ohannessian et al., 2016), and determined the effects of family factors on intense alcohol use (Kask et al., 2013; Ohannessian et al., 2016; Romero-Rodríguez et al., 2022), among others.

To our knowledge, no studies have comprehensively explored the relationship between family support systems, continuing care services, and alcohol addiction recovery. In our study, we aimed to assess the mediation effect of continuing care services on family support systems and alcohol addiction recovery status in Uganda. We hypothesized that: (1) family support systems are strongly associated with alcohol addiction recovery, (2) continuing care services play an intermediary role between family support systems and alcohol addiction recovery, and (3) strong family support can influence alcohol addiction recovery through the care services. Alcohol addiction recovery can be defined as a dynamic process of change characterized by improvements in health and social functioning, as well as increases in well-being and purpose in life (Witkiewitz, 2020).

Methods

Study design

A cross-sectional study design was implemented to collect the secondary data, which was used to assess the mediation role of continuing care services. Survey questionnaires were administered to the selected respondents.

Participants and ethical consideration

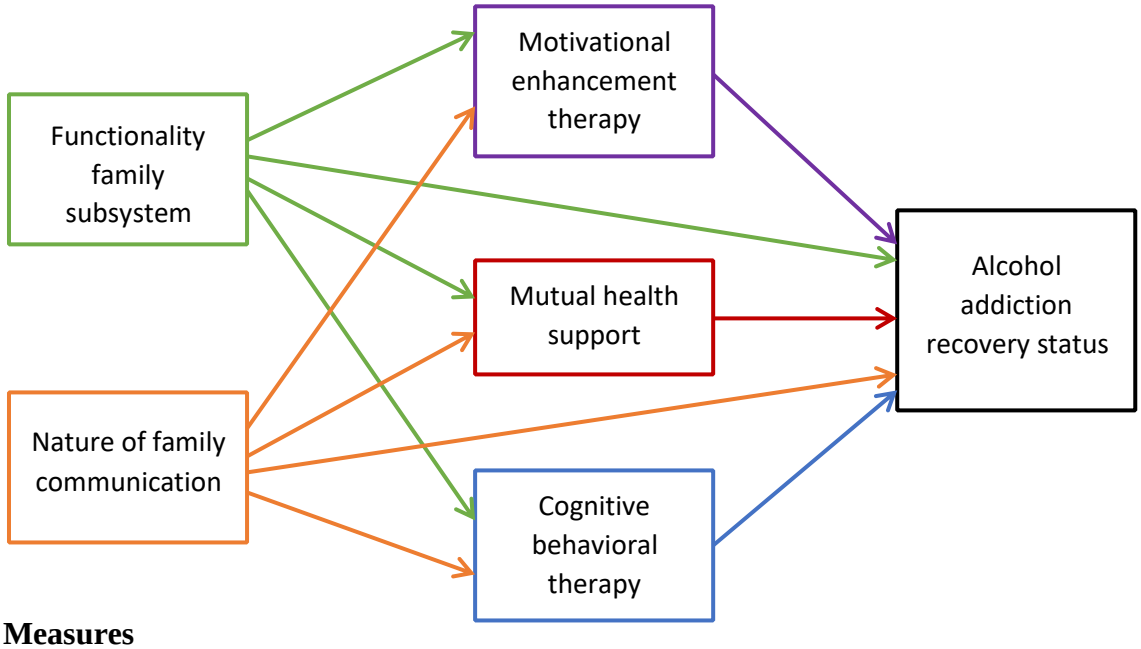
The study included individuals with alcohol addiction who were admitted to 5 treatment centers (Butabika National Referral Mental Hospital, Serenity Centre, Recovery Solutions, National Care Centre, and Hope and Beyond). The main respondents of the study were those individuals from the five selected treatment facilities who had maintained the alcohol addiction recovery status and those who had not. The five treatment facilities were considered because they had

continuously been presenting their data for African Union surveillance studies for the last four years.

The target population consisted of 400 patients across the 5 facilities, encompassing both relapse and non-relapse groups. To determine the sample size, the Krejcie and Morgan's 1979 table was used. Based on this selection method, a sample of 196 respondents was selected from all facilities, ensuring the representation of both relapse and non-relapse groups for case-control purposes. Participants were chosen to ensure equal representation of both categories. The sampling strategy involved proportionately selecting participants from each of the treatment centers, resulting in a balanced and representative sample from the five treatment facilities.

Each participant signed a consent form before participating in the study. Individuals who could neither read nor write were assisted by a literate individual to understand the form and used a thumbprint instead of a signature. To respect the privacy of the participants, questionnaires were filled in private rooms within the treatment facility for both cases and controls. No identifying information, such as names was obtained. Similarly, family members who were the immediate caregivers of the clients were contacted privately and interviewed from convenient and private locations, including their homes.

Figure 1: Hypothetical framework



Measures

All measured variables included in the model were estimated by the mean scores. The internal consistency of the scores was tested by the Cronbach's alpha test. Since all measures were rated on the same scale range (1 to 5) but contained different numbers of items, the mean score was used to maintain the same score range.

Family functionality system: the family functionality system was measured using 3 subscales including the functionality of parent subsystem (4 items), the functionality of sibling subsystem (4 items), and the functionality of spouse subsystem (4 items). All items were rated on a 5 Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items included: "my parents/ significant other value their relationship," "I usually get along with my siblings," and "my parents listen to my opinion even when they do not like it" for the 3 constructs respectively. The sum score ranged from 16 to 80 and a higher score represented a better family functionality system. This measure was modeled as a mean score. The Cronbach's alpha value in this study was [α] = 0.97.

Nature of family communication: this was measured by 4 subscales including the clear and direct (5 items), the clear and indirect (6 items), the masked and direct (4 items), and the masked and indirect (5 items). All items were rated on a 5 Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The sum score ranged from 19 to 95. The Cronbach's alpha value in this study was [α] = 0.96.

Continuing care services: the continuing care services construct was measured by: motivational enhancement therapy (5 items), relapse prevention (6 items), mutual help support (6 items), and cognitive behavioral therapy (6 items). All items were rated on a 5 Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The Cronbach's alpha value in this study was [α] = 0.92.

Alcohol addiction recovery: the alcohol recovery status was measured by 3 subscales including character developments (8 items), healthy living (7 items), and productive engagements (9 items). The Cronbach's alpha value in this study was [α] = 0.95.

Statistical analyses

Descriptive statistics, presented as counts and percentages were used to describe the background characteristics of the study participants. Further, measures of central tendencies including mean, standard deviation, skewness, and kurtosis were used to explore the measured variables in the model and test for multivariate normality. For all measures, a variable was considered fairly symmetric, if the skewness of its mean score was between -0.5 and 0.5.

To test the hypothesis (Figure 2) that continuing care services mediated the pathway between family support systems and the alcohol addiction recovery status, a very general structural equation modeling (SEM) technique (Gunzler et al., 2013) was applied. The goodness of fit of the structural equations model was assessed using the following fit indices and cut-points: root mean squared error of approximation (RMSEA) ≤ 0.06, comparative fit index (CFI) ≥ 0.95, Tucker-Lewis index (TLI) ≥ 0.95, and standard root mean squared residuals (SRMR) ≤ 0.08 (Cho et al., 2020; Finch, 2020; Hu & Bentler, 1999; Peugh & Feldon, 2020; Stone, 2021).

Mediation test

In mediation analysis, the contribution of an intermediate variable or the mediator in the relation between an independent variable and an outcome variable is assessed (Gunzler et al.,

2013). In this study, mediation was tested using the *medsem* package (Mehmetoglu, 2018), a Stata statistical mediation analysis package designed and used in conjunction with the *sem* command. The default output incorporates the Sobel test for indirect effects, which uses a normal approximation, presuming a symmetric distribution of the sampling distribution of the indirect effect (Iacobucci et al., 2007).The delta method approximates variance for more complex mediation while the *zlc* option adds an output articulated by Zhao (Zhao et al., 2010), which relies on the use of a Monte Carlo resampling-based approach for indirect effects, which addresses the low power gap of the Sebel test's normal symmetric distribution assumption.

Results

Demographic characteristics

A total of 192 respondents were enrolled at a ratio of 1:1 (cases = 96, controls = 96). The majority 165 (85.9%) were males and almost all participants had attained either secondary 96 (50.0%) or tertiary 94 (49.0%) education. Most respondents were below 40 years of age 128 (66.7%) and were Christians 176 (91.7%). The rest of the results are in Table 1.

Table 1: Demographic characteristics of study participants

Variable	Count (n = 192)	Percent (%)
Participant's status		
Case	96	50.0
Control	96	50.0
Age		
18-29	70	36.5
30-39	58	30.2
40-49	47	24.5
50-59	15	7.8
60 years and above	2	1.0
Gender		
Male	165	85.9
Female	27	14.1
Education Primary		
	2	1.0
Secondary	96	50.0
Tertiary	94	49.0
Religion Christian		
	176	91.7
Moslem	3	1.6
Other	13	6.8

Descriptive statistics and normality of the study measures

Table 2 shows the mean, standard deviation, kurtosis, and skewness of the variables used in the mediation analysis. The analysis was conducted based on the assumption that the measured

variables followed a normal distribution since structural equation modeling assumes multivariate normality. The values of the measures' skewness were all within the acceptable range (between -0.5 and 0.5) indicating that the measured variables fairly followed normal distribution.

Table 2: Descriptive statistics of observed model variables

Variable	Mean	± SD	Skewness	Kurtosis
Functionality family subsystem	2.98	1.30	0.13	1.25
Nature of family communication	2.98	1.10	0.09	1.57
Motivational enhancement therapy	3.03	1.33	0.12	1.22
Mutual health support	2.83	1.29	0.37	1.36
Mutual health support	2.89	1.00	0.16	1.72
Alcohol addiction recovery status	3.03	0.95	0.14	1.81

The structural equation model

The preliminary model was the hypothetical model shown in Figure 1. After assessing the parameter estimates of the hypothetical model, insignificant paths were excluded step-by-step. However, the final model with significant paths did not meet the fit indices' cut-offs in Table 3, indicating a poor fit. Then continuing care services were modeled as a single construct by combining motivational enhancement therapy, mutual health support, and cognitive behavioral therapy as a single scale that was measured as an average score. The Cronbach's alpha value for the single scale was very high ([α] = 0.92), proving the internal consistency of the single construct.

The modified model (Figure 2) revealed a good overall fit (RMSEA = 0.00, CFI = 1.00, TLI = 1.04, SRMR = 0.00, AIC = 2043.90, and BIC = 2086.25). The fit criteria of the modified model met the recommended levels and were found to be more suitable than that of the hypothetical model (Table 3).

Table 3: Comparison of the model fit of the hypothetical and modified model

Model fit indices	Acceptable value	Fitness indices	
		Hypothetical model	Modified model
RMSEA	≤0.06	0.35	0.00
CFI	≥0.95	0.80	1.00
TLI	≥0.95	0.30	1.04

SRMR	≤0.08	0.18	0.00
AIC		3115.67	2043.90
BIC		3190.59	2086.25

The final model demonstrated that continuing care services (β = 0.38, p < 0.001) and functionality family subsystem (β = 0.14, p = 0.049) had a significant direct positive effect on the alcohol addiction recovery status whereas, the nature of family communication (β = -0.27, p < 0.01) had a significant direct negative effect on the same. The functionality family subsystem (β = -0.12, p = 0.039) negatively affected continuing care services while the nature family of communication (β = 0.67, p = p < 0.001) positively affected it. Details are in Table 4 and Figure 2.

Table 4: Estimates of the modified model

Variable	**β**	**Direct effects**	**Indirect effects**	**Total effects**
Alcohol addiction recovery statu	ȿ			
Continuing care services	0.38***	0.38***	0	0.38***
Functionality family subsystem	0.14*	0.14*	-0.05	0.10
Nature family of communication	-0.27**	-0.27**	0.26***	-0.01
Continuing care services				
Functionality family subsystem	-0.12*	-0.12*	0	-0.12*
Nature family of communication	0.67***	0.67***	0	0.67***

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Figure 2: The modified structural equations model

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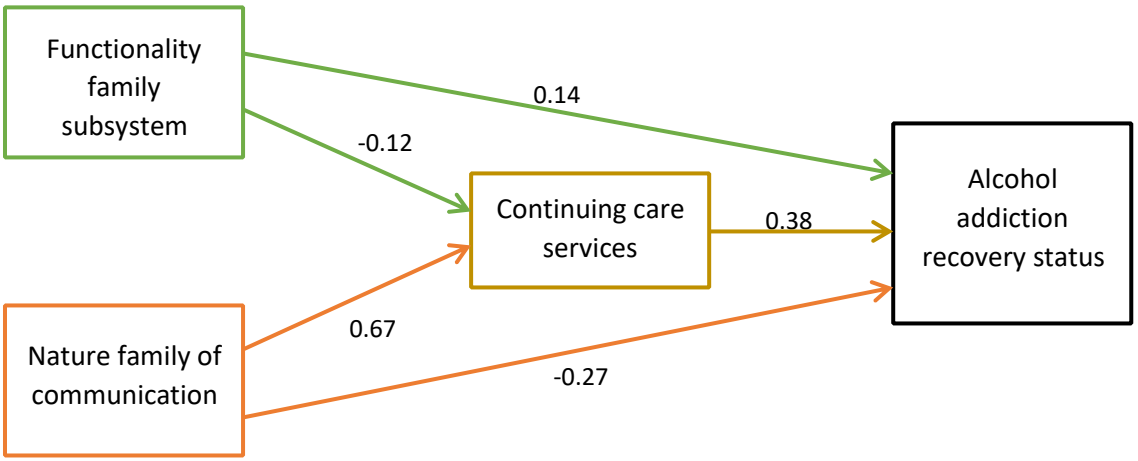

The test for mediation was based on the significance test of indirect effects (Table 5). According to the adjusted Baron and Kenny's approach, the paths between the functionality family subsystem and alcohol addiction recovery status were significant, but since the Sobel test was insignificant, hence the mediation effect of continuing care services was partial. The Monte Carlo z-test based on Zhao, Lynch, and Chen's approach was also insignificant which further supports these results.

The two tests also proved a partial mediation effect of continuing care services between the nature of family communication and alcohol addiction recovery status. Zhao, Lynch & Chen's approach showed that though the paths were significant, their coefficients pointed in opposite directions, hence a competitive or partial mediation.

Table 5: The significance test of the mediation effect

Mediation	Delta	Sobel	Monte Carlo
Between functionality family subsystem and alcohol addiction recovery status			
Indirect effect	-0.045	-0.045	-0.047
p-value	0.063	0.063	0.059
Between nature family of communication and alcohol addiction recovery status			
Indirect effect 0.259 0.259 0.262 p-value < 0.001 < 0.001 < 0.001			

Discussion

The current study provides evidence that continuing care services are critical in the pathway between family functioning systems and alcohol addiction recovery. We found that the nature of family communication not only directly affected the alcohol addiction recovery status but also indirectly affected it through continuing care services. On the other hand, the functionality family subsystem only directly affected the recovery status.

The mediation analysis showed that family functionality could directly influence alcohol addiction recovery. This is in agreement with a study that indicated that alcohol use depends on family functioning as a protective risk factor (Romero-Rodríguez et al., 2022). Family functioning facilitates resilience directly (Dou et al., 2023), or indirectly by promoting positive coping (Shao et al., 2022), and higher resilience is in turn associated with lower alcohol consumption (Schwandt et al., 2024). Family cohesion is an important component of family functioning (Deng et al., 2022) that enhances meaning in life (Liu et al., 2022), which might influence alcohol addiction recovery. For example, a study found that non-users of alcohol had higher scores in family cohesion compared to users (Molero Jurado et al., 2019). Notably, integrating partners and family members into AUD treatment, which are components of family functionality, can maximize positive treatment outcomes and facilitate long-term AUD recovery and the health of individuals with AUD (McCrady, 2021).

In this study, the nature of family communication had a significant direct negative effect on alcohol recovery status ($\beta = -0.27$), which is in agreement with the findings of a study (Ohannessian et al., 2016) that indicated a direct path between father communication and alcohol use ($\beta = -0.29$, $p < 0.001$), suggesting that poorer communication predicted more alcohol use. Family communication influences physiological distress (Geçer & Yıldırım, 2023; Lloyd et al., 2023), which impacts alcohol use (Levine et al., 2020).

This study also found a direct effect of continuing care services (measured by motivational enhancement therapy, mutual health support, and cognitive behavioral therapy) on alcohol recovery. Prior research that aimed to evaluate the efficacy of motivational intervention counseling in reducing alcohol consumption among persons in Uganda (Vorhölter, 2022) indicated that motivational enhancement was effective in reducing alcohol use. Motivation intervention partly enhances the subject's self-efficacy which enables the individuals to withhold from alcohol (Kumar et al., 2021). Individuals who previously participated in a similar study (Ingesson Hammarberg et al., 2023) requested longer motivational treatment to support the patient's self-efficacy for change, an indication that longer periods of the treatment might be more effective.

Previous research has highlighted the significance of combining pharmacological and psychosocial interventions for optimal alcohol dependence abstinence. For example, research has indicated the effectiveness of psychosocial interventions in Sub-Saharan Africa (Preusse et al., 2020) and lower-income countries (Sileo et al., 2021) where Uganda is part. Combining motivational therapy and behavioral therapy was effective in the treatment of alcohol

dependence (Kumar et al., 2022). This was also reflected in this study as the combination of the continuing care services constructs proved a significant relationship with the recovery status. Providing physiological services through help-seeking facilities for individuals with AUD is another effective way to enhance AUD recovery (Chen et al., 2020). A study in Uganda indicated that residential treatment of individuals with AUD was effective in recovery by contributing to reductions in addiction severity and psychopathology (Kalema et al., 2020).

Our study determined the effect of family functioning systems on alcohol addiction recovery and indicated the intermediary role of continuing care services. It also showed how family support systems are strongly associated with alcohol addiction status. However, there were limitations to the current study. First, the psychological indicators were measured through selfreports hence, were prone to recall bias. Second, the cross-sectional study design could not allow causal conclusions to be drawn. Also, the participants included in the study were from two districts of Uganda, so it is unknown whether the study conclusions can be extended to other settings.

Conclusion

Despite limitations, the current study comprehensively assessed the mediation effect of continuing care services in the relationship between family support systems and alcohol addiction recovery status in Uganda, unveiling the significant importance of these services in alcohol recovery. Our findings contribute to the emergent literature on mediation factors in alcohol recovery studies.

Programs and policymakers should specifically integrate motivational enhancement therapy, mutual health support, and cognitive behavioral therapy while designing treatment programs. By creating awareness about the critical role of these services in treatment, and enhancing capacity building for personnel that offer the services, treatment centers may stand a better chance of adopting them. Licensing authorities of treatment centers need to look out for the services before approving recovery centers to operate. Future research should study factors influencing continuing care services and investigate the optimal ways of implementing them during treatment.

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