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Sex differences in alcohol use and perceptions of cognitive health in rural Uganda

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Abstract

Background Dementia is a significant public health issue affecting over 50 million people worldwide. Alcohol consumption has been identified as a modifiable risk factor for dementia and its progression. This study aimed to explore the sociocultural factors influencing sex differences in alcohol consumption and community perceptions of its potential cognitive effects, including dementia risk in rural Uganda, where alcohol use is prevalent.

Methods We employed a qualitative study design in the Ibanda and Lira districts, guided by the Gender Analysis Framework (GAF). We conducted in-depth interviews with 20 older adults (aged 60 years or older) who consume alcohol and 10 key informant interviews with community leaders. We used a deductive thematic analysis approach to generate themes and sub-themes using GAF.

Results Four main themes are presented in this study: Access to resources, Practices and participation, Beliefs and perceptions, and Institutions, Laws and Policies. We found that men had greater access to alcohol due to their economic independence and social norms, often drinking in social settings. This was facilitated by peer relationships and the acceptance of drinking as a social norm for men. Women's access to alcohol is limited by household responsibilities and cultural expectations, with consumption mainly at home and in smaller quantities. Community norms discourage alcohol consumption by women and are associated with shame and family disruption. Most participants believed that alcohol could cause memory problems, although some felt that other factors, such as age, could contribute to cognitive decline. Weak enforcement of alcohol regulations and religious influences were noted, with women reported to be more receptive to religious guidance on quitting alcohol consumption.

Conclusions Gender disparities exist in alcohol access, consumption patterns, and social norms in rural Uganda. Participants commonly associated alcohol use with forgetfulness and short-term memory problems, perceptions that are consistent with early cognitive effects of alcohol but not with later stages of dementia. There is a need for gender-specific interventions to address alcohol consumption and to raise awareness about its potential impact on cognitive health in this population.

Keywords Alcohol use, Alcohol use disorder, Dementia, Gender, Sex, Older adults, Rural Uganda

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Background

Dementia is a major public health issue affecting over 50 million people worldwide, and this number is projected to increase to 131.5 million by 2050 [1]. It is a major cause of disability and dependency among older adults, with significant emotional, social, and financial burdens on caregivers and healthcare systems [2]. Dementia is an umbrella term for a range of progressive diseases and conditions that cause a decline in cognitive function, including memory, thinking, and reasoning, to an extent that it interferes with a person's daily life [3]. The most common types of dementia include Alzheimer's disease, which is the most prevalent, followed by vascular dementia, Lewy body dementia, and frontotemporal dementia [4]. Alcohol consumption has been implicated in both Alzheimer's disease and vascular dementia, primarily through mechanisms such as neuro-inflammation, oxidative stress, and vascular damage, making the discussion of dementia subtypes relevant to our study focus on alcohol use. Dementia disproportionately affects women, with more women living with the condition than men [5, 6]. In sub-Saharan Africa (SSA), the prevalence of dementia ranges from 2.3% in West Africa to 20% in East Africa [7]. In Uganda, a prevalence of 23% was identified in the northern region among adults aged 50 years and above [8], whereas a 20% prevalence was reported among adults aged 60 years and above in southwestern Uganda [9]. The 2024 Report of the Lancet Commission identified 14 modifiable risk factors, of which appropriate interventions could prevent up to 40% of dementia cases globally or at least delay their progression [10]. Among these risk factors, alcohol use has attracted attention because of its potential role in dementia [11, 12]. Alcohol use is linked to systemic inflammation, vascular damage, and neurodegeneration, which can accelerate cognitive decline and dementia progression [13]. A meta-analysis of studies from four European countries reported an association between heavy drinking (>21 units per week) in midlife and an increased risk of dementia compared to light drinking [14].

Alcohol consumption is highly prevalent in most Ugandan settings. A study in Uganda found that the prevalence of medium- to high-end alcohol consumption was highest among residents in the northern region of the country (23.2%), followed by residents in the western (21.4%), central (18.5%), and eastern regions (13.7%) [15]. In this study, "medium-end" consumption was defined as men consuming 4–6 standard drinks per occasion and women consuming 2–4 standard drinks per occasion, while "high-end" consumption was defined as binge drinking or >6 drinks per occasion for men and >4 for women. These definitions differ from the European meta-analysis criteria we cite earlier (heavy drinking as >21 units per week), but we retain the Ugandan classifications here for local relevance. The study also reported that 9.8% of the adult population nationwide had alcohol-related disorders, demonstrating high alcohol use among the elderly [15]. This puts the population in Uganda at a high risk of alcohol use-related dementia onset or progression.

Sex differences in alcohol consumption also play a significant role in vulnerability and progression to dementia [16]. Alcohol use affects men and women differently due to biological, psychological, and social factors. Studies have shown that men generally consume alcohol in higher quantities and frequencies than women, and heavy drinking is associated with a greater risk of cognitive decline [17–19]. Although men consume more alcohol, women are more susceptible to alcohol-related neurotoxicity, leading to accelerated progression to dementia [20]. Social and cultural factors also influence these patterns. In many cultures, alcohol use may be more socially acceptable in men than in women [21, 22].

Most studies evaluating the link between alcohol consumption and dementia have focused on the general population without accounting for sex differences and susceptibility to dementia [23, 24]. There is limited understanding of the sociocultural factors driving these sex-specific differences and the long-term cognitive impacts of alcohol use across genders within rural Uganda. Examining these sociocultural factors requires a theoretical framework synthesizing information about gender roles and relations [25, 26]. This study was guided by the Gender Analysis Framework (GAF), which provides a mechanism to systematize information regarding gender disparities across many domains of social life and investigates how these differences affect the lives and health of men and women. According to the GAF, there are four key domains of social life: access to assets; practices and participation; beliefs and perceptions; and institutions, laws, and policies. All these domains of social life are influenced by power, which lies at the center of the framework [25]. In this study, we contextualized these domains as access to resources that can be used to obtain alcohol, beliefs and perceptions about alcohol consumption, practices and participation in alcohol consumption, and alcohol control laws and policies and their implementation status.

Ibanda and Lira districts, just like most rural sub-Saharan Africa, have a unique socioeconomic landscape where gender disparities are pronounced. Most households depend on subsistence farming as their primary source of income [27]. While both men and women participate in agricultural labor, men usually have greater control over economic assets, including land and income from cash crops [27]. Additionally, men generally have greater social freedom which facilitates their access to alcohol in social gatherings [28]. Education levels also show gendered differences, with male literacy and school

enrollment rates often higher than those of females [29]. According to the 2024 Uganda Bureau of Statistics, 72% of men are literate compared to 62% of women, and male school enrollment rates remain higher across all levels of education [30]. Women contribute significantly to agricultural labor, yet men control more than 80% of land ownership and earn a greater share of cash income from cash crops [27]. These disparities in access to education and economic resources reinforce gendered power relations and influence health behaviors such as alcohol consumption [31]. Together, these socioeconomic and gendered factors are crucial for understanding the structural inequalities that shape roles and influence behaviors like alcohol use in rural Uganda.

This study aimed to explore the social and cultural factors that contribute to sex differences in alcohol consumption and how these factors impact vulnerability to dementia. It focused on adults aged 60 and above, as this demographic faces an increased risk of developing dementia and is also highly susceptible to age-related health complications exacerbated by alcohol use, including accelerated cognitive decline and neurotoxicity.

Methods

Study design

This qualitative study aimed to explore the socio-cultural factors that contribute to sex differences in alcohol consumption and how these factors shape community perceptions of dementia risk, and cognitive health.

Study setting

]The study was conducted in Ibanda and Lira districts of Uganda, two rural regions with varying degrees of alcohol consumption influenced by cultural, economic, and social factors. The prevalence of alcohol use has been previously documented as relatively high in the Ibanda district among the adolescents [32] which implies that the prevalence of alcohol use in this area is generally high [32]. Anecdotal evidence also shows that the prevalence of alcohol use in Lira district is high, and this has been associated with the history of conflict and displacement in this area. Alcohol consumption patterns are shaped by both traditional and post-conflict sociocultural factors. This makes Ibanda and Lira suitable locations for exploring the social and cultural factors that contribute to sex differences in alcohol consumption and the relationship with dementia risk in a rural Ugandan context.

Ibanda District, situated in southwestern Uganda, is bordered by Kitagwenda District to the west, Kamwenge District to the north, Kiruhura District to the east, Mbarara District and Buhweju District to the south, and Rubirizi District to the southwest. Lira district is in the Lango sub-region in northern Uganda. It is bordered by the districts of Agago in the north, Alebtong in the east, Dokolo in the south, Kwania in the southwest, Kole in the west, Oyam, and Gulu in the northwest. The estimated total population in Ibanda District is 308,447 with 151,145 males and 157,302 females, while Lira District has an estimated population of 488,536 with 234,754 males and 253,782 females [30].

Study participants

Qualitative interviews were conducted with 20 participants, 10 from each study site. The participants were purposively selected to participate in the study based on the eligibility criteria. Participants aged 60 years and older who drink alcohol in either Ibanda or Lira districts of Uganda provided informed consent to participate in the study. We excluded participants who had other significant mental health conditions or neurological disorders, and those who had recent substance abuse other than alcohol that could influence cognitive functioning. The cognitive function of the participants was assessed using the Montreal Cognitive Assessment - Basic (MoCA-B) tool to exclude participants with cognitive impairment. Additionally, we conducted key informant interviews with ten opinion leaders from the two study sites. Key informant participants were selected based on their knowledge and experience while handling men and women who consumed alcohol.

Data collection method and tools

We developed two interview guides (key informant interview guide and in-depth interview guide) based on a Gender Analysis Framework (supplementary file 1). An experienced qualitative researcher (EKW) reviewed the questions in the guide to ensure the relevance and appropriateness of the study objectives. Language experts translated the interview guides into local languages (Runyankole and Lango) to ensure that the research assistants asked the correct questions.

We recruited four research assistants with a bachelor's degree in nursing and training in Good Clinical Practice and Responsible Conduct of Research. The research assistants were fluent in English and the local languages for each study site. The research assistants were trained on the data collection tool before data collection to ensure consistency in the data collected. For each study site, we conducted 10 in-depth interviews and five key informant interviews in a private place, as chosen by the participants at their convenience.

During data collection, the research assistant introduced themselves to the study participants and informed them about the purpose of the study, as described in the informed consent form. All participants were informed of the confidentiality of their responses, and consent to audio recording the interview was sought from them. All interviews were conducted in *Lango* for participants

in Lira district and *Runyankore* for those in Ibanda. The interview sessions lasted between 45 and 60 min.

Data management and analysis

The audio-recorded interviews in local languages were transcribed into Microsoft Word documents and translated into English by bilingual individuals (AD and HB) to ensure accuracy and minimize bias. The transcripts were subsequently proofread by two members of the research team, each of whom was proficient in both languages. This was performed by listening to the original audio recordings while reviewing the transcripts to ensure the accuracy of the original content and correcting any grammatical errors identified. Four team members independently read the transcripts to familiarize themselves with the data.

A deductive thematic analysis approach was employed to analyze the data using a priori themes developed based on the gender analysis framework. The themes included access to resources; beliefs and perceptions; practices and participation; and institutions, laws, and policies. To ensure analytic rigor and coding consistency, a detailed codebook was collaboratively developed by four research team members involved in coding. They independently and manually coded an initial subset of transcripts. The manual coding involved assigning pre-determined codes to segments of data to identify and analyze patterns. The patterns were iteratively reviewed and refined to accurately represent participants' perspectives. The research team convened to discuss the coded data. This enabled critical reflection on individual interpretations and any potential biases related to gender, alcohol use, and cultural context were considered. Any discrepancies in interpretation were resolved through consensus. Illustrative quotes were extracted from individual interviews to elaborate on codes.

Ethical considerations

All quotations were reviewed and, where necessary, edited to remove potentially identifying information while maintaining the integrity of participants' perspectives.

Results

Participant characteristics

The study participants' age ranged from 61 to 87 years, with an average of 68.8 years. Most participants had a low education level (12, 60% primary level) or no formal education (4, 20%). Nine (45%) participants were married, and 5 (25%) were widowed. The key informants had an average age of 52.1 years, and the majority had attained education from primary up to the tertiary level, and they had diverse community roles, as shown in Table 1.

Themes

The findings of this study are organized into four major themes that capture the interplay between gender, alcohol use, and its effects on cognitive function. The theme of *access to resources* highlights how the availability of alcohol, the presence or absence of community support

Table 1 Socio-demographic characteristics of the study participants

Participant Characteristics	Study participants (*N* = 20) Frequency (%)	Key informants (*N* = 10) Frequency (%)
Median Age (range)	65 (61–87)	52 (38–75)
Gender		
Male	11 (55%)	5 (50%)
Female	9 (45%)	5 (50%)
Marital Status		
Married	9 (45%)	-
Widowed	5 (25%)	-
Divorced	1 (5%)	-
Cohabiting	3 (15%)	-
Highest level of education		
No formal education	4 (20%)	0
Primary level	12 (60%)	2 (20%)
Secondary level	3 (15%)	5 (50%)
Tertiary level	1 (5%)	3 (30%)
Role in the community		
Village health team (VHT) member	-	3 (30%)
Local council chairperson	-	2 (20%)
Health officer	-	1 (10%)
Health educator	-	1 (10%)
Religious leader	-	2 (20%)
Caretaker of persons with dementia	-	1 (10%)

Table 2 Summary of the key themes identified in this study

Theme	Sub-theme
Access to resources	Access to alcohol
	Community support networks
	Access to healthcare and support services
Practices and participation	Daily routines and role integration
	Context of consumption
Beliefs and perceptions	Community beliefs and social stigma
	Health beliefs and perceptions
Institutions, Laws and Policies	Religious influence
	Policy gaps and weak enforcement

systems, and alcohol-related health issues vary between men and women. *Practices and participation* theme explores how gender roles influence involvement in community activities, particularly those related to alcohol consumption. The theme *beliefs and perceptions* reports the underlying community attitudes, including social stigma and gendered perceptions of alcohol consumption. Finally, *institutions*, *laws*, *and policies* present how institutional structures shape behaviors and reinforce existing gender dynamics. These themes provide a nuanced understanding of the social context surrounding alcohol use and perceptions of its consequences, including memory and cognitive health, for men and women in rural Uganda (Table 2).

Theme 1: access to resources

This theme encompasses three sub-themes: access to alcohol, which examines how men and women procure alcohol and highlights gender differences in resource control, procurement ease, and consumption patterns; community support networks, which investigate the role of social structures such as family, friends, and local leaders in facilitating or hindering alcohol access and support; and access to healthcare and support services, which details how individuals obtain health-related assistance and information about alcohol use. The responses revealed that men typically had more direct control over resources, which facilitated frequent alcohol consumption, while social norms and economic dependence limited women's access.

Access to alcohol

The study participants reported that alcohol was easily accessible within their communities because of the large number of bars in the areas and the brewing of alcohol within their homesteads.

> *"It is easy because it is a very big business in this place. I will not hide it from you, and there must be around 150 bars in this trading center. Everywhere you go, there is a bar; everywhere you stand, there is alcohol. There is nowhere you can go, and you find it difficult to get alcohol. Everywhere you are, it is there" (64-year-old Male, Ibanda).*
>
> *"I prepare alcohol, and I also take it. I can't deny that I don't take it. I have been consuming alcohol for the same number of years as I have been preparing" (64-year-old Male, Lira).*

However, the respondents noted that men generally had more access to alcohol than women. This was attributed to men's independent revenue streams, such as casual labor or small businesses, which allowed them to spend without having to account for their finances. This economic freedom enabled men to consume alcohol more frequently and in larger quantities. On the other hand, participants reported that women's access to money was more constrained and often dependent on seasonal agricultural sales or small-scale household businesses.

> *"He will even sell the property! Men do not lack money. It is like he always has money. Okay, he always has money for which he has worked. If he has money, he goes and buys alcohol and drinks. … If it is a woman and she has grown millet, they will sell it off and get money, and if she loves alcohol, she goes and buys alcohol and drinks it" (80-year-old Female, Ibanda).*

Men's access to alcohol was also perceived to be facilitated by time as a resource, since men have more time to consume alcohol or even go to the bars. In contrast, women's alcohol consumption is constrained by domestic responsibilities and the assumption that women should spend most of their time at home.

> *"But, majorly, men drink more than women. I think that this is because men have more time. We go to these small trading centers here, from even around 10 am, we find men have already started to drink" (40-year-old Male Health Officer, Ibanda).*
>
> *"Those who drink a lot of alcohol are mostly men. Because most of them do not want to take family responsibility, they spend a lot of their time drinking alcohol, leaving women to take care of the family"*

(60-year-old Female Village Health Team member, Lira).

Men were regarded as having more decision-making power in the family than women; they select who drinks and who does not, and they usually make decisions that benefit them. Even when women earned money, decisions about how to spend it, particularly on non-essential items such as alcohol, were influenced by cultural expectations or male dominance within the household. However, the men had complete control over how they spent their money without due influence or consultation, allowing them to drink whenever they wanted.

"Yes, they [men] have their own money. As for a woman, if she doesn't have money, she won't go to the bar" (84-year-old Female, Ibanda).
*"I am the one who has authority over it…for me, the woman cannot speak out to me. I have visited ***[a friend], he has bought alcohol for me and I have drunk it, is it a crime?" (87-year-old Male from Ibanda).*

While men generally had more access to alcohol, it was also noted that a few women often had access to free alcohol from men who bought for them in bars at an indirect cost. Similarly, a few women also participate in brewing local alcoholic drinks, and so they use the same opportunity to consume alcohol.

"Some women drink alcohol for free. You find that men buy for them. That is where the breaking down of homes comes from… The drinks are free, did they sweat for it?" (69-year-old Female, Ibanda).
"We had our own piece of land. My husband used to make [alcohol] every time… I used to grow sorghum. We would brew alcohol and drink it" (80-year-old Female, Ibanda).

Social networks

Our findings suggest that social networks play a vital role in shaping individuals' access to alcohol and drinking behaviors. For men, peer relationships provide both material and social pathways for alcohol consumption. Several participants described being treated to alcohol by friends in bars or during social events. In Lira, men's access to alcohol is reinforced by social networks, especially for local brews like 'Malwa,' which is largely consumed in a group setting in the evening hours. Women, however, were found to lack alcohol-related peer networks for communal drinking. Instead, their social networks were largely oriented toward household responsibilities, caregiving, and meeting family needs, which limited opportunities for alcohol-related group interactions.

"There are times when it becomes difficult for me. When you do not have money, you do not just go to a bar, laugh, and they give it to you. But because you have some friends there, sometimes you go without money, and they buy for you" (63-year-old Male, Ibanda).
"Yes, men who are used to drinking alcohol struggle to get money for drinking, and in case they don't find it, their friends are also there to help them out, and on another day, he helps the other who isn't having money just like that. They are in alcohol drinking groups and meet mostly in the evening hours, and they help one another in case their friend isn't doing well financially" (48-year-old Male Local Council leader, Lira).
"But among women, it might be difficult because women in most cases are so selfish with money, they don't love to buy alcohol so much, in most cases they spend their money on buying food at home" (60-year-old Female Village Health Team member, Lira).

These networks not only facilitate access to alcohol but also reinforce social norms that encourage drinking as a sign of belonging. The study participants reported that peer pressure from friends and workmates made it difficult to resist drinking. Some male participants described drinking as a social event that brings enjoyment and laughter. They prefer to drink with friends rather than drinking alone at home.

"There are those who go into peer pressure. When you are 3 men, you continue going together. … Another one also tells you to join him and go drinking. You also go and drink" (65-year-old Male, Ibanda).
"I would drink at home but also go out sometimes. If someone brings alcohol, I take some and go where people are. Drinking is about socializing, there's conversation, laughter, and enjoyment" (72-year-old Male, Lira).

Access to healthcare and support services

Access to healthcare and support services related to alcohol use was reported to be limited and inconsistent. Participants described healthcare encounters as short-term and emergency-based, particularly for individuals who had collapsed or become unconscious due to excessive alcohol intake. These individuals were typically stabilized at health facilities and sent home without follow-up or psychosocial intervention.

"When they take you to the clinic or health center, the main thing they put you on is a drip. They treat you, and then after you become okay, you just go home" (62-year-old Male Ibanda).

Several participants described feelings of shame or stigma associated with seeking help for alcohol-related problems, particularly in men, which discouraged early help-seeking.

"You should know that if alcohol is too much for you, no one will help you out… They will say, 'That one is always like that'" (87-year-old Male, Ibanda).
"It is even shameful to look for assistance. A woman gets her friend, and she discusses with her… she can't just go anywhere" (87-year-old Male, Ibanda).

Participants reported that they receive some psychosocial support from village health team members regarding alcohol consumption. Additionally, the key informants noted that women were more likely to take advice regarding alcohol consumption compared to men.

"The VHTs advise us. They tell us to control our drinking because illnesses can come at any time, and they shouldn't be made worse by reckless drinking. They always talk about it" (65-year-old Male, Lira).
"A woman, in most cases, humbles herself if someone tells her good advice related to drinking alcohol, she becomes humble and accepts it, and she leaves alcohol. But a man will never accept" (60-year-old Female VHT, Lira).

Theme 2: participation & practices

This theme was subdivided into 2 subthemes: daily routines and role integration, which reports how alcohol consumption fits within daily responsibilities and routines (time, space, mobility), and context of consumption, which reports situations or settings in which alcohol is consumed and how these differ by gender.

Daily routines and role integration

The daily lives of men and women in this community show distinct patterns in how alcohol consumption is integrated into their differing roles and responsibilities. For women, their routines are almost dictated by household duties and childcare. Many prioritize these tasks, often either delaying or limiting alcohol consumption to the evening hours after work is done. Some old women report that they send children to buy them alcohol due to tiredness from daily chores.

"The difference is that men have the habit of just waking up and looking for where there is alcohol… but for us old women, you must cook because if the husband who has gone to drink alcohol will come back and want to eat. I do not start drinking in the morning, I first go and do some work, look for food and eat, and then I take a bath and wait for evening hours when the sun is not very hot because it is not good if you take when the sun is very hot" (61-year-old Female, Lira).
"When I'm tired, I send these grandchildren of mine, they bring for me, and I drink little to relieve tiredness because going to the source is for people who want to shame themselves…" (63-year-old Female, Lira).

In contrast, the routines for men offer them more flexibility for alcohol consumption. The men drink earlier in the day or for longer durations, often outside the home in social settings. The understanding that women are managing household affairs allows men greater freedom to leave home for drinking.

"Men can be away from home taking alcohol because they know they have left a wife at home, but as a woman, you must know that you have a family to attend to, and if you are not there, no one will attend to it on your behalf. Even when you go to drink, you should remember that other things are waiting for you to do at your home" (64-year-old Male, Lira).
"When a woman is at home doing small tasks, she doesn't have much time to go out drinking. If she drinks, she will bring the alcohol home and drink within the compound. But a man knows the woman is handling most of the home responsibilities, so he can leave and drink, knowing that when he returns, he will find food and other things taken care of" (62-year-old Male, Ibanda).

While some men demonstrate responsible drinking habits like returning home after consumption, others spend more time in bars. This was influenced by a perceived lack of alternative activities or just as a coping mechanism for stress and boredom.

"For men, there are those who have responsibility and those who don't have it. Those who sleep in the bar and do those things don't have what to do. But that person who is responsible drinks his alcohol and goes home. It is like this. We are here, but we are vulnerable. Most people who use alcohol are those who don't have anything to do" (64-year-old Male, Ibanda).
"…we do not have land for digging. If there was somewhere to spend time while digging, sometimes you would not waste time at the bar. But because you

failed to understand what to do, you say, "Let me go and be with my friends" (72-year-old Male, Ibanda).

However, regardless of gender, some elderly individuals reported personal principles with which they operate. These principles guide their alcohol consumption, including planning specific drinking times and amounts integrated into their post-chores routine at home.

"For me, I have my principles, I cannot drink anything alcoholic before 4 pm. I plan my time well and at around 4 pm or 7 pm, that is when I can drink something alcoholic. But the time before that, I could not!" (72-year-old Male, Ibanda).

Context of consumption

Consumption patterns differ significantly by gender. Women largely consume alcohol at home for leisure and to relieve tiredness. In contrast, men predominantly drink in bars to socialize, pass time, and cope with worries.

"Sometimes I take alcohol to pass time, sometimes I take it if I am worrying about problems. After taking it and sleeping, I forget about the problem" (64-year-old Male, Lira).
"They told me drinking alcohol can make people feel ashamed. So, if I am to drink alcohol, I should just take it for leisure…I actually just drink alcohol for leisure" (61-year-old Female, Lira).

Theme 3: Beliefs and perceptions

This theme explores community beliefs, social norms, and stigma surrounding alcohol use, including gendered attitudes and perceptions of alcohol's effects on health and memory.

Community beliefs and social norms

Participants revealed strong gendered social norms regarding alcohol consumption. Drinking is widely accepted for men but heavily stigmatized for women, who are often perceived as immoral, undisciplined, and bringing shame to their families if they drink.

"In the area, people say that if a man drinks, it's somewhat acceptable, but if a woman is drunk, it brings shame. So, for women, it's seen as worse… when a woman drinks and gets drunk, it's different. It shames us because it's seen as something more disgraceful for a woman" (62-year-old Female, Lira).
"Ideally, a woman should not drink alcohol because of her nature and life; they are dignified people… even in earlier days, women and girls did not drink alcohol. Even the boys of long ago would drink alcohol after reaching 20 years. Below 20 years, they would not drink alcohol" (65-year-old Male, Ibanda).

While participants acknowledged alcohol's negative impacts on both genders, they emphasized that women face more severe social consequences and are seen as more incapacitated when intoxicated.

"Alcohol affects both women and men, but it disturbs women more, and it is not good for a woman to get drunk" (73-year-old Female, Lira).
"Women who drink alcohol get drunk and cannot do anything for their family, like cleaning the house, preparing tea, etc. Instead, they bring violence to the home" (75-year-old Female, Lira).

Health beliefs and perceptions

Most participants believed alcohol negatively impacts memory and cognitive function, often citing forgetfulness and impaired judgment in drinkers. Some noted that men, perceived to drink more, might experience higher rates of forgetfulness.

"Alcohol causes forgetfulness. For example, someone might tell you something in the evening, and you understand and confirm it at that moment. But you don't even remember being told when you wake up in the morning. That's how alcohol leads to forgetfulness" (62-year-old Male, Lira).

However, some participants attributed memory loss to other factors like age, stress, and illness, viewing alcohol as a contributing rather than a sole cause. A few participants even disagreed that alcohol causes memory loss.

"When a person gets old, their mind will still forget things. Even if they don't drink alcohol, their mind will still forget things… So, I think this forgetfulness of mine may be due to the aging process, where I've started forgetting things" (63-year-old Female, Lira).
"Alcohol does not cause forgetfulness in me personally. When I drink, I remember what I said earlier, and it helps me stay very clear-minded" (80-year-old Male, Lira).

Theme 4: institutions, laws, and policies

This theme presents information on how institutional structures shape behaviors and reinforce existing gender dynamics. The key subthemes identified include religious influence and policy & enforcement gaps.

Religious influence

Religious teachings were frequently mentioned as a deterrent to alcohol consumption, though with varying degrees of effectiveness. In Ibanda, participants shared how religion led to behavior change, especially in women, as they are more receptive to religious teachings. In Lira, religious groups reportedly opposed alcohol use but were criticized for not having enforceable policies.

> *"...women listen. They usually listen to the message from priests. But men have rigid minds, they drink alcohol, and they fail to develop their homes. Women put the message into action, and the number of people who drink alcohol is less. But for the men, where will they get the message if they are not going to church?" (65-year-old Female, Ibanda).*
> *"Religion actually does not allow people to take alcohol, but they do not put any preventive measures" (61-year-old Female, Lira).*

Policy gaps and weak enforcement

While legal and community-based rules exist to regulate alcohol use, participants in both districts expressed concerns about weak enforcement. Some local leaders and law enforcement officers were themselves involved in alcohol use, compromising their authority.

> *"We gave them a directive when the bar should open and close" (52-year-old Female, Ibanda).*
> *"The police have laws/rules. Earlier, they said drinking alcohol should only start at noon. But the police are also alcoholics, even starting in the early morning hours. After their duties, they are always at the drinking joints with the community. If you go to any local bar, you will find police, including other officials drinking alongside community members. Previously, I used to go to that bar and drink with them, the majority of lawmakers are the ones drinking alcohol" (48-year-old Male, Lira).*

Discussion

In this study, we aimed to explore the sociocultural factors influencing sex differences in alcohol consumption and how these relate to community perceptions of dementia risk and alcohol's cognitive health in rural Uganda. We found significant gender dynamics surrounding alcohol use and its perceived cognitive effects among the elderly in rural Uganda. Our findings indicate that men generally have greater access to alcohol and possess more socially accepted drinking patterns, often integrating consumption into their daily routines outside the home. Women's access to alcohol is constrained by economic factors and domestic responsibilities, leading to more limited consumption primarily at home. The community beliefs strongly discourage women's drinking, associating it with negative social stigmas, while men's consumption is largely normalized. Weak enforcement of alcohol regulations and varying religious influences contribute to shaping these gendered behaviors and perceptions regarding alcohol's impact on health and memory.

It was found that access to alcohol was easier for men compared to women, and this was driven by their independent sources of income, greater decision-making power, and free time. These structural advantages enabled men to access bars frequently and in larger quantities, while women's consumption was irregular due to their household roles and cultural expectations. These findings are consistent with previous studies indicating that men are more likely to consume alcohol than women [33, 34]. These patterns suggest men may be perceived as facing higher risks of alcohol-related memory problems and cognitive decline, given their heavier drinking patterns [35, 36]. The findings align with prior research linking gendered disparities in substance use to economic and sociocultural inequities [37]. Similar studies also note that patriarchal norms often restrict women's financial independence and confine them to caregiving roles, limiting their leisure opportunities [38]. Our study also found that stronger social networks among men facilitated greater access to alcohol, particularly through communal drinking groups. At the same time, women were limited to household responsibilities. It is important to note that this refers specifically to alcohol-related peer networks; women's broader social and family networks remain strong but were oriented toward caregiving and household support rather than communal drinking. This distinction aligns with existing literature showing women typically maintain robust general social networks, although these networks do not function to facilitate alcohol use. The research finding aligns with prior studies where male-dominated social networks often reinforce gendered alcohol access by embedding drinking within communal practices [39]. These results suggest that access to resources is a crucial enabler of alcohol consumption for men and a significant barrier for women, thereby contributing to cognitive health risks differently [40]. This overlap is particularly relevant for our study population of older adults, in whom it is often difficult to distinguish between early age-related cognitive decline and alcohol-related cognitive impairment. Both processes may manifest initially as forgetfulness and short-term memory lapses, which were the most common perceptions reported by participants. Our findings, therefore, likely capture community interpretations of memory problems that could stem from either or both processes. This complexity highlights the challenge of isolating alcohol-specific cognitive effects in older populations without clinical diagnostic assessment.

Our study findings show that women's daily routines are heavily centered on household duties and childcare, which either limited or delayed their alcohol consumption to the evening hours and after completing domestic work. This aligns with the observed gendered division of labor, where women are primarily responsible for the household activities [41]. As such, women tend to send their children to purchase alcohol to bypass societal expectations that might restrict their presence in public drinking spaces, especially as they age [39]. The modest drinking may make women less susceptible to alcohol-related cognitive impairment [42]. In contrast, men experience greater flexibility in their daily routines, allowing for more frequent and prolonged alcohol use, often starting earlier in the day and extending for longer durations. The understanding is that women manage household affairs, granting men the freedom to leave home for drinking. This reflects traditional gender structures where men often have more autonomy and leisure time outside the domestic sphere [43]. Alcohol consumption among men was reported as a coping mechanism for stress and boredom from the lack of alternative activities. There is a suggested link between socio-economic factors and alcohol consumption for men [44]. Gendered roles appear to overburden women but also limit their drinking time and alcohol intake. In contrast, men's drinking in public places like bars is more socially accepted. This could increase men's risk of alcohol-related cognitive issues.

The observed gendered disparities in alcohol use suggest potential pathways through which men and women in rural Uganda may face differential risks for dementia onset or progression. The greater access to alcohol and the normalization of frequent and prolonged drinking among men could elevate their risk through several neurobiological mechanisms. Chronic heavy alcohol use directly damages neurons and key brain regions like the hippocampus and frontal lobes, impairing memory and executive functions [45]. Furthermore, sustained alcohol consumption can trigger chronic systemic and neuroinflammation [46] and induce oxidative stress [47], both of which are implicated in the pathogenesis of Alzheimer's disease and vascular dementia [48]. In contrast, women's limited access and less frequent alcohol consumption in this study may offer some protection against its direct neurotoxic effects. However, it is important to acknowledge that women may face other vulnerabilities. For instance, differences in alcohol metabolism could lead to higher blood alcohol concentrations even with lower intake [49, 50]. Moreover, the chronic stress associated with their demanding gender roles coupled with modest alcohol use could potentially lead to cognitive decline [51]. Given our study population of older adults, it is important to note the overlap between age-related dementia and alcohol-related dementia. While heavy alcohol use is a risk factor for dementia, its effects can be synergistic with the neurodegenerative processes of aging [40]. Chronic alcohol exposure is directly neurotoxic to different regions in the brain, which are also vulnerable to age-related decline and diseases like Alzheimer's [10]. Future research should explore these complex interactions and compare dementia rates in men and women with varying drinking patterns in similar sociocultural contexts.

The participants acknowledged that alcohol negatively affects both genders, but it is perceived to have a more detrimental impact on women. A common belief is that alcohol causes memory problems, with higher rates of forgetfulness observed in men, who generally consume more alcohol. These reported "forgetfulness" events are best understood as short-term, alcohol-induced cognitive deficits rather than the long-term, neurodegenerative process of dementia [52]. Alcohol-related dementia (ARD) has been described as progressing through different stages, beginning with mild cognitive impairment (short-term forgetfulness and attention problems), progressing to moderate deficits (executive dysfunction, visuospatial problems, and language difficulties), and in severe stages, manifesting as global dementia with marked impairment in daily functioning [53, 54]. Based on participant narratives, the present findings most closely align with the early/mild stage of ARD, where forgetfulness and day-to-day lapses are perceived, rather than later stages characterized by pervasive functional decline. This contextualization underscores that community perceptions captured here reflect awareness of early cognitive effects of alcohol, not clinical dementia.

The results indicate that religion plays a significant role in deterring alcohol consumption, particularly among women. Women who identify with religious beliefs often refrain from alcohol use due to moral, spiritual, and social expectations imposed by their faith communities. However, reinforcing religious principles as a preventive strategy has proven difficult, particularly in more secular or economically strained communities where religion may no longer hold strong behavioral influence, especially among men. Despite the presence of policies and community bylaws aimed at regulating alcohol consumption, their enforcement remains weak and inconsistent. Challenges such as corruption and lack of political will hinder the implementation of these regulations.

The Gender Analysis Framework [25] provided a robust lens for our study. It helped identify gender disparities in alcohol use and their impact on dementia vulnerability in rural Uganda. Our analysis focused on gender roles, responsibilities, resources, and norms. This allowed us to systematically interpret how these factors shape gendered alcohol experiences across our themes and how

this impacts dementia vulnerability. Our findings consistently showed the framework illustrated gender's differential impact on alcohol access, consumption, stigma, and institutional interactions. This explicit gendered perspective aligns with other studies using similar frameworks [26]. It provided a deeper understanding of power imbalances and social constructs driving alcohol behavior, which enhanced the rigor and impact of our study.

Strengths and limitations

In-depth interviews allowed for the collection of detailed and nuanced data, offering a deeper understanding of how gender roles, social expectations, and cultural beliefs shape alcohol consumption behaviors among men and women. While this study highlighted valuable insights into the gendered dimensions of alcohol use and the perceived link to dementia vulnerability in rural Uganda, it is subject to certain limitations. The study relied on self-reported data which may be subject to recall and social desirability bias towards alcohol consumption data. However, this potential bias was minimized by using data triangulation, where participants' responses were corroborated by insights from key informant interviews. In addition, although participants were screened for cognitive impairment using the MoCA-Basic tool, they did not undergo formal clinical evaluation for dementia. It is therefore possible that undetected cognitive decline among some participants may have influenced their ability to accurately recall or report alcohol use and related experiences. This limitation highlights the need for future research that combines qualitative inquiry with formal cognitive assessments to better understand alcohol-related dementia risk in similar settings.

Conclusion

Sociocultural factors in our study settings appear to be protective of women from alcohol consumption and possibly the perceived cognitive effects of alcohol. However, it is not well understood whether these protections reduce women's risk for alcohol-related memory problems of cognitive impairment. There is a need to establish the extent to which alcohol consumption results in cognitive impairment from a gendered lens; this would be valuable in designing gender-specific interventions to reduce alcohol consumption and associated effects among people living in similar settings. For instance, gender-tailored health messaging and religious/community leader trainings, which could be tailored to address the distinct drinking behaviors and risks faced by men and women. Additionally, establishing gender-specific support networks within existing social or economic groups like male peer group interventions could help individuals reduce alcohol consumption and mitigate its adverse effects.

Abbreviations

SSA	Sub-Saharan Africa
GAF	Gender Analysis Framework
IDI	In-depth Interview
KII	Key Informant Interview

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

EM, JK, JN, and HB contributed to research conception, data analysis, interpretation of data, writing, and revision of the draft manuscript. SM participated in the study coordination and revision of the draft manuscript. GZR, EKW, CO contributed to research conception and revision of draft manuscript. All authors read and approved the final manuscript.

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Data availability

All data generated or analyzed during this study are included in this published article and its supplementary information files.

Declarations

Ethics approval and consent to participate

This study complies with the Declaration of Helsinki and was performed according to ethics committee approval. Ethical approval was obtained from the research and ethics committees of Gulu University (GUREC-2024-990) and the Uganda National Council for Science and Technology (SS3477ES). Administrative clearance was obtained from the Chief Administrative Officers of Lira and Ibanda, and then the Local Council chairpersons for the respective villages where the data was collected. All study participants provided voluntary written informed consent after explaining the purpose, benefits, and risks of participating in the study. We ensured participants' privacy by conducting interviews in a quiet environment without other people. Interviewers were trained in techniques for asking sensitive questions and recognizing signs of distress. This ensured they approached the conversations in a supportive and considerate manner. At the end of each interview, participants were thanked for their time and provided with a debriefing about the study's objectives. Participant identities were anonymized in the transcripts, and audio recordings were securely stored, restricting access to the study team.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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