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ORIGINAL RESEARCH

Prevalence and Factors Associated with Probable Alcohol Use Disorder Among Men at Higher Risk of HIV Enrolled in the HIV Pre-Exposure Prophylaxis Program in Tanga, Tanzania. A Call for Integrated Care

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Background: Probable alcohol use disorder is rarely on the minds of people who use alcohol, probably due to technicality related to making that diagnosis. Men who have sex with men are more vulnerable to alcohol use, usually as a coping strategy to manage minority distress, stigma, violence and validation. This study determined the prevalence and factors associated with probable alcohol use disorder among men who have sex with men enrolled in the HIV pre-exposure prophylaxis program in Tanga, Tanzania.

Methodology: This study included 364 men who have sex with men recruited through respondent driven sampling. Structured questionnaire was used for socio-demographic and sexual characteristics data collection. Probable alcohol use disorder was assessed using the Alcohol Use Disorder Identification Test (AUDIT). A modified Poisson regression model was used to determine the factors associated with probable alcohol use disorder among men who have sex with men.

Results: Our study found that about 45% of participants had probable alcohol use disorder. The prevalence was high among participants with a history of having group sex (aPR=1.29; 95% CI: 1.00–1.65, P=0.051), who had ever paid for oral or anal sex (aPR=1.65; 95% CI: 1.21–2.25, p=0.002), who reported facing financial difficulties (aPR=1.40; 95% CI: 1.10–1.79, p=0.007), those who experienced moderate stigma (aPR=1.44;95% CI: 1.13–1.84, p=0.003) and higher stigma (aPR=1.39;95% CI: 1.02–1.91, p=0.040).

Conclusion: The prevalence of probable alcohol use disorder was found to be relatively high among men who have sex with men, especially those with a history of group sex, paying for sex, facing financial difficulties and those who reported experiencing a moderate-to-high level of stigma. This highlights the need to intensify health, reproductive and safe sex practices programs while escalating anti-stigma campaigns. We recommend the integration of substance screening and harm reduction services in HIV treatments and prevention programming.

Keywords: alcohol use disorder, men who have sex with men, HIV pre-exposure prophylaxis, PrEP, Tanzania

Introduction

Alcohol use is a culturally accepted practice in many communities worldwide.[1] With that acceptability, it can affect human life both biologically, psychologically, and socially, particularly when in problematic patterns of use, which develop gradually along the course of use. At this level, it represents a significant medical and mental health concern known as "alcohol use disorder." This condition encompasses a cluster of cognitive, behavioural, and physiological

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symptoms, indicating that an individual continues to use alcohol despite facing substantial alcohol-related problems.[2] Alcohol use disorder is a risk factor for numerous health conditions, such as diabetes, accidents, violence, and various social risks, including unprotected sexual intercourse, contributing up to approximately 5.1% of all disability-adjusted life years and 5.3% of global mortality.[3] The disorder negatively impacts human life,[4] resulting in poor health-seeking behaviours, which might lead to underutilization of health services, for example, inadequate use of HIV pre-exposure prophylaxis, neglect of self-care practices like unprotected sexual intercourse, and poor nutrition, thereby affecting both individuals and society as a whole.[5]

Men who have sex with men (MSM) as members of marginalized populations are at higher risk of using alcohol, exemplifying many other substances to cope with imposed distress for different reasons. In this study, alcohol use is identified as a behavioural response among the men who have sex with men compared to heterosexual men, which might affect their retention of PrEP, attracting attention for further exploration in the Tanzanian context.[6] Their elevated risk of alcohol use is attributed to the need to alleviate stress stemming from community marginalization, discrimination, and stigma.[7] Alcohol is seen as a means to raise confidence for engaging in sex, particularly in environments where sex is commodified[8] among men who have sex with men. However, while alcohol initially serves the intended purpose, it may result in alterations in brain neurochemistry, resulting in both physical and behavioural changes, such as addiction, impaired health-seeking behaviours, and poor adherence to health guidelines.[9]

In western countries, reports shows that, 33.2% and 87.9% of men who have sex with men use alcohol, which can render them at a chance of impaired health-seeking behaviours such as HIV PrEP use and retention.[10,11] In this scenario, they can be at higher susceptibility to HIV acquisition, mainly driven by impulsiveness and engagement in unprotected sexual intercourse; for example, the systematic reviews indicate that 13% to 15% of substance use, including alcohol, among men who have sex with men is specifically geared towards facilitating sexual activities, often leading to pathological use.[12,13] Alcohol use is commonly initiated for social and recreational purposes, but later it ends up as alcohol use disorder, exemplified by findings in Peru where a study reported that approximately 62.8% of men who have sex with men met the criteria for alcohol use disorder, which is nearly two-thirds of them.[14]

In sub-Saharan Africa, studies demonstrate a wide range of alcohol use prevalence, from 1.4% to 100% among MSM, with notable rates of alcohol use disorder, particularly in Egypt and Kenya, respectively.[15] In South Africa, alcohol use among men who have sex with men is among the recreational and communal influences, with some individuals using it to enhance sexual performance,[16] but fewer studies have reported the specific prevalence of alcohol use disorder.

In Tanzania, approximately 14% of men who have sex with men have reported using any form of substances regardless of the severity, including alcohol, which is associated with risky sexual behaviours; a study which was done more than 17 years ago, when the interventions were limited than today.[17] The prevalence of probable alcohol use disorder among men who have sex with men in Tanzania is unknown. Studies elsewhere report alcohol use among men who have sex with men to be related to positive HIV status, unstable housing, unemployment, and frequent diagnosis of sexually transmitted diseases;[18] increased libido, sexual adventures, coping mechanisms for rejection and discrimination, anxiety, and low self-esteem as drivers of drug use in communities of men who have sex with men.[19] In this understanding, alcohol use is an important health concern which deserves a special attention. However, the prevalence of probable alcohol use disorder and possible determinants are not known in the Tanzanian context among men who have sex with men. Therefore, this study aimed to determine the prevalence and factors associated with probable alcohol use disorder among men who have sex with men enrolled in the pre-exposure prophylaxis program in Tanga, Tanzania.

Methodology

Study Design and Setting

This was the cross-sectional analytical study design, presenting an analysis of data from a pragmatic quasi-experimental trial evaluating the rollout of HIV pre-exposure prophylaxis (PrEP) in Tanzania, known as the PREPTA study. The trial focused on both men who have sex with men and female sex workers across two regions Dar Es Salaam (intervention group) from March 2021 to July 2022 and Tanga (control group) from February 2022 to June 2023, respectively.[20–22] This study explicitly analyses data from men who have sex with men for whom data regarding alcohol use were available

and complete. The Tanga region (control arm) was chosen for this study as it represents real-world (without m health intervention) PrEP implementation in Tanzania.

Study Population and Eligibility

The study involved men who had sex with men who were enrolled in a pre-exposure prophylaxis program in Tanga, Tanzania. Eligibility criteria included being aged at least 18 years, having had sex with a man in the last 3 months, and having lived in the city of Tanga for the past 6 months, and other inclusion criteria such as creatinine clearance exceeding 60 mL/min and consented to initiate PrEP according to the national HIV guideline.[23]

Sample Size

The study used a convenient sample of 364 men who have sex with men, using data from the pre-exposure prophylaxis rollout in Tanzania (PREPTA) project. The original sample size for the PREPTA study was estimated at 369 men, based on a formula for calculating sample sizes in cohort studies that accounted for the RDS (Respondent-Driven Sampling) recruitment method.[24,25]

Data Collection Procedure

The PREPTA project data were collected through face-to-face interviews conducted by trained research assistants, who were well-prepared to ensure accurate and ethical data collection. The assistants received training that covered data safety, the research process, and ethical considerations. To protect participants' sensitive information, responses were recorded on handheld tablets connected to the Services for Sensitive Data (TSD) platform, a secure server with strict access and data transfer controls.[21,22] The tools for data collection were, standardized and tested with 10 participants to check for clarity, ease of understanding, and cultural relevance before data collection. The AUDIT tool was used for assessing alcohol use disorder, standardized questionnaire contained questions focusing on sexual behaviors, HIV knowledge, PrEP-related stigma, self-efficacy, and social support, depressive symptoms and anxiety symptoms.

Measurements

Dependent Variable

The primary outcome was probable alcohol use disorder. To determine the prevalence of alcohol use disorder, all participants who scored ≥16 in the alcohol use disorder identification test tool (AUDIT) were considered positive (probable alcohol use disorder).[26] Alcohol use was evaluated using the Alcohol Use Disorders Identification Test; a 10-item screening tool developed by the World Health Organization to help healthcare providers identify individuals who may benefit from interventions aimed at reducing alcohol use.[26] We employed a Swahili version of the instrument, which has been validated in a Tanzanian population of patients with traumatic brain injury, with only minor adjustments in wording to enhance clarity.[27] The AUDIT is designed to detect hazardous and harmful drinking patterns as well as potential alcohol dependence. The first three questions focus on hazardous drinking, defined as alcohol consumption that increases the risk of adverse outcomes without necessarily indicating a disorder.[26] These questions assess drinking frequency, the typical quantity of alcohol consumed, and the frequency of heavy drinking episodes.

Four additional items specifically target harmful alcohol use and address issues such as blackouts, feelings of guilt, alcohol-related injuries, and concern from others about the individual's drinking. The remaining items assess classic signs of dependence, including prioritization of drinking, difficulty in controlling alcohol use, and drinking in the morning. The total score ranges from 0 to 40. According to WHO guidelines; scores of 8–15 indicate hazardous use, scores of 16–19 reflect harmful use, and scores of 20 or above suggest probable dependence. Individuals in these categories require psychotherapies, pharmacological treatment and monitoring in line with WHO recommendations.[26] Participants who reported no alcohol consumption in the past twelve months were not asked to complete the AUDIT tool because their maximum possible score would not exceed 6, and they were automatically categorized as low-risk.

Independent Variables

The independent variables in the study were grouped into socio-demographic and sexual characteristics which included the following: age which was grouped into two groups (18–24years and ≥25years), education level grouped as either primary education and low including informal educations, marital status categorized as never married versus any history of marriage either currently of previously, having own children as either father to a child or never had a child, easy access to condoms (one can get a condom timely when he wants to have sex either dispensable in hotels, in health facilities or can buy), financial dependents (having people who directly depend on him to get money either yes or no), monthly personal income in Tanzanian shillings (all income he collected via formal or informal employment in a month categorized as ≤100,000/= or 100,001–299,999/= and ≥300,000/=), financial barriers to accessing healthcare (inability to accessing healthcare services due to lack of money to pay for that service as yes or no), history of sexually transmitted diseases (asked for any history of sexually transmitted disease based of different symptoms like urethral discharge as yes or no), HIV knowledge as yes or no, twelve-month history of forced sex (being engaged in anal sex without his willingness as yes or no), self-perceived HIV status as low, moderate of high, PrEP self-efficacy (extent of his believe that PrEP can offer protection against HIV transmission as low or high), prior arrests by police as yes or no. Social support was measured using an 8-item, 5-point Likert scale adapted from the Duke-UNC Functional Social Support Questionnaire (FSSQ), which demonstrated high reliability with a Cronbach's alpha of 0.88. A total score below 32 indicated inadequate social support and above that was adequate social support.[21,22] Perceived stigma against men who have sex with men was evaluated using 13 items a Swahili translated and pre-tested questionnaire, each question with five response options (1 = Strongly Disagree to 5 = Strongly Agree), yielding a high reliability with a Cronbach's alpha of 0.84. Moreover, stigma was categorized into low (scores ≤26), moderate (scores 27–38), and high (scores ≥39). Furthermore, perceived PrEP stigma was measured using a 10-item scale a Swahili translated and pre-tested questionnaire, a five point Likert scale, checked for internal consistency with a Cronbach's alpha of 0.88. Lastly, the PrEP stigma was classified as low (scores ≤30) or high (scores >30); all these were composed in the baseline questionnaire.[28] Lastly, the mental distress (depressive or anxiety symptoms or both), which was assessed using both the patient health questionnaire (PHQ-2) and the generalized anxiety questionnaire (GAD-2), was determined by the presence of either depressive symptoms or anxiety symptoms or both. The PHQ-2 assesses anhedonia, ie, how often the patient has had "little interest or pleasure in doing things" in the past two weeks, and depressed mood, ie, feeling down, depressed, or hopeless. Items are responded to on a Likert-type scale from 0-Not at all to 3-Nearly every day for a total score of 0 to 6.[29,30] Similarly, the GAD-2 assesses "Feeling nervous, anxious, or on edge" and "Not being able to stop or control worrying" for the past two weeks. Items are responded to on a Likert-type scale from 0-Not at all to 3-Nearly every day for a total score of 0 to 6.[29,30] Both of these tools are short versions for quick community-based population screening and validated in Tanzania with good internal consistency at a Cronbach alpha of 0.81 by Materu et al in Tanzania.[31,32] Both tools were translated to Swahili language, a national language and were pre-tested before data collection started.

Data Analysis

Descriptive statistics for continuous variables were summarized using the mean and standard deviation, while categorical variables, such as education level, were presented as proportions. In bivariate analysis, the chi-square test was used to screen for the factors associated with probable alcohol use disorder, which will be selected for the final regression analysis. Few factors were selected to be included in the modified Poisson regression analysis, especially those with a p-value <0.2 in the bivariate analysis, and those identified in previous literature to be related to probable alcohol use disorder. Given that the prevalence of alcohol used disorder (45%) exceeds 10%, the modified Poisson logistic regression with robust standard errors was used to determine independent factors associated with probable alcohol use disorder with the measure of association a prevalence ratio. This method was chosen because it minimizes the risk of overestimating effects, which can occur when using a conventional logistic regression model.[33] Variables with a p-value <0.05 in the multivariable modified Poisson regression model were considered statistically significant. All analyses were conducted using STATA, version 18.

Ethical Consideration

The study was conducted in accordance with Declaration of Helsinki. It received ethical clearance registration number MUHAS-REC-12-2024-2542 from the Muhimbili University of Health and Allied Sciences Ethical Review Committee in Tanzania. The study project from which data for this study received ethical approval from the Regional Committee for Medical and Health Research Ethics (REK) in Norway (protocol ref no: 33675). All the study participants provided their written informed consent to participate in this study.

Results

Sociodemographic Characteristics of Men Who Have Sex with Men Who Enrolled in HIV Pre-Exposure Prophylaxis

A total of 364 participants were included in the data analysis. The mean (±SD) age of the study participants was 24.7±5.5 years, whereby more than half (59.0%) were between 18 and 24 years old, and most (87.91%) had never been married.

Regarding the total monthly income, slightly more than one-third (31.86%) of participants reported a monthly income between 100,000 and less than 300,000, while nearly one-third (31.86%) earned 100,000 or less. The remaining participants had a monthly income of 300,000 or more.

Additionally, two-thirds (66.1%) of the participants had no children, while 65.66% of them had financial dependents. Furthermore, almost half (49.45%) reported facing financial difficulties when accessing healthcare services.

In univariable analysis, the age group of the participants (p=0.000), having their own children (p=0.000), having financial dependents (p=0.000) and facing financial difficulties in accessing health care (p=0.000) were associated with probable alcohol use disorder. At the same time, other sociodemographic characteristics were not (Table 1).

Table 1 Distribution of Sociodemographic Characteristics by Probable Alcohol Use Disorder Among Men Who Have Sex with Men Enrolled on HIV Pre-Exposure Prophylaxis

Variable	Total N (%)	Probable Alcohol Use Disorder		*p-value*
		No n (%)	Yes n (%)	
Age groups (24.7±5.5) years				0.000
18-24	215 (59.07)	136 (63.26)	79 (36.74)	
25+	149 (40.03)	64 (42.95)	85 (57.05)	
Marital status				0.790
Never married	320 (87.91)	175 (54.69)	145 (45.31)	
Ever married	44 (12.09)	25 (56.82)	19 (43.18)	
Has own children				0.000
Yes	124 (33.88)	48 (39.02)	76 (60.98)	
No	240 (66.12)	151 (62.92)	89 (37.08)	
Level of education				0.522
Primary and below	120 (32.97)	64 (49.90)	56 (50.10)	
Secondary and above	244 (67.03)	136 (55.74)	108 (44.26)	
Financial dependents				0.000
Yes	239 (65.66)	113 (47.28)	126 (52.72)	
No	125 (34.34)	87 (69.60)	38 (30.40)	

(*Continued*)

Table 1 (Continued).

Variable	Total N (%)	Probable Alcohol Use Disorder		*p-value*
		No n (%)	Yes n (%)	
Total income per month (shillings)				0.230
≤100,000	115 (31.86)	68 (59.13)	47 (40.87)	
100,001–299,999	135 (37.39)	66 (48.89)	69 (51.11)	
≥300,000	111 (30.75)	64 (56.76)	50 (43.24)	
History of having faced financial difficulties due to health spending				0.000
Yes	180 (49.45)	79 (43.89)	101 (56.11)	
No	184 (50.55)	21 (54.85)	63 (34.25)	
Level of social support				0.961
Inadequate	277 (76.10)	152 (54.87)	125 (45.13)	
Adequate	87 (23.90)	48 (055.17	39 (44.83)	

Structural and Sexual Characteristics of Men Who Have Sex with Men Enrolled in HIV Pre-Exposure Prophylaxis

The mean age of sexual debut among participants was 15.9±2.7 years, where nearly three-quarters (70.88%) of them had a sexual debut below 18 years of age, and more than a third (36.26%) of them had either anal, oral or thighs sexual debut. Regarding the age of first anal sex, 40.41% of them had their first anal sex at an age less than 18 years, and nearly a third (31.04%) of participants had a man as their first sexual partners.

About a three-quarters (77.75%) had an insertive role in their last anal sex. More than two-thirds (69.33%) of the study participants reported no use of condoms in their last anal, and more than half of them had multiple sexual partners (55.49%). Nearly three-quarters (74.45%) of the participants reported ever paid for having oral or anal sex, and almost 1 in every 10 participants (11.54%) had a history of having group sex and 15.38% of them had a history of being arrested during the past twelve months. More than three-quarters (77.47%) of the participants reported easy access to male condoms, but 12.64% of them had a history of being diagnosed with sexually transmitted diseases in the previous six months. Furthermore, about 71.97% of the participants perceived themselves as at higher risk of HIV acquisition, while more than a third (35.16%) reported experiencing moderate stigma, and 14.01% reported experiencing high levels of stigma and about 16.76% participants had mental distress (having either depressive symptoms/anxiety symptoms or both).

During bivariable analysis, the last anal sex position role (p=0.031), history of ever paid for having oral or anal sex (p=0.002), history of being arrested in the past 12 months (p=0.048), having group sex (p=0.013) and experienced stigma (p=0.010) were associated with probable alcohol use disorder, while factors did not (Table 2).

Factors Associated with Probable Alcohol Use Disorder Among Men Who Have Sex with Men Enrolled in HIV Pre-Exposure Prophylaxis

The participants with a history of having group sex had a higher prevalence of probable alcohol use disorder compared to those who were not (aPR=1.29; 95% CI: 1.00–1.65, P=0.051). Those who had ever paid for oral or anal sex had nearly twice higher the prevalence of probable alcohol use disorder compared to their counterparts (aPR=1.65; 95% CI: 1.21–2.25, p=0.002). Also, the study participants who reported facing financial difficulties in accessing healthcare services had a higher prevalence of probable alcohol use disorder (aPR=1.40; 95% CI: 1.10–1.79, p=0.007). The prevalence of probable alcohol use disorder was also increased among participants who experienced moderate stigma

Table 2 Distribution of Structural and Sexual Characteristics by Probable Alcohol Use Disorder Among Men Who Have Sex with Men Enrolled on Pre-Exposure Prophylaxis

Variable	Total (N)	Probable Alcohol Use Disorder		*p-value*
		No n (%)	Yes n (%)	
Age at sex debut (15.9 ± 2.7)				0.684
<18	258 (70.88)	140 (54.26)	118 (45.74)	
18+	106 (29.02)	60 (56.60)	46 (43.40)	
Type of sex at sex debut				0.588
Anal/Oral/Thighs	132 (36.26)	75 (56.82)	57 (43.18)	
Vaginal	232 (63.74)	125 (53.88)	107 (46.12)	
Age at first anal sex (18.7 ± 4.5)				0.145
<18	146 (40.11)	87 (59.59)	59 (40.41)	
18+	218 (59.89)	113 (51.83)	105 (49.17)	
First Sex Partner				0.263
Male	113 (31.04)	67 (59.29)	46 (40.71)	
Female	251 (68.96)	133(52.99)	118 (47.01)	
Steady male partner				0.866
Yes	186 (51.10)	103 (55.38)	83 (44.62)	
No	178 (48.90)	97 (54.49)	81 (45.51)	
Anal Sex Position				0.106
Insertive	258 (70.88)	133 (51.55)	125 (48.45)	
Receptive	31 (08.52)	21 (67.74)	10 (32.26)	
Versatile	75 (20.60)	46 (61.33)	29 (38.67)	
Last Anal Sex Position				0.031
Insertive	283 (77.75)	147 (51.94)	136 (48.06)	
Receptive / Versatile	81 (22.25)	53 (65.43)	28 (34.57)	
Using a condom in the last anal sex				0.151
Yes	112 (30.77)	68 (60.71)	44 (39.29)	
No	252 (69.33)	132 (52.59)	120 (47.41)	
Multiple Sex Partners				0.824
Yes	202 (55.49)	111 (54.46)	93 (45.54)	
No	162 (44.51)	90 (55.63)	72 (44.38)	
History of using any lubricant				0.198
Yes	278 (76.37)	148 (53.24)	130 (46.76)	
No	85 (23.63)	52 (61.18)	33 (38.82)	

(*Continued*)

Table 2 (Continued).

Variable	Total (N)	Probable Alcohol Use Disorder		*p-value*
		No n (%)	Yes n (%)	
Frequency of lubricant use				0.101
Never used	85 (23.35)	52 (61.18)	33 (38.82)	
Sometimes	90 (24.73)	54 (60.67)	35 (39.33)	
Always	189 (51.92)	94 (49.74)	95 (50.26)	
History of using lubricant last time had anal sex				0.072
Never used	85 (23.35)	52 (61.18)	33 (38.82)	
Yes	237 (66.66)	121 (50.58)	116 (49.15)	
No	42 (11.54)	28 (66.67)	14 (33.33)	
Ever paid for having oral or anal sex				0.002
Yes	271(74.45)	136 (50.18)	135 (49.82)	
No	93 (25.55)	64 (68.82)	29 (31.18)	
History of having a group sex				0.013
Yes	41 (11.54)	15 (36.59)	26 (63.41)	
No	322 (88.46)	184 (57.14)	138(42.86)	
Forced sex lasts 12 months				0.138
Yes	138 (37.91)	69 (50.00)	69 (50.00)	
No	226 (62.09)	131 (57.96)	95 (42.04)	
Arrested last 12 months				0.048
Yes	56 (15.38)	24 (42.86)	32 (57.14)	
No	308 (84.62)	176 (57.14)	132 (42.86)	
Ever tested for HIV				0.418
Yes	236 (64.84)	126 (53.39)	110 (46.61)	
No	128 (35.16)	74 (57.81)	54 (42.19)	
Can easily access male condom when in need				0.495
Yes	282 (77.47)	152 (53.90)	130 (46.10)	
No	79 (22.53)	46 (58.23)	33 (41.77)	
Diagnosed with STIs in the past 6 months				0.086
Yes	45 (12.64)	19 (43.18)	25 (56.82)	
No	318 (87.36)	181 (56.92)	137 (43.08)	

(*Continued*)

Table 2 (Continued).

Variable	Total (N)	Probable Alcohol Use Disorder		*p-value*
		No n (%)	Yes n (%)	
Self-perceived HIV risk				0.464
High risk	262 (71.97)	140 (53.44)	122 (46.56)	
Medium risk	32 (08.79)	16 (50.00)	16 (50.00)	
Low/no risk	62 (17.03)	38 (61.29)	24 (38.71)	
Experienced stigma				0.010
<=26 (Low)	185 (50.82)	116 (62.70)	69 (37.30)	
27–38 (Moderate)	128 (35.16)	60 (46.88)	68 (53.13)	
≥39 (High)	51 (14.01)	24 (47.06)	27 (52.94)	
Comprehensive HIV knowledge				0.720
No	254 (69.78)	138 (54.33)	116 (45.67)	
Yes	110 (30.22)	62 (56.36)	48 (43.64)	
PrEP knowledge				0.178
Low	242 (66.48)	139 (57.44)	103 (42.56)	
High	61 (33.52)	61 (50.00)	61 (50.00)	
PrEP stigma				0.770
Low	291 (79.95)	161 (55.33)	130 (44.67)	
High	73 (20.05)	39 (53.42)	34 (46.58)	
PrEP self-efficacy				0.628
Low (<24=24)	100 (27.47)	57 (57.00)	43 (43.00)	
High (>24)	264 (72.53)	143 (54.17)	121 (45.83)	
Mental distress				0.203
No	303 (83.24)	171(56.44)	132 (43.56)	
Yes	61 (16.76)	29 (47.54)	32 (52.46)	

(aPR=1.44;95% CI: 1.13–1.84, p=0.003) and higher stigma (aPR=1.39;95% CI: 1.02–1.91, p=0.040) compared to those with a low level of experienced stigma (Table 3).

Discussion

Our study identified less integrated care by detecting the probable alcohol use disorder among men who have sex with men at a prevalence of 45% during the pre-exposure prophylaxis rollout programme in Tanga, Tanzania. The study found that probable alcohol use disorder to be common among men who have sex with men enrolled in the programme, presenting an inadequately integrated HIV prevention and treatment service. The history of group sex, history of paying for anal or oral sex, facing financial difficulties and those experiencing stigma were associated with higher prevalence of probable alcohol use disorder.

Table 3 The Factors Associated with Probable Alcohol Use Disorder Among Men Who Have Sex with Men Enrolled in HIV Pre-Exposure Prophylaxis

Variables	Crude Estimates of the Prevalence Ratio		Adjusted Estimates of Prevalence Ratio	
	cPR (95% CI)	*p-value*	aPR (95% CI)	*p-value*
Age groups (years)		0.000		
18-24	Ref.		Ref.	
25+	1.55 (1.24–1.94)		1.22 (0.94–1.59)	0.128
Level of education		0.663		
Primary and below	Ref.		Ref.	
Secondary and above	0.95 (0.75–1.20)		0.96 (0.76–1.21)	0.728
Having own children				
Yes	1.64 (1.32–2.4)	0.000	Ref.	
No	Ref.		0.80 (0.61–1.05)	0.113
Total income per month				
<=100,000	Ref.		Ref.	
100,001–299,999	1.25 (0.95–1.65)	0.111	1.21 (0.92–1.58)	0.172
≥300,000	1.06 (0.78–1.44)	0.718	0.79 (0.57–1.10)	0.167
Age at first anal sex				
<18	Ref.			
18+	0.95 (0.74–1.22)	0.687	1.04 (0.86–1.32)	0.769
Preferred Anal Sex Position				
Insertive	Ref.		Ref.	
Receptive/Versatile	0.76 (0.57–1.00)	0.054	0.98 (0.65–1.48)	0.936
Condom use in last anal sex				
Yes	0.83 (0.63–1.07)	0.154	Ref.	
No	Ref.		0.96 (0.73–1.25)	0.757
Lubricant use in the last anal sex				
Yes	1.33 (1.02–1.73)	0.034	Ref.	
No	Ref.		1.22 (0.95–1.56)	0.115
History of group sex				
Yes	1.48 (1.14–1.93)	0.003	1.29 (1.00–1.65)	0.051
No	Ref.		Ref.	

(*Continued*)

Table 3 (Continued).

Variables	Crude Estimates of the Prevalence Ratio		Adjusted Estimates of Prevalence Ratio	
	cPR (95% CI)	***p-value***	**aPR (95% CI)**	***p-value***
Ever paid for having oral or anal sex				
Yes	1.60 (1.15–2.21)	0.005	1.65 (1.21–2.25)	0.002
No	Ref.		Ref.	
Forced sex lasts 12 months.				
Yes	1.19 (0.95–1.49)	0.134	0.93 (0.74–1.16)	0.508
No	Ref.		Ref.	
Arrested last 12 months				
Yes	1.33 (1.03–1.73)	0.031	1.16 (0.88–1.53)	0.280
No	Ref.		Ref.	
Diagnosed with STIs in the past 6 months				
Yes	1.31 (0.98–1.74)	0.066	0.90 (0.66–1.22)	0.515
No	Ref.		Ref	
Faced financial difficulty in paying for health services				
Yes	1.64 (1.29–2.08)	0.000	1.40 (1.10–1.79)	0.007
No	Ref.		Ref.	
Experienced stigma				
<=26 (Low)	Ref.		Ref.	
27-38 (Moderate)	1.42 (1.11–1.83)	0.005	1.44 (1.13–1.84)	0.003
≥39(High)	1.42 (1.03–1.95)	0.032	1.39 (1.02–1.91)	0.040
PrEP stigma				
Low	Ref.		Ref.	
High	1.04 (0.79–1.38)	0.768	1.04 (0.80–1.36)	0.758
Level of social support				
Inadequate	0.99 (0.76–1.30)	0.961	1.03 (0.79–1.32)	0.849
Adequate	Ref.		Ref.	
Mental distress				
Yes	1.20 (0.92–1.58)	0.180	1.06 (0.83–1.35)	0.647
No	Ref.		Ref.	

Abbreviations: PR, Prevalence ratio; CI, Confidence interval; aPR, adjusted Prevalence ratio, cPR; crude prevalence ratio; Ref, reference category.

Our study has replicated the findings from a study in Lima by Harrera et al,[34] which reported a similar prevalence (45%) among MSM and transgender women. The similarity could be due to the use of similar measurements and a slightly larger sample size, which can affect the ratio even if they had more cases than in our case. However, the different findings have been reported in Colombia at the prevalence of 18.8%, lower than the findings of our study.[35] Although, it should be noted that this

prevalence was reported in age-specific groups, mainly those aged eighteen to twenty-three years of age. Furthermore, in the comparison study,[36] they used the Diagnostic and Statistical Manual version IV (DSM-IV) in screening for alcohol use disorder, which introduces subjectivity and under- or overestimation compared to the AUDIT tool, which was used in our study, a standardized tool.

Unlike our study, the Peruvian studies have reported a higher prevalence of alcohol use disorder at 55.2%[37] and 62.8%[38] in a similar population, however, in different periods. Some reasons for the higher prevalence could be due to fact that the comparison study used low cut-off points (≥8) (increasing number of cases) compared to our study where we used higher cut-off points (≥15) in scoring alcohol use disorder identification test. The comparison studies also used the large sample size which increases the chances of picking the cases compared to our research, which involved only one city.

The reported probable alcohol use disorder in this study is almost double the prevalence reported in the general population of men in northern Tanzania,[39] but less than what was reported from studies from other African countries, such as South Africa.[40,41] In line with that, the prevalence of probable alcohol use disorder among MSM was relatively higher compared to female sex workers in Tanzania.[42] Although the occasional alcohol use is common among MSM, the escalated level of psychosocial distress can prompt a use as copying strategy and later on long term use some of them can end up with alcohol use disorder as a mental health concern,[43] hence elevating the prevalence of alcohol use disorder in this community. The available evidence shows that, integrating substance use such as alcohol screening into HIV programming, and addressing substance use can improve the success of other interventions, such as PrEP uptake and adherence,[44] which can be a good step to take in line with findings of this study.

Concerning the possible determinants, this study found that the history of group sex, history of paying for anal or oral sex, facing financial difficulties and those experiencing stigma were associated with higher prevalence of probable alcohol use disorder. Our study found a higher prevalence of probable alcohol use disorder among MSMs with a history of engaging in group sex. Engaging in group sex, exemplifies the different risky sexual behaviours which have been consistently reported in various studies across the world among people who use substances such as alcohol, with particular attention in key and vulnerable populations, such as men who have sex with men.[45,46] The behaviours could stem from different factors, including a need for sexual adventure, disinhibition and impaired judgment due to intoxication, desire for social acceptance, validation and confidence within their sexual networks.[43,45] The interaction of these psychosocial reasons can explain the possible association found by this study. This finding is particularly important for public health interventions and prevention programs, as group sex under the influence of alcohol often leads to neglected or improper condom use,[43,45] thereby increasing the risk of HIV transmission and other health consequences.

In line with similar behavioural patterns, our study has found that participants who had a history of paying for sex had a higher prevalence of probable alcohol use disorder compared to their counterparts.[47] The findings of our study are consistent with a study by Diane et al in the Dominican Republic, which found that exchanging sex for anything or paying for sex was common among their study participants.[48] Paying for sex and transactional sex are among the findings which have been reported from the previous studies, such as a study by Sheri et al in Botswana,[49] which found a strong association between paying for sex and problematic alcohol use. This is among the risky sexual behaviours which have been discussed with particular attention in key and vulnerable populations such as men who have sex with men, as it can play a mediating role in HIV transmission,[50] due to autonomy and decision-making compromise as buyers of sex can be decision makers for condoms use.

MSM who reported facing financial difficulties showed a higher prevalence of alcohol use disorder compared to their counterparts. These findings align with those of a 2018 study by Su Hyun et al in Paris,[49] which reported an increased prevalence of substance use, including alcohol, among men who have sex with men experiencing financial hardship. On top of this, our findings are also consistent with reports from China[48] and Ireland,[50] where the studies found an association of low-income level, unemployment (indicating possible financial difficulties) and alcohol use disorder among men who have sex with men. The relationship between financial difficulties and alcohol use disorder can be understood from multiple perspectives. The social causation hypothesis[51] suggests that financial hardship makes MSM more vulnerable to alcohol use disorder due to psychological distress, leading to drinking as a coping mechanism, and limited access to healthcare services, including medical and psychological support. Conversely, the social drift hypothesis posits that alcohol use disorder can contribute to financial difficulties.[51] It argues that the disorder disrupts normal brain

reward circuitry, impairing behaviours and reducing the ability to engage in income-generating activities, thereby perpetuating financial hardship. However, unlike our study findings, Wenhua and colleagues[11] in New York found no association between alcohol use and income level among men who have sex with men; this could be due to population (have relatively stable economy to meet basic needs compared to MSM in Tanga, Tanzania) and methodological differences, (their study was matched case control study attracting effect of similarity).

Furthermore, our study found an increased prevalence of probable alcohol use disorder among the participants who reported experiencing a moderate to high level of stigma. The experienced stigma among MSM has been reported in the different literature[52,53] such that some will cope by excessive alcohol intake, leading to probable or clinical alcohol use disorder. Studies have reported similar findings to our study, regardless of the population studied,[54,55] which justifies the science behind "stigma is stigma, no matter what type and where, or to whom", and so addressing is a crosscutting issue. Stigma has an intrinsic role in determining the quality of life of men who have sex with men in communities where this type of sex orientation is criminalized and it can led to different ameliorative coping strategies, such as alcohol use.[54] This presents an opportunity for researchers and healthcare stakeholders to strengthen anti-stigma campaigns, promote health for all, and improve the coverage and utilization of healthcare services, particularly in reproductive health, HIV treatments and prevention programming.

The Study Limitation

The study had several limitations. Participants were recruited based on their eligibility for PrEP; hence, they may not represent the actual population of men who have sex with men. Participants identified with alcohol use disorder by the screening tool AUD did not receive further assessments for diagnosis or interventions. The use of respondent-driven sampling methods, a non-probabilistic method in the recruitment of respondent-driven sampling methods, and a non-probabilistic method in the recruitment may have introduced selection bias. However, the regression analysis of respondent driven sampling data has been indicated to be accurate in estimating predictors of outcome, similar to estimates from probabilistic sampling. Furthermore, the use of standardized measures and efforts to ensure confidentiality and anonymity might have addressed these potential biasses.

Conclusions and Recommendations

The prevalence of probable alcohol use disorder was found to be relatively high. This is especially true among those who reported a history of group sex, paying for sex, facing financial difficulties and those who reported experiencing a moderate-to-high level of stigma. This highlights the need for health stakeholders, researchers and scientists to intensify health, reproductive and safe sex practices while escalating anti-stigma campaigns. We recommend the integration of substance screening and harm reduction services in HIV treatments and prevention programming to improve the outcomes.

Data Sharing Statement

Access to the data used in this analysis is available upon reasonable request to the principal investigator (PI) of the PREPTA project.

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Disclosure

The authors declare no conflicts of interest in this work.

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