

# Alcohol use, pregnancy and associated risk factors: a pilot cross-sectional study of pregnant women attending antenatal care in an urban city

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## Research article

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# Abstract

**Background** Alcohol consumption during pregnancy can cause adverse pregnancy outcomes such as preventable alcohol-related developmental disability fetal alcohol syndrome. This study examined the prevalence of alcohol use in a representative sample of pregnant women attending prenatal care at two urban clinics in Lusaka, Zambia. **Methods** A cross-sectional facility based survey evaluated self-reported alcohol use in the periconceptional period and pregnancy recognition (outcomes). Bivariate analyses were performed using the  $\chi^2$  test for dichotomous variables and the t-test for continuous variables. Mixed-effects linear models were used to evaluate the effect of outcome variables with patient-level variables. **Results** About 40 (21.2%) pregnant women were identified by the T-ACE as at-risk for problem drinking during pregnancy. Except for regular prenatal care and distance, there was no difference in the demographic factors between pregnant women who scored  $<2$  on the T-ACE and those that scored  $> 2$  points (all  $p$ 's  $> 0.05$ ). A small proportional of women at both clinics reported binge drinking during the periconceptional period (12.7% vs. 3.2%,  $p=0.003$ ) and beyond periconception period. Excluding employed women, no significant relationships were observed between alcohol use and demographic factors. **Conclusion** These findings underscore the need for targeted screening and intervention for alcohol use in all pregnant women in Zambia.

## Background

Alcohol consumption during pregnancy is a major public health problem linked to adverse pregnancy outcomes such as preventable alcohol-related developmental disability fetal alcohol syndrome (FAS).<sup>1,2</sup> It is estimated that globally around 9.8% women consume alcohol during pregnancy, with about 14.6 per 10,000 people estimated to be affected by FAS.<sup>3</sup> In Zambia, it is estimated that 49.3% of the population above age 15 indulge in heavy drinking (five or more drinks) on at least one occasion in the past 30 days (60.1% for men and 24.8% for women)<sup>4</sup>, and problem drinking is greater among teen girls than teen boys.<sup>5,6</sup> Studies conducted in Zambia and the Republic of South Africa (RSA) found misperceptions about alcohol use during pregnancy.<sup>7,8</sup>

Alcohol use during pregnancy has been found to be correlated with many negative health outcomes for the neonate (e.g., physical and cognitive defects<sup>9</sup> and neurodevelopmental abnormalities),<sup>10</sup> and for the mother (e.g., decreased production of breast milk).<sup>11,12</sup> Therefore, screening, proper counselling and referral to treatment would be of great significance.

A vast literature in particular that conducted in RSA has shown age at onset, tobacco use, partner violence, urban living, current use and having a male partner or extended family member who drinks alcohol<sup>13,14</sup> and depression<sup>15</sup> as risk factors for alcohol use during pregnancy. Protective factors of

alcohol use while pregnant include lower gravidity and parity, education and income. These studies combined demonstrate the need for early detection strategies for prevention of alcohol use before and during pregnancy. However, in Zambia, alcohol use and associated risk factors have not been investigated, and screening in prenatal care is nonexistent. Here, I examined the prevalence of alcohol use in pregnant women attending prenatal care at two clinics in Lusaka, Zambia.

## Methods

### Design and Setting

A cross-sectional facility-based survey was conducted at two public health clinics of Lusaka, Zambia in July 2017. These clinics were selected due to their geographic location and catchment area population. At the time of this study, annual antenatal target for Mtendere (urban clinic) was 6,159 compared to 5,111 for Kalingalinga (peri-urban clinic). I recruited participants during their regular prenatal visit using systematic sampling technique. Eligibility for further participation included participants' agreement to written consent to study protocols and being currently pregnant.

### Survey Measures

I used a validated T-ACE alcohol-screening questionnaire, which included four questions that relate to Tolerance (T); Annoyed (A); Cut down and eye-opener (E) (see Table 1). The T-ACE is commonly used tool as it allows for the identification of potential pregnant risk drinkers and those who may have lifetime issues with alcohol,<sup>16</sup> using a standard cut-off point of “two or more drinks” or gaining two points on the T-ACE question # 1. The author (native speaker) translated the tools into local languages (Bemba and Nyanja).

### Covariates

I embedded demographic and quantity-frequency-related questions about usual alcohol use with the T-ACE. Demographic information included age, gender, and socioeconomic status as approximated by parental education. All covariate items are included in the tables.

### Analysis

I performed descriptive statistics using IBM SPSS Statistics, version 24.0 (Armonk, NY: IBM Corp). To compare demographic factors and alcohol use patterns among participants by clinic and among those who scored two or more points on the T-ACE questionnaire, I performed bivariate analyses using the  $\chi^2$  test for dichotomous variables and the t-test for continuous variables. Because alcohol use data were not normally distributed, I used medians and first (Q1) and third (Q3) quartiles to describe the data distribution on any alcohol use and binge drinking episode in the past 30 days (number of drinks and drank  $\geq 4$  alcoholic drinks on at least one day), and any at-risk drinking (scored  $>2$  on the T-ACE

questionnaire). A mixed-effects linear model (188 pregnant women in 10 wards) was used to evaluate the effect of the log-transformed outcome variables (number of drinks consumed  $\geq 4$  alcoholic drinks on at least one day in the past 30 days and scoring  $>2$  on the T-ACE questionnaire), after adjusting for patient-level variables. Patient-level variables included age, marital status, education and prenatal care regular attendance. The mixed-effects analysis were used to account for dependence resulting from pregnant women being nested within administrative wards. Statistical significance of fixed effects were evaluated at  $p < .05$ .

## Results

### Participants

The mean age of participants at the time of screening was 26.8 (range: 14–41) years and mean gestational age was 24.4 (range: 4–42; median = 24.0; Quartile 1 = 16; Quartile 3 = 31.5) weeks. The self-reported mean age at first use of alcohol was 19.9. Only 9.0% of screened participants were primigravida and the majority were unemployed (69.1%).

### At Risk Drinking During Pregnancy

Of all participants, about 40 (21.2%) were identified by the T-ACE as at-risk for problem drinking during pregnancy. Except for 2 of 12 variables used, no differences in the demographic factors were detected between participants who scored  $<2$  points and those that scored  $> 2$  points on the T-ACE (all  $p$ 's  $>0.05$ ) (Table 1). Regular prenatal use was lower among participants who scored  $>2$  points compared to those who scored  $<2$  points on T-ACE (48.8% vs. 20.8%,  $p < 0.001$ ). A higher proportion of participants who scored  $<2$  points on T-ACE did not perceive distance as a constraint to prenatal care access (26.2% vs. 9.5%;  $p < 0.001$ ).

[Insert Table 1 here]

### At Risk Drinking During the Periconceptional Period

While most participants in the sample (66%,  $n=124$ ) reported never drinking any alcohol, about 12.7% in the Kalingalinga and 3.2% at Mtendere samples,  $p=0.003$  reported binge drinking (consuming  $\geq 4$  drinks) during the periconceptional period (Table 2). A somewhat smaller proportion of participants reported binge drinking beyond periconceptional period (representing 2<sup>nd</sup> and 3<sup>rd</sup> trimesters for most participants) that is consuming  $\geq 4$  drinks in at least one day during the past 30 days, and scoring  $>2$  or more drinks on the T-ACE (9.0% vs. 8.0% at Kalingalinga and 16.0% vs. 13.3% at Mtendere).

[Insert Table 2 here]

## Demographic Associations with past 30 days Alcohol Use

Adjusted multivariable analyses further indicated that the odds of at-risk drinking during the past 30 days was 1.002 more likely among employed participants than unemployed participants (95% CI, 0.1.000-1.003). There were no significant relationships between at risk drinking during the past 30 days and other neighborhood demographics; and between participants who scored  $\geq 2$  on the T-ACE and demographics factors (all  $p$ 's  $> 0.05$ ; data not shown).

## Discussion

The current study found that alcohol consumption is prevalent in the periconceptional period and during pregnancy in participants attending prenatal care in Zambia. To note, although most participants in the sample reported never consuming any alcohol in the periconceptional period and during pregnancy, almost a quarter of participants at both clinics were identified as at-risk for problem drinking during the periconceptional period and during pregnancy. Prevalence estimates obtained in this study are alarming, particularly given the self-reported nature of the study and small sample size and because there is no safe amount of alcohol to drink while pregnant. Therefore, while these results do not imply cause and effect, these findings suggest that Zambian women who consume any alcohol during pregnancy may be at increased risk for poor pregnancy outcomes<sup>17</sup> due to lack of alcohol screening in prenatal care.

Results also suggest that consuming alcohol during pregnancy was less likely, if a participant attended prenatal care regularly and or if distance was not a barrier to accessing prenatal care, suggesting that improving structural constraints (e.g., improved transportation) may improve access and utilization prenatal care and the behavior of pregnant women. This finding broadly supports the work of other studies in this area linking actual travel distance with access to reproductive health services.<sup>18,19</sup> Further analysis also revealed that the odds of at risk drinking during the past 30 days was higher among employed pregnant women compared to unemployed pregnant women. This finding is in accord with previous studies indicating that alcohol consumption is higher for women with higher income or higher social class.<sup>20</sup>

Potential limitations to this study include reliance on participant self-reporting of alcohol use before and during pregnancy. In addition, given the stigmatization associated with alcohol consumption during pregnancy, the prevalence estimates, while high, might be an underestimation. Further, some participants could not accurately recall their previous alcohol use. To minimize this effect, participants of the current study were asked about their alcohol use in private and non-judgmental settings (conference room). In addition, the study was cross sectional, precluding discussion of temporality nor can causality be

inferred. The study only included maternal factors based on literature and other factors that may relate to alcohol use during pregnancy were not included in the analysis. Nevertheless, the findings support increased efforts to develop and implement evidence-based interventions to prevent and reduce alcohol use during pregnancy.

## Conclusions

Understanding barriers, risks, and protective factors associated with at risky drinking in pregnancy, early screening, counselling including referrals for treatment, and other factors (e.g., personal and environmental) may be useful in the development of interventions for screening and reducing drinking during pregnancy and related consequences.

## Abbreviations

**T-ACE:** Tolerance-Annoyance, Cut Down, Eye Opener

**FAS:** Fetal Alcohol Syndrome

**RSA:** Republic of South Africa

**CI:** Confidence Interval

**FASD:** Fetal Alcohol Spectrum Disorder

## Declarations

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### *Authors' contributions*

IKM designed all aspects of the study, coordinated data collection, data analysis and drafted the manuscript.

### *Ethics approval and consent to participate*

The University of Miami Institutional Review Board and ERES Converge Research Ethics Committee approved the study. Informed written consent was obtained from all study participants prior to study participation. For those participants who were below the legal consenting age (below 18 years), they provided written assent, however their parents/guardians provided additional written informed consent.

### *Consent for publication*

Not applicable.

### *Competing interests*

The authors declare that they have no competing interests.

### *Availability of data and materials*

Not applicable. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to them containing information that could compromise research participant privacy.

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## Tables

**Table 1** Demographic characteristics of pregnant women attending prenatal care at study clinics by T-ACE scores: Lusaka, Zambia, July 2017 (n=188).

	T-ACE Scored		p-value
	<2 points (n = 116)	>2 point (n = 40)	
	Mean (95% CI)	Mean (95% CI)	
Maternal age at screening (years)	27.0(25.9-28.1)	25.7(24.0-27.4)	0.299
Gestational age at screening (weeks)	24.2 (22.6-25.9)	24.5 (21.7-27.2)	0.808
Number of times pregnant	3.0(2.8-3.2)	2.9(2.51-3.19)	0.086
Maternal age first time had alcohol drink	18.4(17.2-19.6)	19.6(17.7-21.4)	0.296
	N (%)	N (%)	
Employment status			0.602
Unemployed	68(40.5)	25 (14.9)	
Employed	16(9.5)	9(5.4)	
Marital status			0.934
Single (never married/dating)	15(8.9)	7(4.2)	
Married	82(48.85)	30(17.9)	
Divorced/separated/windowed	3(1.8)	1(0.6)	
Education			0.432
Some primary school	11(6.5)	7(4.2)	
Primary school	24(14.3)	9(5.4)	
Secondary school	48(28.6)	18(10.7)	
>college	17(10.1)	3(1.8)	
Religion			0.756
Christian (e.g., Catholic, protestant)	98(58.3)	38(22.6)	
Muslim	0(0.0)	0(0.0)	
Not religious	1(0.6)	0(0.0)	
Household income (monthly)			0.569
Dependent (no income)	31(18.5)	11(6.5)	
≤ 1,000 ZMW	15(8.9)	8(4.8)	
>1,000 ZMW	37(22.0)	12(7.1)	
Primary source of emotional support			0.580
Parent/relative	42(25.0)	20(11.9)	
Spouse/significant other	51(30.4)	15(8.9)	
Friend	6(3.6)	1(0.6)	
Prenatal care (regular)			0.001
no	17(10.1)	2(1.2)	
yes	82(48.8)	35(20.8)	
Distance factor to prenatal care services			0.001
no	44(26.2)	16(9.5)	
yes	30(17.9)	12(7.1)	

**Note:** Descriptive statistics were calculated and reported for women who answered the particular questions as means with associated confidence intervals, and percentages as appropriate. Only participants who responded to all the four

T-ACE questions are included in the analysis (n=156 or 188 participants).

T-ACE Questionnaire: T, How many drinks does it take to make you feel high?; A, Annoyed, Have people annoyed; you by criticizing your drinking?; C, Cut down, Have you ever felt you ought to cut down on your drinking); and E, Eye-opener asked, have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?

**Table 2** Alcohol Use among Pregnant women screened at the Kalingalinga and Mtendere Clinics, Lusaka, Zambia, July 2017 (n = 188)

	Clinics		p-value
	Kalingalinga (n = 79) n (%)	Mtendere (n = 109) n (%)	
<b>Alcohol use in the periconceptional period<sup>a</sup></b>			<b>0.003</b>
Did not consume any alcohol	52 (27.7)	22 (31.9)	
Consumed alcohol (≤4 drinks at one time)	2 (1.1)	21 (11.2)	
Any binge drinking <sup>a</sup>	10 (12.7)	6 (3.2)	
<b>Frequency of drinking</b>			<b>0.557</b>
Everyday	0 (0.0)	4 (2.1)	
3-4 days a week	1 (0.5)	2 (1.1)	
1-2 days a week	3 (1.6)	6 (3.2)	
2-3 days a week	0 (0.0)	0 (0.0)	
Once a month	4 (2.1)	8 (4.3)	
Less than once a month	1 (0.5)	4 (2.1)	
Never (don't drink)	57 (30.3)	67 (35.6)	
<b>Alcohol use in the past 30 days</b>			
Consumed no alcoholic drinks in at least one day	50 (26.6)	57 (30.3)	0.322
Any binge drinking at least one day/weekly average	17 (9.0)	30 (16.0)	
<b>T-ACE alcohol-screening questionnaire</b>			<b>0.613</b>
Scored < 2 or more points	52 (27.7)	64 (34.0)	
Scored > 2 or more points (risk drinking during pregnancy) <sup>b</sup>	15 (8.0)	25 (13.3)	

**Note:**

<sup>a</sup> ≥4 drinks at one time during the time the woman was pregnant but did not know she was pregnant;

<sup>b</sup>Based on the T-ACE standard cut-off point-- responding "2 or more drinks" on the T-ACE question # 1.

## Supplementary Files

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