Association between Alcohol Consumption and Early Sexual Initiation in Ethiopia: A Systematic Review and Meta-analysis

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Abstract

Background: The association between alcohol consumption and early sexual initiation is not studied at a national level in Ethiopia. Thus, the aim of this systematic review and meta-analysis study focused on examining the association between alcohol consumption and early sexual initiation in Ethiopia.

Methods: Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, included studies were retrieved through search engines such as PubMed/MEDLINE, Cochrane Library, EMBASE, CINHAL, HINARI portal, Google Scholar, and institutional repositories. The Joanna Briggs Institute employed a critical appraisal checklist for observation studies was used. The data were extracted and stored using a Microsoft excel sheet. Then abstracted data were imported into STATA 14 for analysis. Heterogeneity across the studies was assessed by the Q and the I2 test. Random-effects model analysis technique was employed to estimate the pooled estimates. The subgroup analysis was done by region and year of publication. To examine publication bias, a funnel plot and Egger's regression test were used.

Results: A total of 10 studies with 5,904 samples were included in this study. The pooled association between alcohol consumption and early sexual initiation in Ethiopia was found to be 1.61 (95% CI: 1.29–1.92; I^2=47.3%; p<0.048).

Conclusion: The current study found a positive association between alcohol consumption and early sexual initiation. Thus, holistic age-appropriate sexuality education is recommended.

Keywords: *Alcohol; Early sex Initiation; Ethiopia*

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Introduction

World Health Organization (WHO) estimate that, globally, about 53% of people aged 15 years and above have ever used alcohol (Compton, 2009). Due to excessive alcohol consumption, 6% of mortality and 5% of disability-adjusted life years (DALYs) are lost worldwide (Prince *et al*., 2007). Recent trends indicate that the use of substances including alcohol has dramatically increased particularly in developing countries (Deressa and Azazh, 2011; Negussie and Berhane, 2012). Most alcohol consumers as well as other substance users may not be able to see the harmful effect of their activities. In addition to its association with acute intoxication, negative psychosocial outcomes decreased academic performance, other abnormalities such as lethargy, hopelessness, and insomnia, and addiction can emerge in its consumers (Dawson, *et al*., 2008; Gates, et al., 2016; Strandberg, *et al*., 2019). Alcohol is also one facilitation of sexual contact (Bellis and Hughes, 2004; Foxman, et al., 2006; Sumnall, et al., 2007). Furthermore, alcohol is associated with risky sexual behaviors like multiple partners, casual unprotected sexual activity, and an early sexual debut/ initiation. Early sexual initiation means sexual intercourse before the age of 18 years (Rehm *et al*., 2012; Berhan and Berhan, 2015; Cook and Clark, 2005). In Ethiopia, available studies have estimated the magnitude of alcohol consumption up to 77% (Gelay *et al*., 2012). Though alcohol use has become a common practice among Ethiopian youths, few interventions have been provided to address the magnitude and associated factors. This might be because available primary studies conducted in different parts of the country come with conflicting findings. Because, when many studies (Kebede and Ayele, 2009; Bizuayehu *et al*., 2015; Tilahun and Ayele, 2013) founds

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a positive association between early sexual initiation and alcohol consumption, others (Kassa *et al*., 2014; Girma *et al*., 2015; Kassahun *et al.*, 2019) underline insignificant associations. Thus, this systematic review and meta-analysis study gives attention to examining the association between alcohol consumption and early sexual initiation in Ethiopia. The finding will help policymakers to take appropriate intervention in the area

Review Question

The review question of this systematic review and meta-analysis was is there an association between alcohol consumption and early sexual initiation in Ethiopia.

Methods

This protocol has been written according to the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher, *et al* ., 2009**).**

Search Strategy

This review identified studies that provide data on the association between alcohol consumption and age at sexual initiation in Ethiopia. In the search engine, PubMed/MEDLINE, Cochrane Library, EMBASE, CINHAL, HINARI portal, Google Scholar, and institutional repositories were retrieved. The search included keywords that are the combinations of population, condition or outcome, context, and exposures. A snowball searching for the references of relevant papers for linked studies was also performed Those search terms or phrases including were: "Adolescents", "youth", "young adults", "alcohol consumption", "sexual initiation", "sexual practice", sexual debut, and Ethiopia. Using those key terms, the following search map was applied: (prevalence OR magnitude) AND (effect OR impact OR association) AND (alcohol consumption OR drinking alcohol OR alcohol) (youth [MeSH Terms] OR adolescent OR young people) AND (early sexual initiation [MeSH Terms] OR premature sexual initiation OR early sexual practice OR premature sexual practice OR early sexual debut OR premature sexual debut AND Ethiopia on PubMed database (Table S1). Thus, the PubMed search combines #1 AND #2 AND #3 AND #4 AND #5 (Table S1). These search terms were further paired with the names of each Ethiopian Region ("2000/01/01" [PDat]: "2019/12/30" [PDat]). On both Cochran Library and Google scholar, a built-in text search was used in the advanced search section of the sources.

Eligibility Criteria

Inclusion Criteria

Both published and unpublished studies which were conducted in English on the association between alcohol consumption and early sexual initiation in both males and females below the age of 18 years old in Ethiopia were included. Moreover, all observational studies mainly cross-sectional, case-control, and cohort studies were also included. Exclusion criteria after having attempted to contact the primary authors, not fully accessed studies were excluded. This is because it was impossible to assess the quality of each study without accessing the full text. Moreover, editorials and qualitative studies were excluded from the analysis.

Study Selection and Screening

The retrieved studies were exported to Endnote version 8 reference managers to remove duplicate studies. The investigators independently screened the selected studies using the article's title and abstracts before retrieval of full-text papers. Pre-specified inclusion criteria were used to further screen the full-text studies. Accordingly, the full text of potentially relevant studies for further assessment was acquired. Disagreement was resolved through evidence-based discussion among investigators. The summary flow chart of inclusion and exclusion records were summarized in Fig1.

Data Extraction

The authors developed a data extraction form on the excel sheet in considering author(s), Adjusted Odds Ratio (AOR), region of study, and year of study. The data extraction sheet was piloted using four randomly selected studies, and it was adjusted after piloting the template. Both authors extracted the data using the extraction form independently. The reason is to settle the disagreement of authors by crosschecking independently extracted or included papers.

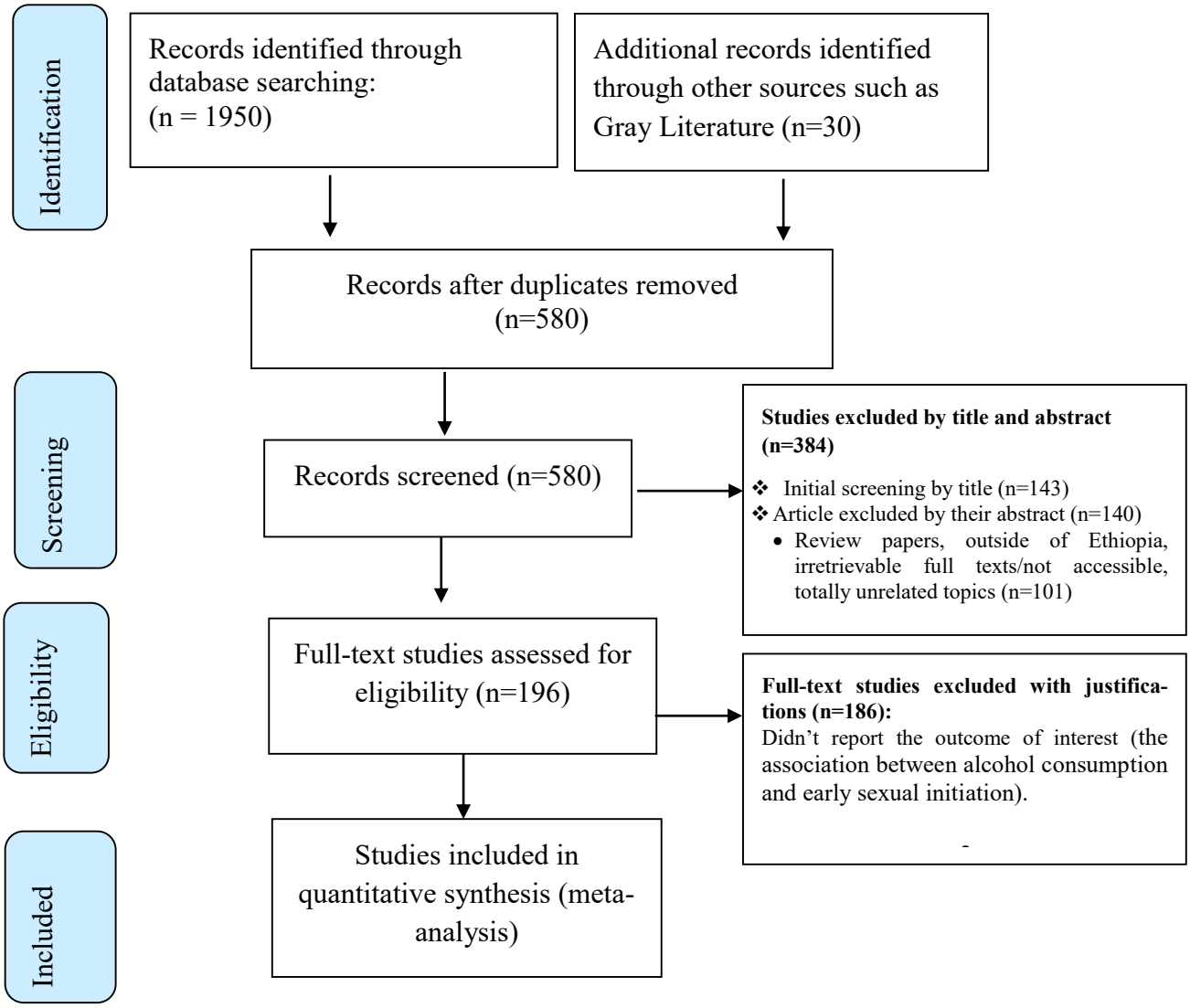


Figure 1: PRISMA –adapted flow diagram showed the results of the search and reasons for exclusion (Moher, et al., 2009).

Quality Assessment

Authors independently appraised the quality of the studies by using the Joanna Briggs Institute (JBI) quality appraisal checklist. Studies were considered as low risk or good quality when they scored 4 (Joanna Briggs Institute, 2017). In this systematic review and meta-analysis, the quality scores of included studies ranged from 6 to 8 out of 8 (see Table S2). This infers that each included studies were a high-quality study.

Synthesis of Results

Information computed from retrieved studies was extracted using Microsoft Excel spreadsheet form and exported to STATA (version 14; Stata Corp, College Station, TX) for further analysis.

We pooled the overall estimates of AOR of alcohol consumption as a predictor of early sexual intercourse by a random effect meta-analysis model. We examined the heterogeneity of effect size using the Q statistic and the I2 statistics. In this study, the I2 statistic value of zero indicates true homogeneity, whereas the value 25%, 50%, and 75% represented low, moderate, and high heterogeneity, respectively (Higgins, et al., 2003). Although this study reported low (47.3%) heterogeneity, subgroup analysis was done by the study region and year of publication. Besides, a sensitivity analysis was employed to examine the effect of a single study on the overall estimation. Publication bias was checked by funnel plot and more objectively through Egger's regression test (Egger, et al., 1997) and a p-value less than 0.05 was considered as statistically significant. The pooled association of early initiation of sexual intercourse was computed using forest plots with a 95% CI.

Ethical Consideration

Not applicable.

Results

Description of studies

A total of 1980 studies were identified; 1950 from the database and 30 from other sources. After duplication was removed, a total of 580 studies remained (1400 removed by duplication). Finally, 196 studies were screened for full-text review, and 10 studies with (n=5904 participants) were selected (Fig.1) for this systematic review and meta-analysis (Belay, 2014; Bizuayehu *et al*., 2015; Girma *et al.,* 2015; Kassa et al., 2014; Kassahun *et al*., 2019; Kebede and Ayele, 2018; Mazengia and Worku, 2009; Teferra *et al.,* 2015; Tilahun and Ayele, 2013; Yigzaw *et al.,* 2014) (Table 1). Geographically, among included studies, six studies were found in Amhara, one in Southern Nation Nationalities and Peoples (SNNP), and three in Addis Ababa (AA). All of the included studies were cross-sectional study designs. Half of the studies, 5(50%) were published between 2015 and 2019; the remaining 5(50%) studies were published between 2009 and 2014.

Pooled estimates of alcohol consumption as a risk factor for early sexual initiation

In all included studies (n=10) the odds of early initiation of sexual intercourse among respondents who consumed alcohol have been reported. The AOR of alcohol consumption ranged from 0.65 (Girma et al., 2015) to 3.80 (Tilahun and Ayele, 2013). The random-effects model analysis from those studies revealed that the pooled estimates of alcohol consumption as a risk factor for early sexual initiation in Ethiopia were found to be 1.61 (95% CI:1.29–1.92; I2=47.3%; p<0.048) (Fig.2).

Regarding the heterogeneity test, the Galbraith plot showed heterogeneity, and combining the result of ten studies, Both the I-Squared (I2) and P-value also showed heterogeneity (Fig 2). Accordingly, the following subgroup analysis was done.

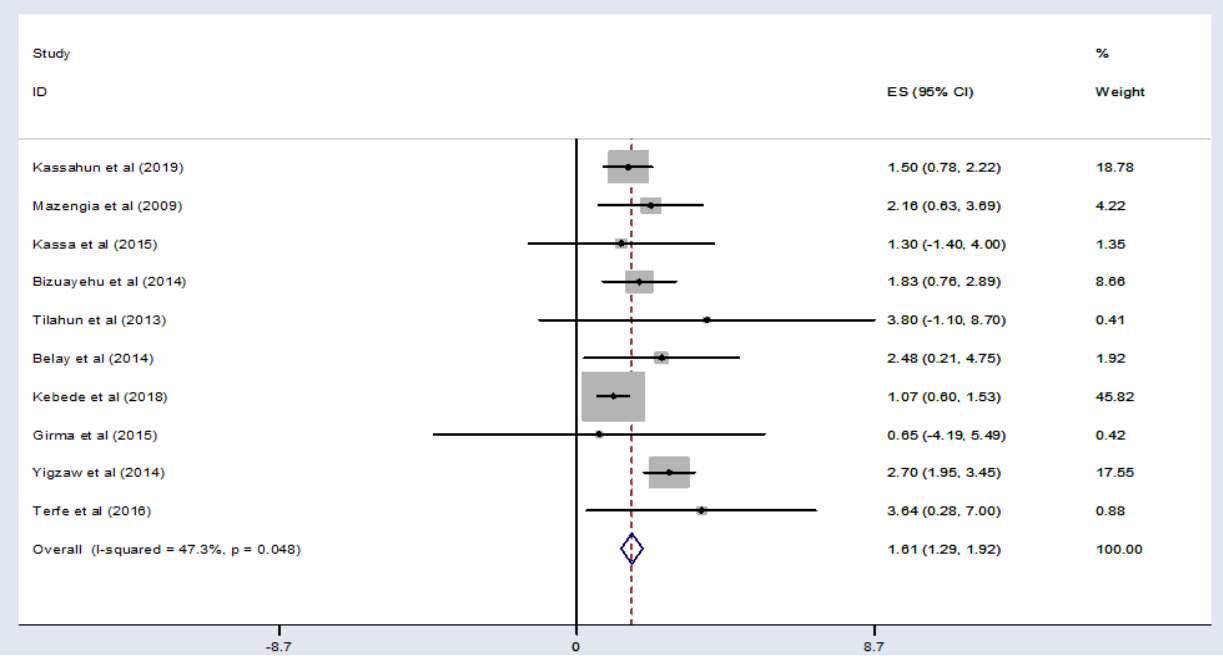
Subgroup analysis of the pooled estimate of alcohol consumption in Ethiopia

The subgroup analysis was done stratified by region/city administration and year of publication to determine the relationship between alcohol consumption and early sexual initiation in terms of geographic area or region and year. Accordingly, the pooled estimate of alcohol consumption was insignificant, with the exception of Addis Abeba, where it was estimated to be 2.64. (Fig 3). The pooled estimate of alcohol intake was determined to be non-significant depending on the year it was published (AOR=1.22; 95 % confidence CI: 0.84-1.61) for studies done between 2009 and 2014 and AOR= 2.40 (95 % confidence CI: 1.85-2.95) for research done between 2015 and 2019). (Fig 4).

Table 1: Distribution of included studies on the adjusted odd ratio of alcohol consumption on early sexual initiation in Ethiopia

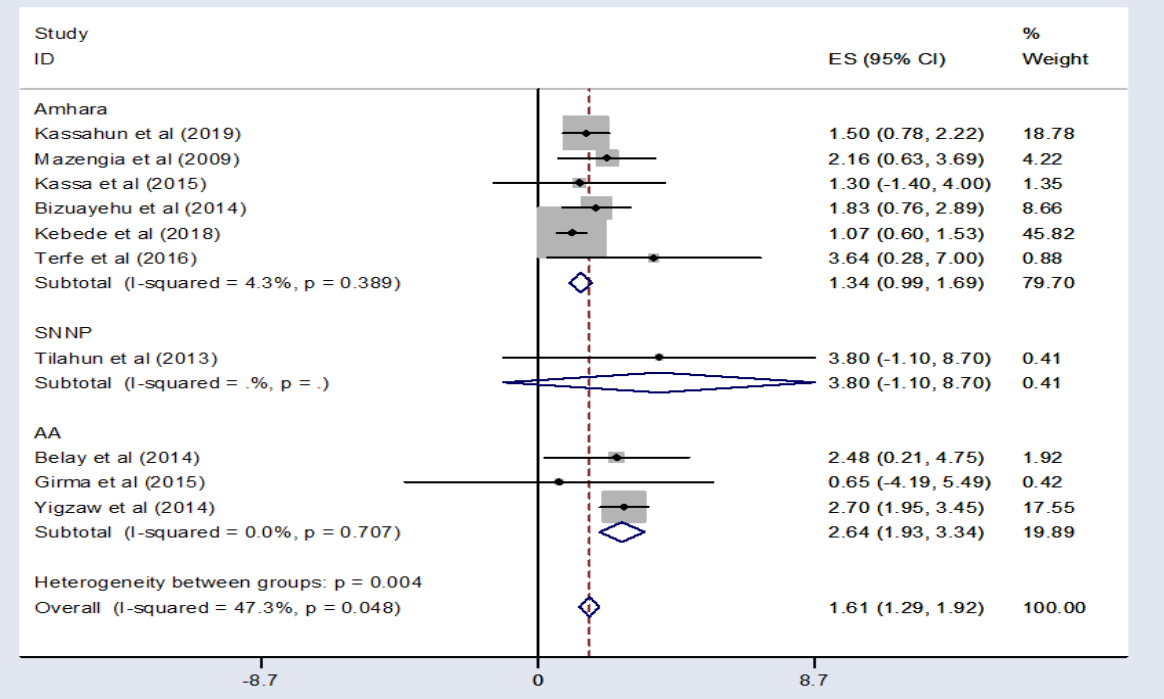
Authors	Region/city ad-mistration	Study year	Sample Size	AOR	LBCI	UBCI	SeOR
Belay, 2014	Addis Ababa	2014	598	2.48	1.09	5.63	1.16
Bizuayehu et al., 2015	Amhara	2014	326	1.83	1.05	3.18	0.54
Girma et al., 2015	Adiss Ababa	2015	636	0.65	0.65	2.47	2.47
Kassa et al., 2014	Amhara	2015	260	1.3	0.29	5.70	1.38
Kassahun et al., 2019	Amhara	2019	723	1.5	0.9	2.35	0.37
Kebede and Ayele, 2018	Amhara	2018	406	1.10	-0.40	0.53	0.24
Mazengia and Worku, 2009	Amhara	2009	1236	2.16	1.12	4.18	0.78
Teferra et al., 2015	Amhara	2015	302	3.64	1.59	8.31	1.71
Tilahun and Ayele, 2013	SNNP	2013	405	3.80	1.3	11.1	2.50
Yigzaw et al., 2014	Adiss Ababa	2014	1012	2.7	1.1	2.6	0.38

AOR: Adjusted Odd Ratio; Lower Bound Confidence Interval; UBCL: Upper Bound Confidence Interval; SeOR: Standard error of Odds Ratio



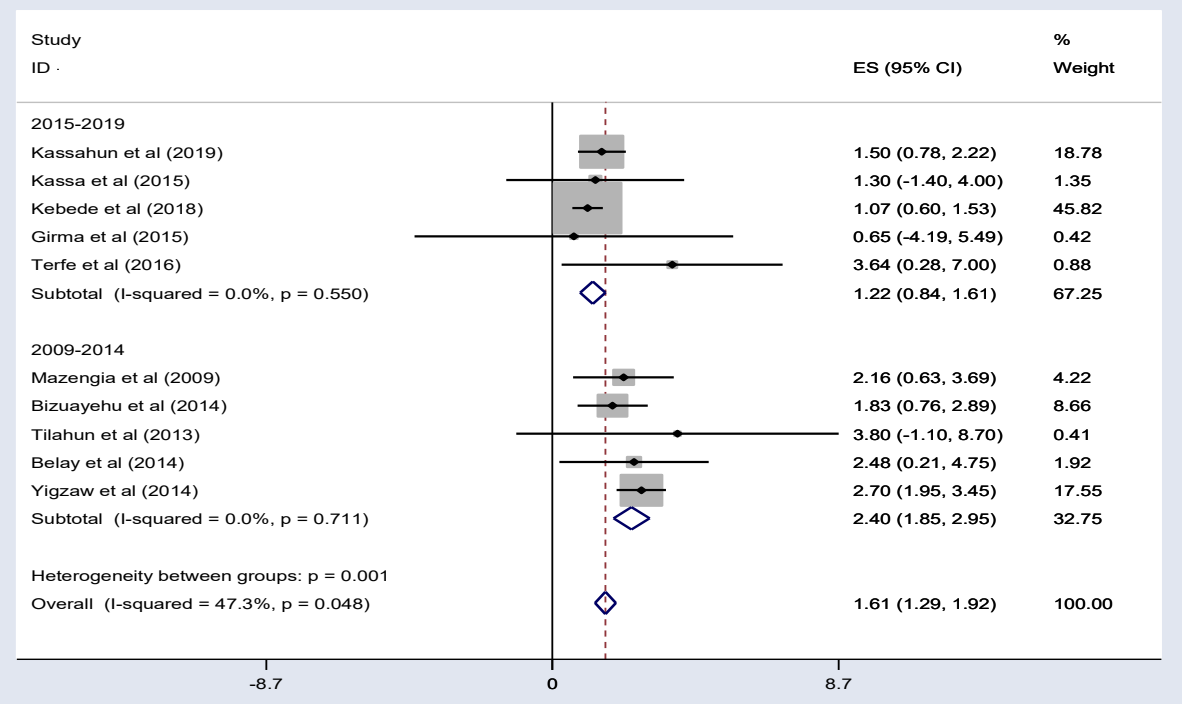
ES: Estimated weight; CI: Confidence Interval;

Figure 2: Forest plot showing a pooled estimate of alcohol consumption as a risk factor for early initiation of sexual intercourse



ES: Estimated weight; CI: Confidence Interval;

Figure 3: Subgroup analysis of the pooled estimate of alcohol consumption by region in Ethiopia



ES: Estimated weight; CI: Confidence Interval;

Figure 4: Subgroup analysis of the pooled estimate of alcohol consumption by year of publication in Ethiopia

Sensitivity analysis

Sensitivity analysis was used to identify the potential source of heterogeneity in the analysis of the pooled estimate of alcohol consumption in Ethiopia. The results of this sensitivity analysis showed that the findings were not dependent on a single study.

The pooled estimate of alcohol consumption varied from 1.37 to 2.06 after the deletion of a single study. According to this, no study significantly influences the pooled estimate of alcohol consumption as a risk factor for early sexual initiation (Fig 5).

Study ommited	Coef.	[95% Conf.	Interval]
Kassahun et al	1.969967	1.2515892	2.688345
Mazengia et al	1.8262193	1.2078356	2.4446032
Kassa et al	1.8816346	1.2811717	2.4820976
Bizuayehu et al	1.8748796	1.2152829	2.5344763
Tilahun et al	1.8246267	1.2497618	2.3994915
Belay et al	1.8193986	1.2238432	2.4149539
Kebede et al	2.0672991	1.640437	2.4941614
Girma et al	1.8728524	1.2854108	2.4602942
Yigzaw et al	1.3762871	1.0302542	1.72232
Terfe et al	1.7977464	1.2312869	2.3642061
Combined	1.8474101	1.2821088	2.4127115

Figure 5: sensitivity analysis on alcohol consumption as a risk factor for early sexual initiation in Ethiopia

Publication Bias

A funnel plot showed a symmetrical distribution. The Egger's regression test value was 0.193, which indicated that, the absence of publication bias (Figure6).

Tests for Publication Bias

Begg's Test

adj. Kendall's Score (P-Q) = 11
Std. Dev. of Score = 11.18
Number of Studies = 10
z = 0.98
Pr > |z| = 0.325
z = 0.89 (continuity corrected)
Pr > |z| = 0.371 (continuity corrected)

Egger's test

Std_Eff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
slope	1.222361	.3430308	3.56	0.007	.4313301	2.013391
bias	.9614705	.6766626	1.42	0.193	-.5989164	2.521857

Figure 6: Publication bias on alcohol consumption as a risk factor for early sexual initiation in Ethiopia

Discussion

This systematic review and meta-analysis integrated the results of 10 studies involving 5,904 participants living in Ethiopia, sampled between 2009 and 2019. The finding revealed that alcohol consumers aged below 18 are 1.61 times more likely to engage in early sexual initiation than those who are not drinkers. This finding is in line with other related systematic review and meta-analysis studies done on a worldwide level (Scott-Sheldon *et al*., 2013), Latin America (Vagenas, *et al*., 2013), Russia (Lan *et al*., 2017), and North America (Rehm *et al*., 2011). In addition, a study from North America and Europe identified alcohol use as a major predictor of sexual decision-making (Lori *et al.,* 2016). This might be because the use of alcohol disturbs one's moods or emotional state through sustained release or inhibition of neurotransmitters, thus enhancing or dampening of individual's response (Witkiewitz *et al*., 2011).

As the subgroup analysis of the study, the association between alcohol consumption and early sexual initiation in terms of time was insignificant in publication years between 2015 and 2019 but it was significantly associated before 2015. This implies the probability of adolescents being exposed to various sexual and reproductive health problems including unwanted pregnancy, abortion, sexually transmitted infection, fistula, and also psychological problems such as depression, withdrawal, loneliness, poor self-worth, and aggression (Lüdicke et al 2001; Li *et al*., 2015; Mmbaga *et al*., 2012; Nigatu *et al*., 2012; Starr et al., 2012). This might be because various stakeholders are doing well in the area.

Geographically, the association between alcohol consumption and early sexual initiation was positively associated in Addis Ababa but insignificantly associated in other places. This might be because the magnitude of early sexual initiation is more severe in urban than rural parts of the country (Bayissa *et al.,* 2016; Nigatu *et al*., 2020).

Strength and Limitation of the Study

Identifying the association between alcohol consumption and early sexual initiation at a nationwide level can be the main strength of this study. However, the study has the following limitations. The first limitation

is that only studies done via the English language were considered in this analysis. Moreover, since included studies were conducted in Amhara, SNNP, and Addis Ababa, the finding might not be representative of the whole parts of Ethiopia.

Conclusion

Alcohol consumption is positively associated with early sexual initiation among adolescents in the Ethiopia. The association was significant in urban areas like Addis Ababa. Therefore, governmental and non-governmental stakeholders work on awareness creation about the adverse consequences of consuming alcohol on early sexual initiation, especially for those whose age is below 18 years old. Besides, holistic age-appropriate sexuality education addressing alcohol consumption is also necessary. This review also recommends that more research on the magnitude and factors associated with alcohol consumption, as well as its association with the magnitude of early initiation, be conducted in different geographical areas of Ethiopia, using both qualitative and quantitative data.

Abbreviations and Acronyms

HIV: Human Immunodeficiency Virus; CI: Confidence interval; OR: Odds Ratio; STI: Sexual Transmuted Infections. WHO: World Health Organization; SNNP: Southern Nations, Nationalities and Peoples.

Acknowledgment

Not applicable.

Competing Interests

Not applicable.

Authors' Contribution

MDA and BBA Conceptualization, quality appraisal, investigation, and conducted the formal data analysis writing-original draft, writing-review, and editing. Both authors read and approved the manuscript for publication. AD also did writing-review and editing as well as gave proper language editing starting from its draft to the final version of the manuscript**.**

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Background: The association between alcohol consumption and early sexual initiation is not studied at a national level in Ethiopia. Thus, the aim of this systematic review and meta-analysis study focused on examining the association between alcohol consumption and early sexual initiation in Ethiopia.

Methods: Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, included studies were retrieved through search engines such as PubMed/MEDLINE, Cochrane Library, EMBASE, CINHAL, HINARI portal, Google Scholar, and institutional repositories. The Joanna Briggs Institute employed a critical appraisal checklist for observation studies was used. The data were extracted and stored using a Microsoft excel sheet. Then abstracted data were imported into STATA 14 for analysis. Heterogeneity across the studies was assessed by the Q and the I2 test. Random-effects model analysis technique was employed to estimate the pooled estimates. The subgroup analysis was done by region and year of publication. To examine publication bias, a funnel plot and Egger's regression test were used.

Results: A total of 10 studies with 5,904 samples were included in this study. The pooled association between alcohol consumption and early sexual initiation in Ethiopia was found to be 1.61 (95% CI: 1.29–1.92; I^2=47.3%; p<0.048).

Conclusion: The current study found a positive association between alcohol consumption and early sexual initiation. Thus, holistic age-appropriate sexuality education is recommended.

Keywords: *Alcohol; Early sex Initiation; Ethiopia*

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Introduction

World Health Organization (WHO) estimate that, globally, about 53% of people aged 15 years and above have ever used alcohol (Compton, 2009). Due to excessive alcohol consumption, 6% of mortality and 5% of disability-adjusted life years (DALYs) are lost worldwide (Prince *et al*., 2007). Recent trends indicate that the use of substances including alcohol has dramatically increased particularly in developing countries (Deressa and Azazh, 2011; Negussie and Berhane, 2012). Most alcohol consumers as well as other substance users may not be able to see the harmful effect of their activities. In addition to its association with acute intoxication, negative psychosocial outcomes decreased academic performance, other abnormalities such as lethargy, hopelessness, and insomnia, and addiction can emerge in its consumers (Dawson, *et al*., 2008; Gates, et al., 2016; Strandberg, *et al*., 2019). Alcohol is also one facilitation of sexual contact (Bellis and Hughes, 2004; Foxman, et al., 2006; Sumnall, et al., 2007). Furthermore, alcohol is associated with risky sexual behaviors like multiple partners, casual unprotected sexual activity, and an early sexual debut/ initiation. Early sexual initiation means sexual intercourse before the age of 18 years (Rehm *et al*., 2012; Berhan and Berhan, 2015; Cook and Clark, 2005). In Ethiopia, available studies have estimated the magnitude of alcohol consumption up to 77% (Gelay *et al*., 2012). Though alcohol use has become a common practice among Ethiopian youths, few interventions have been provided to address the magnitude and associated factors. This might be because available primary studies conducted in different parts of the country come with conflicting findings. Because, when many studies (Kebede and Ayele, 2009; Bizuayehu *et al*., 2015; Tilahun and Ayele, 2013) founds

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a positive association between early sexual initiation and alcohol consumption, others (Kassa *et al*., 2014; Girma *et al*., 2015; Kassahun *et al.*, 2019) underline insignificant associations. Thus, this systematic review and meta-analysis study gives attention to examining the association between alcohol consumption and early sexual initiation in Ethiopia. The finding will help policymakers to take appropriate intervention in the area

Review Question

The review question of this systematic review and meta-analysis was is there an association between alcohol consumption and early sexual initiation in Ethiopia.

Methods

This protocol has been written according to the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher, *et al.,* 2009**).**

Search Strategy

This review identified studies that provide data on the association between alcohol consumption and age at sexual initiation in Ethiopia. In the search engine, PubMed/MEDLINE, Cochrane Library, EMBASE, CINHAL, HINARI portal, Google Scholar, and institutional repositories were retrieved. The search included keywords that are the combinations of population, condition or outcome, context, and exposures. A snowball searching for the references of relevant papers for linked studies was also performed Those search terms or phrases including were: "Adolescents", "youth", "young adults", "alcohol consumption", "sexual initiation", "sexual practice", sexual debut, and Ethiopia. Using those key terms, the following search map was applied: (prevalence OR magnitude) AND (effect OR impact OR association) AND (alcohol consumption OR drinking alcohol OR alcohol) (youth [MeSH Terms] OR adolescent OR young people) AND (early sexual initiation [MeSH Terms] OR premature sexual initiation OR early sexual practice OR premature sexual practice OR early sexual debut OR premature sexual debut AND Ethiopia on PubMed database (Table S1). Thus, the PubMed search combines #1 AND #2 AND #3 AND #4 AND #5 (Table S1). These search terms were further paired with the names of each Ethiopian Region ("2000/01/01" [PDat]: "2019/12/30" [PDat]). On both Cochran Library and Google scholar, a built-in text search was used in the advanced search section of the sources.

Eligibility Criteria

Inclusion Criteria

Both published and unpublished studies which were conducted in English on the association between alcohol consumption and early sexual initiation in both males and females below the age of 18 years old in Ethiopia were included. Moreover, all observational studies mainly cross-sectional, case-control, and cohort studies were also included. Exclusion criteria after having attempted to contact the primary authors, not fully accessed studies were excluded. This is because it was impossible to assess the quality of each study without accessing the full text. Moreover, editorials and qualitative studies were excluded from the analysis.

Study Selection and Screening

The retrieved studies were exported to Endnote version 8 reference managers to remove duplicate studies. The investigators independently screened the selected studies using the article's title and abstracts before retrieval of full-text papers. Pre-specified inclusion criteria were used to further screen the full-text studies. Accordingly, the full text of potentially relevant studies for further assessment was acquired. Disagreement was resolved through evidence-based discussion among investigators. The summary flow chart of inclusion and exclusion records were summarized in Fig1.

Data Extraction

The authors developed a data extraction form on the excel sheet in considering author(s), Adjusted Odds Ratio (AOR), region of study, and year of study. The data extraction sheet was piloted using four randomly selected studies, and it was adjusted after piloting the template. Both authors extracted the data using the extraction form independently. The reason is to settle the disagreement of authors by crosschecking independently extracted or included papers.

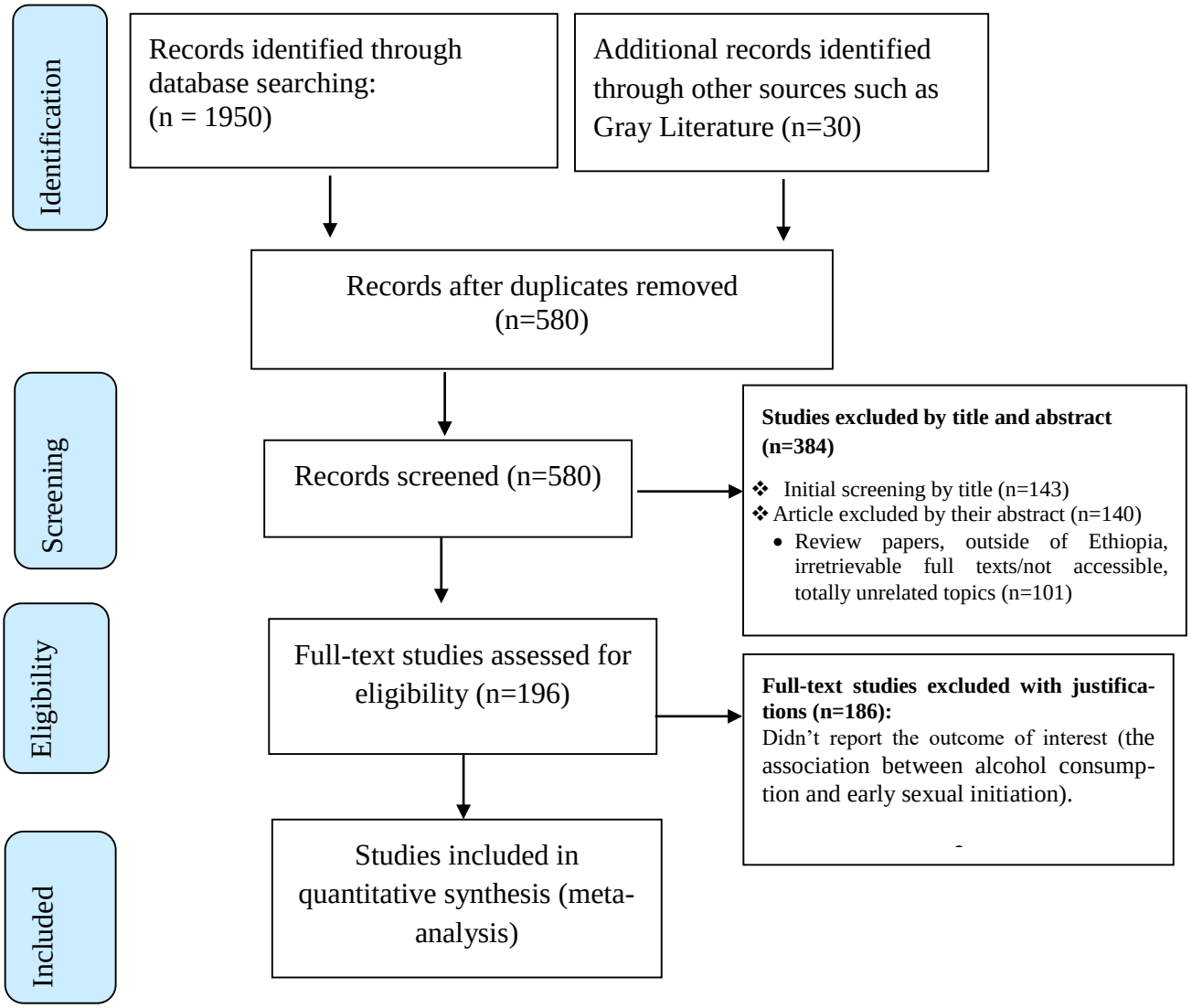

Figure 1: PRISMA –adapted flow diagram showed the results of the search and reasons for exclusion (Moher, et al., 2009).

Quality Assessment

Authors independently appraised the quality of the studies by using the Joanna Briggs Institute (JBI) quality appraisal checklist. Studies were considered as low risk or good quality when they scored 4 (Joanna Briggs Institute, 2017). In this systematic review and meta-analysis, the quality scores of included studies ranged from 6 to 8 out of 8 (see Table S2). This infers that each included studies were a high-quality study.

Synthesis of Results

Information computed from retrieved studies was extracted using Microsoft Excel spreadsheet form and exported to STATA (version 14; Stata Corp, College Station, TX) for further analysis.

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We pooled the overall estimates of AOR of alcohol consumption as a predictor of early sexual intercourse by a random effect meta-analysis model. We examined the heterogeneity of effect size using the Q statistic and the I2 statistics. In this study, the I2 statistic value of zero indicates true homogeneity, whereas the value 25%, 50%, and 75% represented low, moderate, and high heterogeneity, respectively (Higgins, et al., 2003). Although this study reported low (47.3%) heterogeneity, subgroup analysis was done by the study region and year of publication. Besides, a sensitivity analysis was employed to examine the effect of a single study on the overall estimation. Publication bias was checked by funnel plot and more objectively through Egger's regression test (Egger, et al., 1997) and a p-value less than 0.05 was considered as statistically significant. The pooled association of early initiation of sexual intercourse was computed using forest plots with a 95% CI.

Ethical Consideration

Not applicable.

Results

Description of studies

A total of 1980 studies were identified; 1950 from the database and 30 from other sources. After duplication was removed, a total of 580 studies remained (1400 removed by duplication). Finally, 196 studies were screened for full-text review, and 10 studies with (n=5904 participants) were selected (Fig.1) for this systematic review and meta-analysis (Belay, 2014; Bizuayehu *et al*., 2015; Girma *et al.,* 2015; Kassa et al., 2014; Kassahun *et al*., 2019; Kebede and Ayele, 2018; Mazengia and Worku, 2009; Teferra *et al.,* 2015; Tilahun and Ayele, 2013; Yigzaw *et al.,* 2014) (Table 1). Geographically, among included studies, six studies were found in Amhara, one in Southern Nation Nationalities and Peoples (SNNP), and three in Addis Ababa (AA). All of the included studies were cross-sectional study designs. Half of the studies, 5(50%) were published between 2015 and 2019; the remaining 5(50%) studies were published between 2009 and 2014.

Pooled estimates of alcohol consumption as a risk factor for early sexual initiation

In all included studies (n=10) the odds of early initiation of sexual intercourse among respondents who consumed alcohol have been reported. The AOR of alcohol consumption ranged from 0.65 (Girma et al., 2015) to 3.80 (Tilahun and Ayele, 2013). The random-effects model analysis from those studies revealed that the pooled estimates of alcohol consumption as a risk factor for early sexual initiation in Ethiopia were found to be 1.61 (95% CI:1.29–1.92; I2=47.3%; p<0.048) (Fig.2).

Regarding the heterogeneity test, the Galbraith plot showed heterogeneity, and combining the result of ten studies, Both the I-Squared (I2) and P-value also showed heterogeneity (Fig 2). Accordingly, the following subgroup analysis was done.

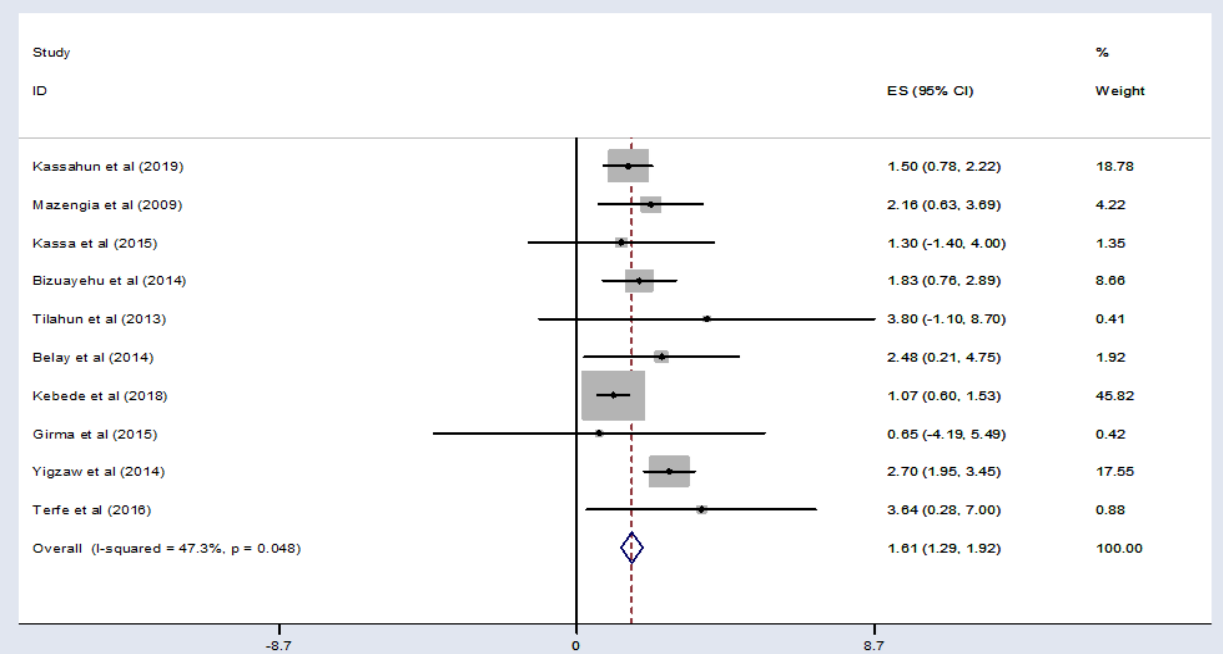
Subgroup analysis of the pooled estimate of alcohol consumption in Ethiopia

The subgroup analysis was done stratified by region/city administration and year of publication to determine the relationship between alcohol consumption and early sexual initiation in terms of geographic area or region and year. Accordingly, the pooled estimate of alcohol consumption was insignificant, with the exception of Addis Abeba, where it was estimated to be 2.64. (Fig 3). The pooled estimate of alcohol intake was determined to be non-significant depending on the year it was published (AOR=1.22; 95 % confidence CI: 0.84-1.61) for studies done between 2009 and 2014 and AOR= 2.40 (95 % confidence CI: 1.85-2.95) for research done between 2015 and 2019). (Fig 4).

Table 1: Distribution of included studies on the adjusted odd ratio of alcohol consumption on early sexual initiation in Ethiopia

Authors	Region/city administration	Study year	Sample Size	AOR	LBCI	UBCI	SeOR
Belay, 2014	Addis Ababa	2014	598	2.48	1.09	5.63	1.16
Bizuayehu et al., 2015	Amhara	2014	326	1.83	1.05	3.18	0.54
Girma et al., 2015	Adiss Ababa	2015	636	0.65	0.65	2.47	2.47
Kassa et al., 2014	Amhara	2015	260	1.3	0.29	5.70	1.38
Kassahun et al., 2019	Amhara	2019	723	1.5	0.9	2.35	0.37
Kebede and Ayele, 2018	Amhara	2018	406	1.10	-0.40	0.53	0.24
Mazengia and Worku, 2009	Amhara	2009	1236	2.16	1.12	4.18	0.78
Teferra et al., 2015	Amhara	2015	302	3.64	1.59	8.31	1.71
Tilahun and Ayele, 2013	SNNP	2013	405	3.80	1.3	11.1	2.50
Yigzaw et al., 2014	Adiss Ababa	2014	1012	2.7	1.1	2.6	0.38

AOR: Adjusted Odd Ratio; Lower Bound Confidence Interval; UBCL: Upper Bound Confidence Interval; SeOR: Standard error of Odds Ratio



ES: Estimated weight; CI: Confidence Interval;

Figure 2: Forest plot showing a pooled estimate of alcohol consumption as a risk factor for early initiation of sexual intercourse

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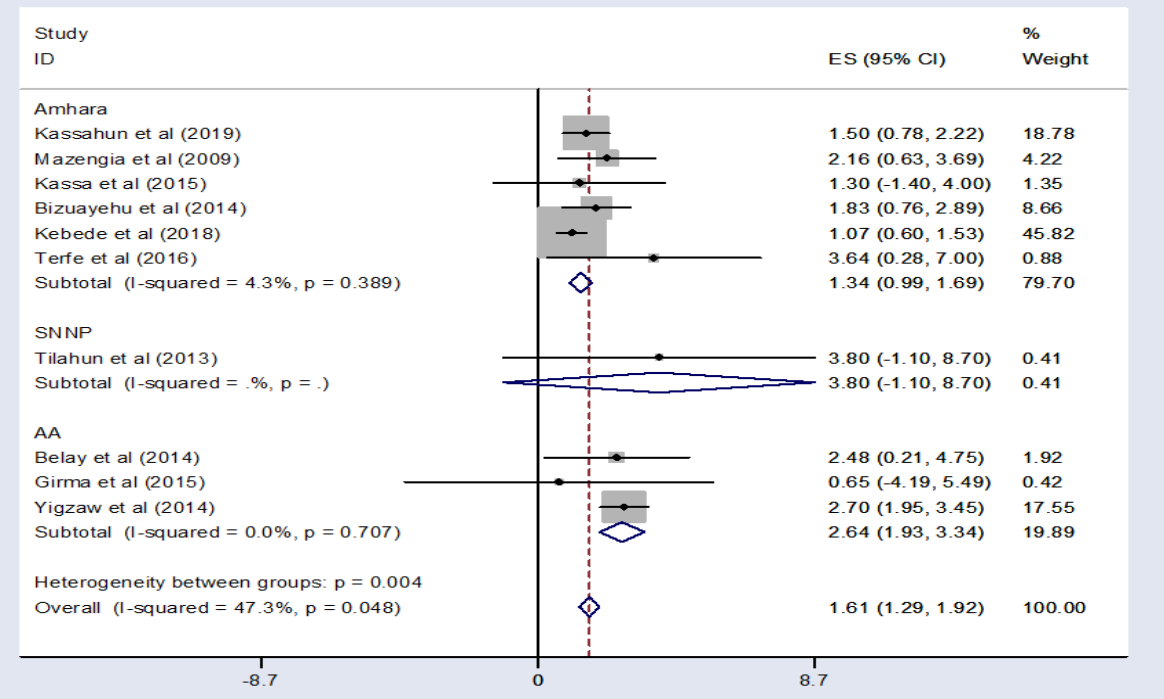
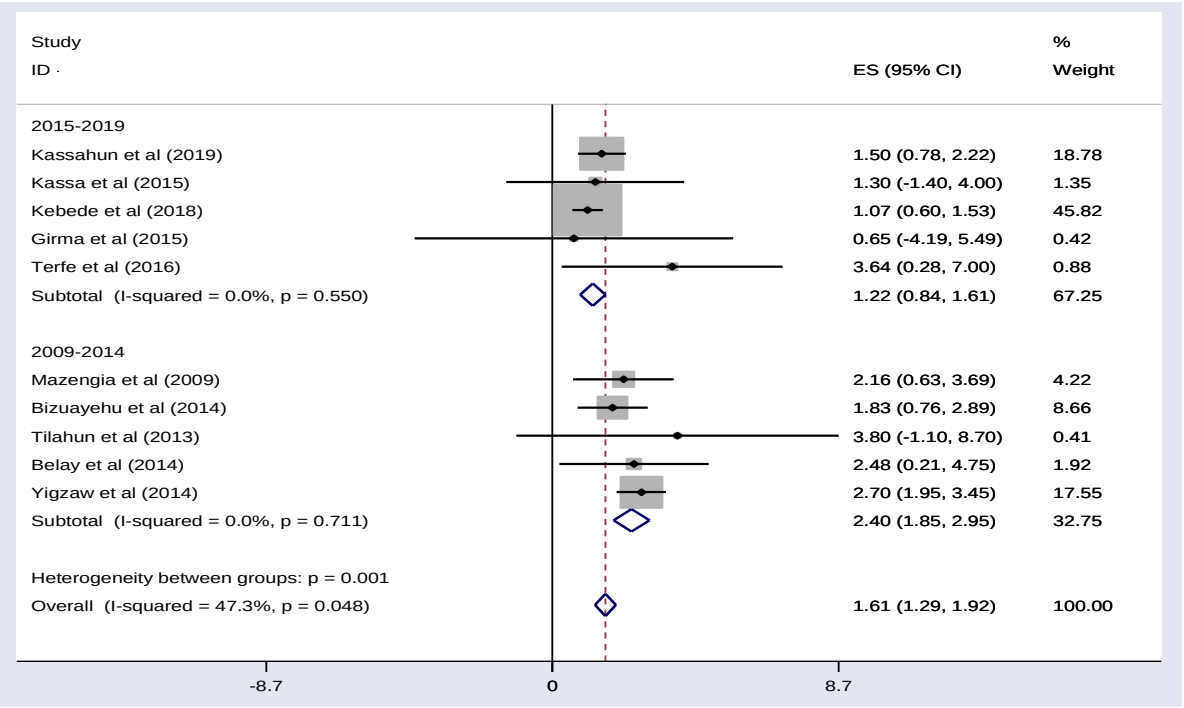


ES: Estimated weight; CI: Confidence Interval;

Figure 3: Subgroup analysis of the pooled estimate of alcohol consumption by region in Ethiopia



ES: Estimated weight; CI: Confidence Interval;

Figure 4: Subgroup analysis of the pooled estimate of alcohol consumption by year of publication in Ethiopia

Sensitivity analysis

Sensitivity analysis was used to identify the potential source of heterogeneity in the analysis of the pooled estimate of alcohol consumption in Ethiopia. The results of this sensitivity analysis showed that the findings were not dependent on a single study.

The pooled estimate of alcohol consumption varied from 1.37 to 2.06 after the deletion of a single study. According to this, no study significantly influences the pooled estimate of alcohol consumption as a risk factor for early sexual initiation (Fig 5).

Study ommited	Coef.	[95% Conf.	Interval]
Kassahun et al	1.969967	1.2515892	2.688345
Mazengia et al	1.8262193	1.2078356	2.4446032
Kassa et al	1.8816346	1.2811717	2.4820976
Bizuayehu et al	1.8748796	1.2152829	2.5344763
Tilahun et al	1.8246267	1.2497618	2.3994915
Belay et al	1.8193986	1.2238432	2.4149539
Kebede et al	2.0672991	1.640437	2.4941614
Girma et al	1.8728524	1.2854108	2.4602942
Yigzaw et al	1.3762871	1.0302542	1.72232
Terfe et al	1.7977464	1.2312869	2.3642061
Combined	1.8474101	1.2821088	2.4127115

Figure 5: sensitivity analysis on alcohol consumption as a risk factor for early sexual initiation in Ethiopia

Publication Bias

A funnel plot showed a symmetrical distribution. The Egger's regression test value was 0.193, which indicated that, the absence of publication bias (Figure6).

Tests for Publication Bias

Begg's Test

adj. Kendall's Score (P-Q) = 11
Std. Dev. of Score = 11.18
Number of Studies = 10
z = 0.98
Pr > |z| = 0.325
z = 0.89 (continuity corrected)
Pr > |z| = 0.371 (continuity corrected)

Egger's test

Std_Eff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
slope	1.222361	.3430308	3.56	0.007	.4313301	2.013391
bias	.9614705	.6766626	1.42	0.193	-.5989164	2.521857

Figure 6: Publication bias on alcohol consumption as a risk factor for early sexual initiation in Ethiopia

Discussion

This systematic review and meta-analysis integrated the results of 10 studies involving 5,904 participants living in Ethiopia, sampled between 2009 and 2019. The finding revealed that alcohol consumers aged below 18 are 1.61 times more likely to engage in early sexual initiation than those who are not drinkers. This finding is in line with other related systematic review and meta-analysis studies done on a worldwide level (Scott-Sheldon *et al*., 2013), Latin America (Vagenas, *et al*., 2013), Russia (Lan *et al*., 2017), and North America (Rehm *et al*., 2011). In addition, a study from North America and Europe identified alcohol use as a major predictor of sexual decision-making (Lori *et al.*, 2016). This might be because the use of alcohol disturbs one's moods or emotional state through sustained release or inhibition of neurotransmitters, thus enhancing or dampening of individual's response (Witkiewitz *et al*., 2011).

As the subgroup analysis of the study, the association between alcohol consumption and early sexual initiation in terms of time was insignificant in publication years between 2015 and 2019 but it was significantly associated before 2015. This implies the probability of adolescents being exposed to various sexual and reproductive health problems including unwanted pregnancy, abortion, sexually transmitted infection, fistula, and also psychological problems such as depression, withdrawal, loneliness, poor self-worth, and aggression (Lüdicke et al 2001; Li *et al*., 2015; Mmbaga *et al*., 2012; Nigatu *et al*., 2012; Starr et al., 2012). This might be because various stakeholders are doing well in the area.

Geographically, the association between alcohol consumption and early sexual initiation was positively associated in Addis Ababa but insignificantly associated in other places. This might be because the magnitude of early sexual initiation is more severe in urban than rural parts of the country (Bayissa *et al.*, 2016; Nigatu *et al*., 2020).

Strength and Limitation of the Study

Identifying the association between alcohol consumption and early sexual initiation at a nationwide level can be the main strength of this study. However, the study has the following limitations. The first limitation

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is that only studies done via the English language were considered in this analysis. Moreover, since included studies were conducted in Amhara, SNNP, and Addis Ababa, the finding might not be representative of the whole parts of Ethiopia.

Conclusion

Alcohol consumption is positively associated with early sexual initiation among adolescents in the Ethiopia. The association was significant in urban areas like Addis Ababa. Therefore, governmental and non-governmental stakeholders work on awareness creation about the adverse consequences of consuming alcohol on early sexual initiation, especially for those whose age is below 18 years old. Besides, holistic age-appropriate sexuality education addressing alcohol consumption is also necessary. This review also recommends that more research on the magnitude and factors associated with alcohol consumption, as well as its association with the magnitude of early initiation, be conducted in different geographical areas of Ethiopia, using both qualitative and quantitative data.

Abbreviations and Acronyms

HIV: Human Immunodeficiency Virus; CI: Confidence interval; OR: Odds Ratio; STI: Sexual Transmuted Infections. WHO: World Health Organization; SNNP: Southern Nations, Nationalities and Peoples.

Acknowledgment

Not applicable.

Competing Interests

Not applicable.

Authors' Contribution

MDA and BBA Conceptualization, quality appraisal, investigation, and conducted the formal data analysis writing-original draft, writing-review, and editing. Both authors read and approved the manuscript for publication. AD also did writing-review and editing as well as gave proper language editing starting from its draft to the final version of the manuscript**.**

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