



Systematic Review / Meta-analysis

Prevalence and risk factors of psychoactive substance abuse among students in Ethiopia: A systematic review and meta-analysis

Semagn Mekonnen Abate^{a,*}, Yigrem Ali Chekol^b, Solomon Yimer Minaye^b^a Department of Anesthesiology, College of Health Sciences and Medicine, Dilla University, Dilla, Ethiopia^b Department of Psychiatry, College of Health Sciences and Medicine, Dilla University, Dilla, Ethiopia

ARTICLE INFO

Keywords:
 Psychoactive
 Substance abuse
 High school
 College
 University

ABSTRACT

Background: Substance uses were seen in 18–25 years old age groups who are more than 40% world population, from which Africa was the region with the highest proportion accounting 60% in 2016. This review aimed to assess the burden of substance abuse among students in Ethiopia.

Methods: A comprehensive search was conducted in PubMed/Medline; Science direct and African Online Journal without language and date restriction. The Heterogeneity among the included studies was checked with forest plot, χ^2 test, I² test, and the p-values. All cross-sectional studies reporting rate of prevalence of psychoactive substance among students were included and the rest were excluded.

Result: A total of 545 articles were identified from different databases and 42 articles were selected for evaluation. Twenty-nine Articles with 22, 012 participants were included. The overall prevalence of psychoactive substance abuse was 32.28% (95% confidence interval (CI): 26.74 to 37.82).

Conclusion: The review revealed that one-third of the high school and higher education students used different psychoactive substances in Ethiopia.

Registration: This Systematic Review and Meta-Analysis was registered in Prospero international prospective register of systemic reviews (CRD42020146656) on April 28/2020.

1. Introduction

Psychoactive substance abuse is the consumption of substances or deliberate use of substances for the purpose other than its intended purpose without the supervision of a physician or medical practitioner [1].

According to the United Nations Office on Drugs and Crime (UNODC) report, the highest levels of drug uses were seen in 18–25 years old age groups who are more than 40% world population and from which Europe was the region with the lowest proportion of its population under 25 (27%) and Africa was the highest proportion accounting for sixty percent in 2016 [2].

Recent global statistics on Alcohol consumption, daily tobacco smoking, and Illicit drug use report revealed that the prevalence of alcohol consumption, Tobacco smoking, cannabis and opioid use among the adult population aged greater than 15 years were 18.4%, 15.2%, 3.8%, and 0.77% respectively. Alcohol consumption was the highest in the European region and the lowest was reported in North Africa and the Middle East [3].

There were approximately one billion Tobacco smokers globally where the highest smokers found in China (268.3 million) followed by India (104.2 million) and Indonesia (53.4 million). The North American region counts for the highest drug illicit substances including cannabis, opioid, and cocaine [3].

Historically, cannabis use and cultivation have been prevalent in Africa, Central Europe, South Asia, and China [3–8]. Global reports showed that cannabis is the most commonly used illicit drug where the prevalence is higher among Western Central Africa, North America, and Oceania [2,4,5]. According to a global estimate from different countries, 13.8 million students aged 15–16 years old used cannabis in the last 12 months in 2016 with the highest in European school students where Estonia and Poland accounting the highest prevalence [3,5].

A systemic review done in Sub-Saharan African countries showed that the prevalence of substance abuse varies with the types of substance within the region [8]. The pooled prevalence of substance abuse among adolescents in the Sub-Saharan region was 41.6% with the highest in Central Africa (55.5%) followed by East Africa (48.99% and West Africa (38.3%) [8].

* Corresponding author.

E-mail address: semmek17@gmail.com (S.M. Abate).<https://doi.org/10.1016/j.amsu.2021.102790>

Received 1 August 2021; Received in revised form 24 August 2021; Accepted 2 September 2021

Available online 8 September 2021

2049-0801/© 2021 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license

<http://creativecommons.org/licenses/by-nc-nd/4.0/>.

The pooled prevalence of alcohol consumption was very high in Sub-Saharan African region (32.77%), from which Southern Africa region accounted for the highest prevalence (40.82%) followed by East Africa (34.25%) whereas cannabis abuse among Adolescents was the highest in East Africa (28.9%) followed by Southern Africa (25.7%) and West Africa (0.70%) [8].

The overall prevalence of substance use among University students in Ethiopia ranged from 16.7% to 72.6% [1,8–26] whereas the overall prevalence of substance use varies from 24.6% to 47.9% among high school students [27–31]. The lifetime prevalence of Khat chewing, Alcohol consumption and cigarette smoking varies from 7% to 65%, 13%–28%, 4.8%–5.4% and 4.2–50%, 0.8 to 67 and 0.8 to 12 among college and University students respectively [1,9–11,13–16,19–23,26,31–35].

A systematic review conducted among University Students in Ethiopia on the burden of Khat chewing showed that the prevalence of Khat chewing among University students was 23.22% [36].

There were about 190 million substance users worldwide and from which 40 million were identified with severe illness and disorders each year. Substance abuse leads to decrease academic performance, increase risk of unprotected sex and sexually transmitted infections, increase unwanted pregnancy and abortion and also it is the major cause of psychiatric disorders like depression and suicide attempts [2–4,6,8,9,17,25,32,36–49]. The global burden of disease showed that substance abuse was responsible for more than 170,000 deaths in the year 2005–2015 alone, and from which opioid use disorders accounted for the majority of drug use related deaths in 2015 [4].

Studies since the 1990s showed that cannabis use before the age of 15 years predicts early school-leaving and this persists after adjustment for confounders [50]. Longitudinal studies have also shown that early initiation of heavy cannabis use is associated with lower income, lower college degree completion, and greater need for economic assistance, unemployment, and use of other drugs [5,47,48].

Currently, substance abuse is a neglected health problem in developing countries which affects the younger and productive age groups who are the gear pivots of development of a nation. A number of observational studies were conducted among students in Ethiopia in different regions of the country. However, the pooled prevalence and risk factors of psychoactive substance abuse among students in Ethiopia, particularly in high school students is uncertain and a topic of debate. Therefore; this systemic review aimed to investigate the national prevalence and reasons of substance abuse among Ethiopian students.

2. Methods

2.1. Protocol and registration

The systematic review and meta-analysis was conducted based on the Preferred Reporting Items for Systematic and meta-analysis (PRISMA) protocols [51], and the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) checklist [52]. This systematic review and meta-analysis was registered in Prospero's international prospective register of systematic reviews (CRD42020146656) on April 28/2020.

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

All cross-sectional studies reporting prevalence and risk factors of psychoactive substance abuse among high school, college and University students in Ethiopia without date and language restriction were included.

2.2.2. Exclusion criteria

Studies that didn't report prevalence of psychoactive substances, studies on prevalence of substance among general population, street children and studies conducted abroad, systemic review, case reports

and clinical reviews were excluded.

2.3. Outcomes of interest

2.3.1. Primary outcomes

The primary outcomes of interest were prevalence of Khat, Alcohol, smoking among students Secondary outcomes.

Prevalence of reasons of substance abuse among students was the secondary outcome.

2.4. Search strategy

The search strategy was intended to explore all available published and unpublished studies on psychoactive substance abuse among Ethiopian students without language and date restriction. A three steps search strategy was employed in this review on November 2020 and the search strategy was updated in June 16, 2021. An initial search on PubMed/Medline, Science direct and African Online Journal was carried out followed by an analysis of the text words contained in Title/Abstract and indexed terms. A second search was undertaken by combining free text words and indexed terms with Boolean operators. The third search was conducted with the reference lists of all identified reports and articles for additional studies. Finally, the additional and grey literature search was conducted on Google scholars. The search strategy was used as follows by modifying the Mesh terms and combing Boolean operators: student OR high School student OR college student OR university student OR compass student AND substance OR alcohol OR Khat OR Catha Edulis OR Chat OR mirra OR mairungi OR Cigarrate OR shisha OR psychoactive substance OR cocaine OR opioids OR marijuana AND addiction OR abuse OR burden OR Magnitude OR prevalence. The result of the search strategy was presented with the Prisma flow chart (Fig. 1).

2.5. Data extraction

The data from each study were extracted with two independent authors with a customized format. The disagreements between the two independent authors were resolved by the third Author. The extracted data included: Author names, country, date of publication, sample size, the prevalence of Khat chewing, alcohol consumption, cigarette smoking, prevalence of the commonest reason of psychoactive substance abuse, region where the study is conducted, study design and types of substance abuse. Finally, the data were then imported for analysis in R software version 3.6.1 and STATA 14.

2.6. Assessment of methodological quality

Articles identified for retrieval were assessed by two independent Authors for methodological quality prior to inclusion in the review using a standardized critical appraisal Tool adapted from the Joanna Briggs Institute (Supplemental Table 1). The disagreements between the Authors appraising the articles were resolved through discussion. Articles with average scores greater than fifty percent were included for data extraction. The quality of this systematic review was evaluated with the Assessment of Multiple Systematic Reviews 2 (AMSTAR2) checklist [53].

2.7. Data analysis

The pooled prevalence of substance abuse was determined with a random effect model as there was substantial heterogeneity. The Heterogeneity among the included studies was checked with forest plot, χ^2 test, I^2 test, and the p-values. Substantial heterogeneity among the included studies was investigated with subgroup analysis and meta-regression. Sensitivity analysis was done to evaluate the influential studies and further analysis was made after removing the outliers.

Publication bias was checked with a funnel plot and the objective

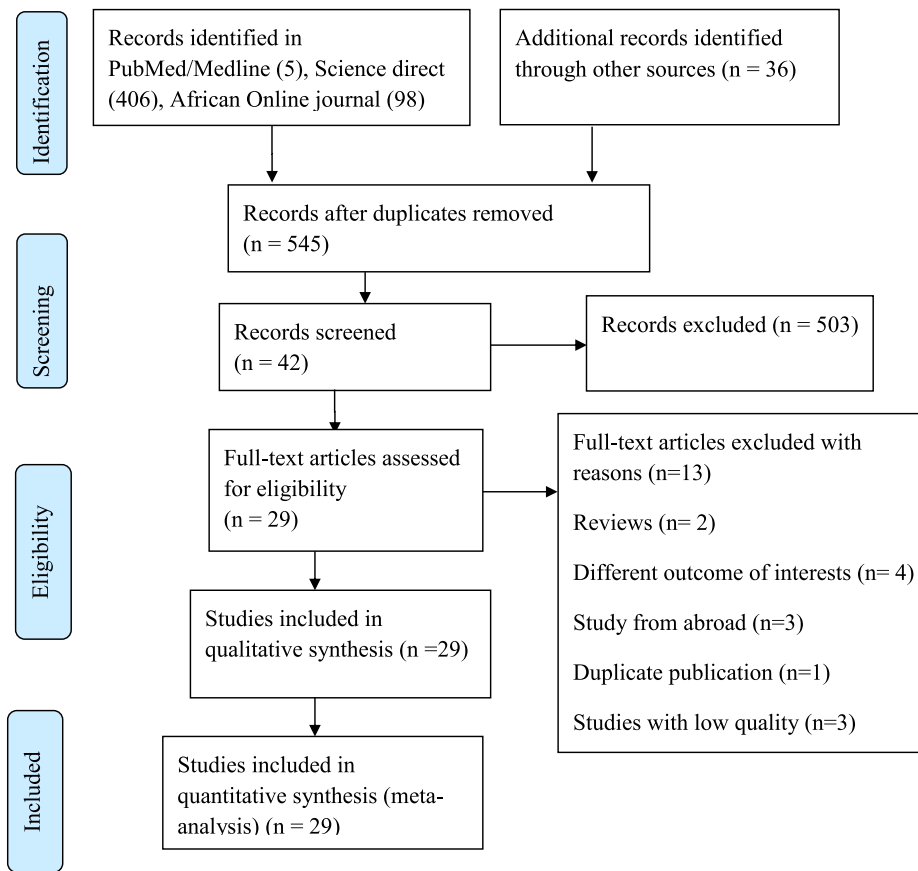


Fig. 1. Prisma flow chart.

Table 1
Description of included studies.

Author	Year	Cases	sample	region	education	types of substance	Study design	Quality score
Gobeje et al. [28]	2019	171	502	Amhara	High School	ALL substances	Cross-sectional	8
Eyasu t al [34]	2018	270	1211	SNNPR	College	Khat	Cross-sectional	7
Gebremariam et al. [7]	2018	69	695	Amhara	University	ALL substances	Cross-sectional	5
Mesfin et al. [33]	2017	138	384	SNNPR	College	ALL substances	Cross-sectional	8
kassa et al. [29]	2017	51	1577	SNNPR	High School	Khat	Cross-sectional	8
Gamachu et al. [54]	2017	417	648	Somalia	University	ALL substances	Cross-sectional	7
Abdeta et al. [11]	2017	30	296	Oromia	University	Khat	Cross-sectional	4
Adere et al. [24]	2017	238	730	Amhara	University	ALL substances	Cross-sectional	6
Dires et al. [55]	2016	47	296	Oromia	High School	Khat	Cross-sectional	8
Haftay et al. [1]	2016	57	471	Tigray	University	ALL substances	Cross-sectional	7
Berihun et al. [56]	2015	213	118	Addis	High School	ALL substances	Cross-sectional	7
Teshome et al. [19]	2015	343	728	Oromia	University	Khat	Cross-sectional	8
Astatkie et al. [23]	2015	784	1290	SNNPR	University	Khat	Cross-sectional	7
Wazema and Madhavi [57]	2015	76	620	Oromia	University	Khat	Cross-sectional	7
Awoke et al. [43]	2014	347	378	Amhara	High School	Khat	Cross-sectional	7
Ahmed et al. [30]	2014	174	220	Oromia	High School	ALL substances	Cross-sectional	8
berhanu et al. [44]	2014	190	651	Amhara	High School	ALL substances	Cross-sectional	7
Gebrehanna et al. [9]	2014	230	3268	Amhara	University	Khat	Cross-sectional	6
Tsegay et al. [13]	2014	314	845	Amhara	University	ALL substances	Cross-sectional	8
Moges [22]	2014	150	623	SNNPR	University	ALL substances	Cross-sectional	7
Tesfaye et al. [20]	2014	70	1040	Harari	University	ALL substances	Cross-sectional	4
Kassa et al. [21]	2014	262	586	SNNPR	University	ALL substances	Cross-sectional	4
Eticha and Kidane [14]	2014	457	193	Tigray	University	Cigarrate	Cross-sectional	8
Yeshalem et al. [31]	2013	60	754	Amhara	College	Khat	Cross-sectional	7
Tesfahun et al. [58]	2013	644	423	Amhara	College	ALL substances	Cross-sectional	7
Gebreslassie et al. [10]	2013	203	764	Tigray	University	ALL substances	Cross-sectional	4
Rada et al. [44]	2012	406	1890	Harari	High School	Khat	Cross-sectional	8
Deressa et al. [16]	2011	142	622	Addis	University	ALL substances	Cross-sectional	6
Legese et al. [59]	2004	146	127	Oromia	University	Khat	Cross-sectional	7

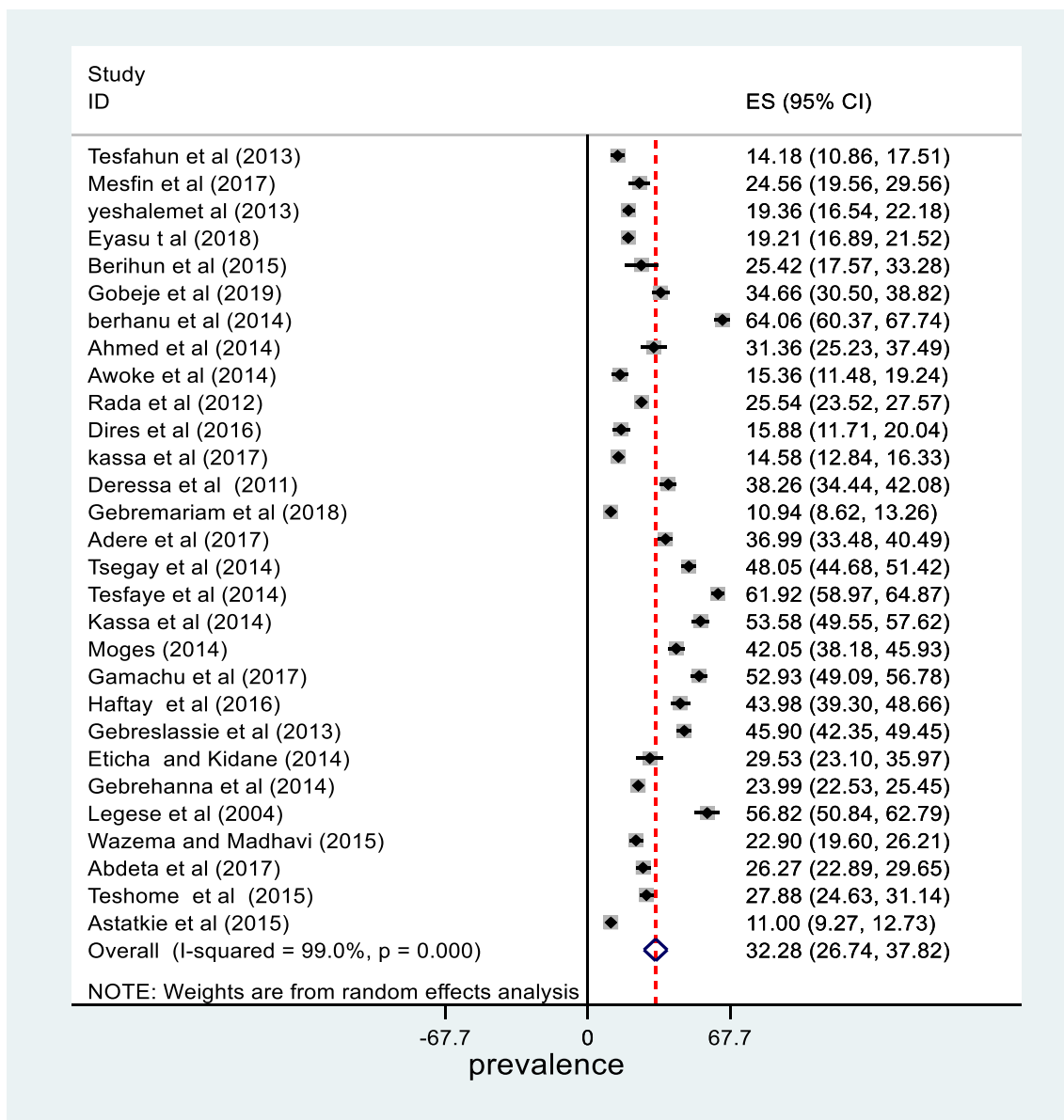


Fig. 2. Forest plot for the overall prevalence of substance abuse among students: The midpoint of each line illustrates the prevalence; the horizontal line indicates the confidence interval, and the diamond shows the pooled prevalence.

diagnostic test was conducted with Egger’s correlation, Begg’s regression tests.

3. Results

3.1. Selection of studies

A total of 545 articles were identified from different databases with an initial search. Forty-two articles were selected for evaluation after the successive screening. Twenty-nine Articles with 22012 participants were included in the systematic review and Meta-Analysis while thirteen studies were excluded with reasons (Fig. 1).

3.2. Description of included studies

A total of 545 articles were identified from different databases as with the Prisma flow diagram (Fig. 1).

Forty-two articles were selected for evaluation after the successive screening. Twenty-nine Articles with 22, 012 participants assessing the

prevalence of psychoactive substance abuse as a primary outcome among students were included and the rest were excluded. The included studies were published from 2004 to 2019 with sample size ranged from 118 to 3268.

All of the included studies were cross-sectional studies and their methodological qualities were moderate to high. The majority of studies were from the Amhara regional state followed by Oromia and SNNPR. There was no study from Afar and Benshangul Gumuz regional states.

The majority of included studies were conducted in Universities [17] followed by High Schools [8] and college [4]. Eighteen studies tried to assess the prevalence and associated factors of more than two substance uses, twelve studies assess only the prevalence and associated factors of Khat among students and one study assessed the prevalence of Cigarette smoking alone.

Three studies assessed the prevalence of cannabis and its varieties use including Hashish, Shisha, and Marijuana among students. One study reported the use of narcotics, benzodiazepines, hashish and benzene among university students.

The majority of studies reported different types of risk factors of

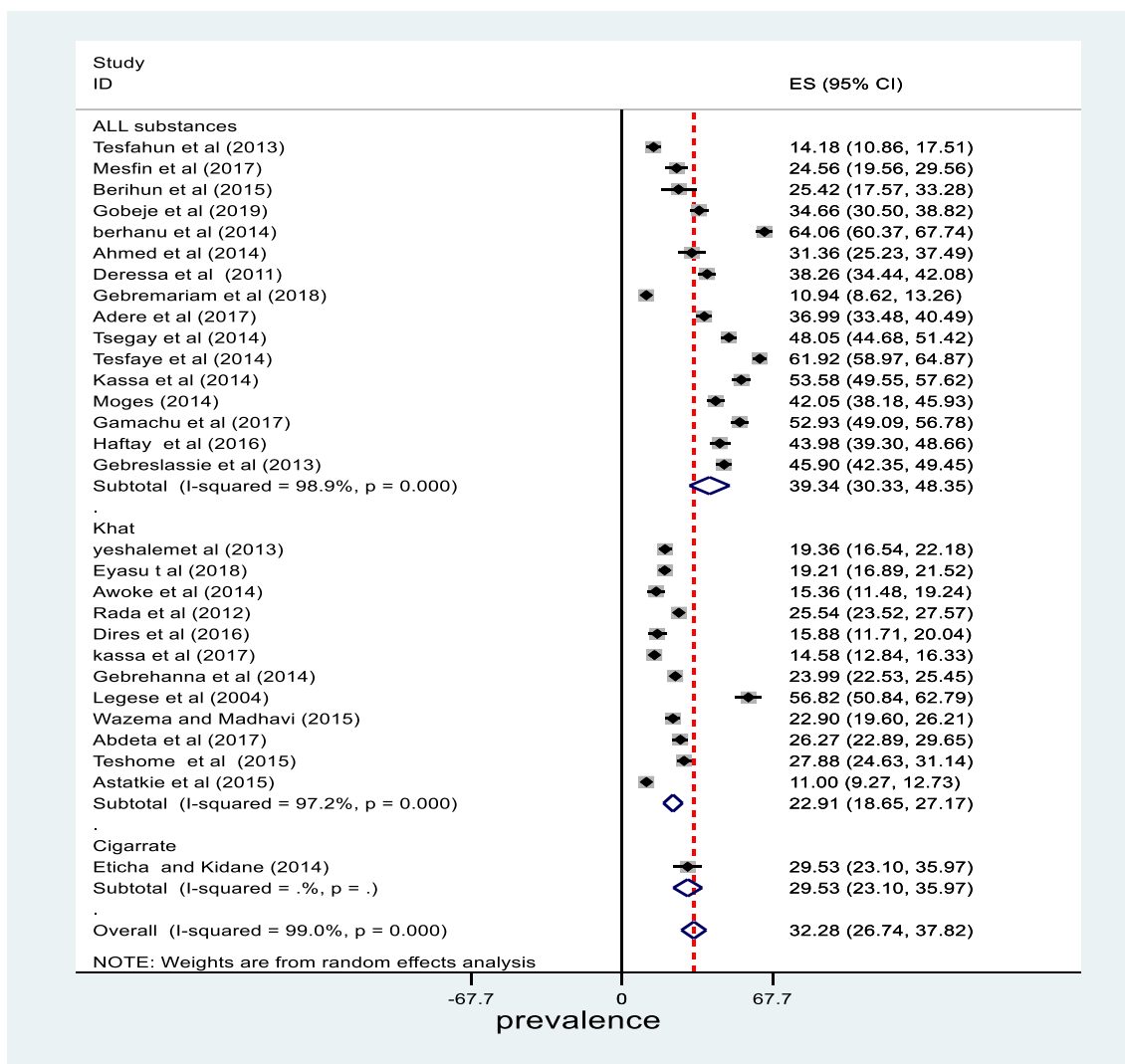


Fig. 3. Forest plot for subgroup analysis of prevalence of substance abuse among students by types of substance: The midpoint of each line illustrates the prevalence; the horizontal line indicates the confidence interval, and the diamond shows the pooled prevalence.

substance abuse among students including Family substance use, peer pressure, poor academic performance, dissatisfaction, and socio-demographic characteristics (Table 1).

3.3. Meta-Analysis

Twenty Nine studies assessing different types of substance abuse among high School, College, and University students were identified. The overall prevalence of psychoactive substance among students was 32.28% (95% confidence interval (CI): 26.74 to 37.82, 29 studies, 22, 012 participants) (Fig. 2).

The Subgroup analysis revealed that the lifetime prevalence of more than two substance abuse was 39.34% (95% confidence interval (CI): 30.33 to 48.35, 16 studies, 9176 participants whereas the prevalence of Khat and cigarette smoking was 22.91% (95% confidence interval (CI):18.65 to 27.17 and 29.53% (95% confidence interval (CI): 23.10 to 37.82) respectively (Fig. 3). Besides, the Meta-Analysis revealed that the prevalence of psychoactive substance abuse was highest in Somalia region, 52.93% (95% confidence interval (CI): 40.09 to 56.78) followed by Harari 43.72% (95% confidence interval (CI): 8.07 to 79.73) (Supplemental Fig. 1).

The subgroup analysis showed that the highest prevalence of psychoactive substance abuse among students was in University and High

School students, 37.18% (95% confidence interval(CI): 29.21 to 45.16, 17 studies, 13956 participants) and 28.35% (95% confidence interval (CI): 17.34 to 39.36, 9 studies, 6594 participants) respectively(Fig. 4).

The Meta- Analysis showed that the prevalence of reasons among students for chewing Khat were reading/concentration, enjoyment and peer pressure: 45.83% (95% confidence interval(CI): 40.02 to 51.65), 34.77% (95% confidence interval(CI): 19.36 to 50.17) and 27.51% (95% confidence interval(CI): 18.84 to 36.38) respectively (Fig. 5) where as enjoyment was the main reason for Alcohol consumption followed by peer pressure. (supplemental Fig. 2).

3.4. Publication bias and sensitivity analysis

The funnel plot for evaluation of publication bias didn't show asymmetric funnel plot. Besides, the rank correlation and Egger's regression test didn't show a significant difference for small study effect (p-value > 0.3051 and 0.090 respectively) (Fig. 6). Sensitivity analysis didn't show influential studies on the summary effect (Supplemental Table 3).

4. Discussion

The overall pooled prevalence of psychoactive substance abuse in

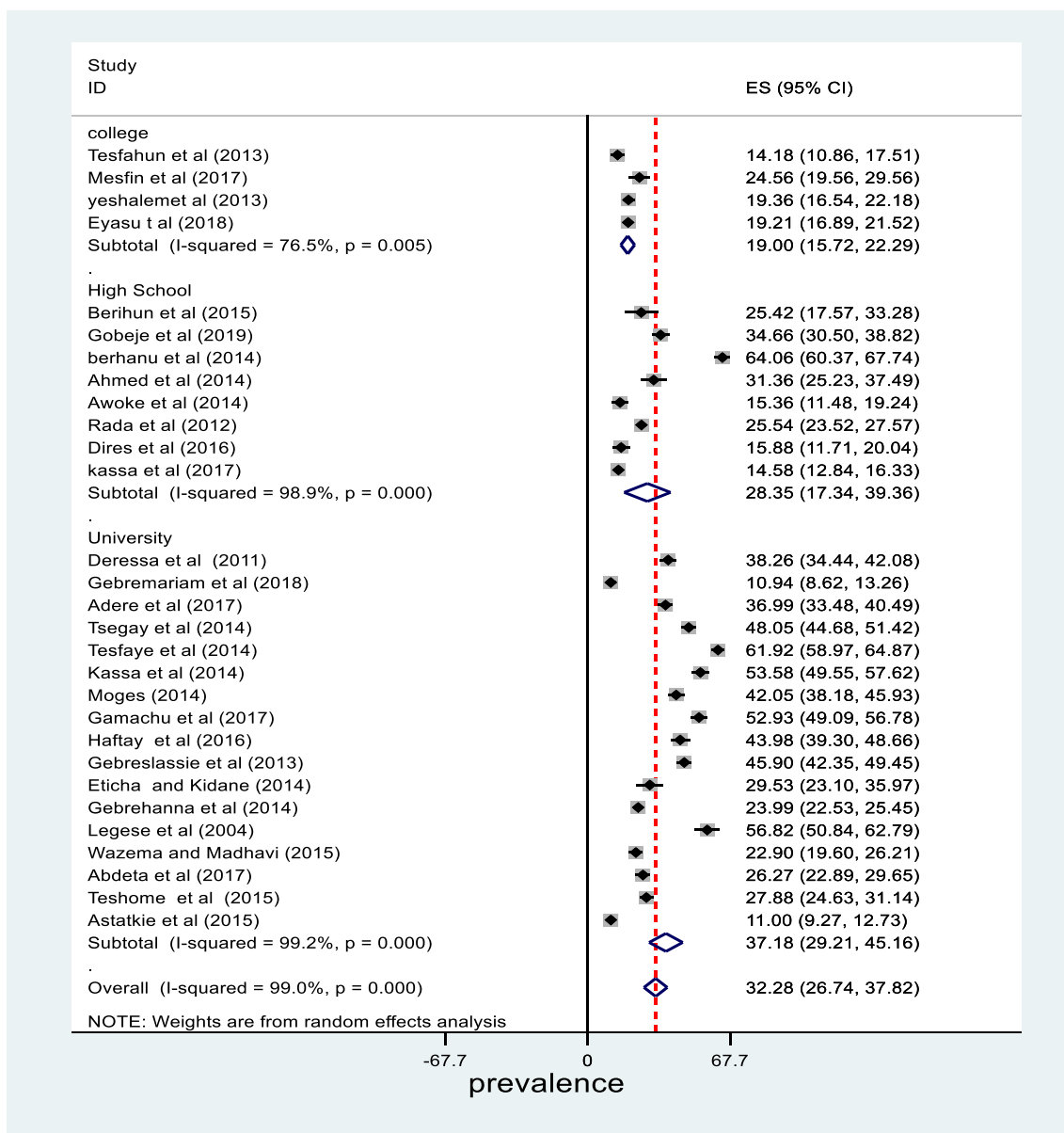


Fig. 4. Forest plot for subgroup analysis of prevalence of substance abuse among students by types of substance: The midpoint of each line illustrates the prevalence; the horizontal line indicates the confidence interval, and the diamond shows the pooled prevalence.

this systematic review and Meta-analysis was 32% (95% confidence interval (CI): 27 to 38, 29 studies, 22, 012 participants). The finding of this review is less compared to another meta-analysis conducted in Sub-Saharan region (41.6%), in Central Africa (55.5%), East Africa (48.99%) and West Africa (38.3%) [8]. The possible reason for the noted difference might be the access and availability of different psychoactive substances and the influence of cultural and religious norms of the society that condemns the use of psychoactive substances. Besides this, the difference in the total number of literature review plays a role in the prevalence difference.

Based on the number of substances consumed the lifetime prevalence of more than two substance abuse was 39% (95% confidence interval (CI), 30 to 48). This finding is in line with studies conducted among college and university student in Ethiopia [1,9–11,13–16,19–23,26,31–35].

The systemic review and meta-analysis revealed that the lifetime prevalence of Khat chewing was found to be 23% (95% confidence interval (CI) 19 to 27) which is in line another systematic review and meta-analysis conducted on the prevalence of Khat chewing among university

students in Ethiopia, 23.22% [36].

In this systematic review and meta-analysis, the lifetime prevalence of cigarette smoking was found to be 30% (95% confidence interval (CI) 23 to 37). Although this meta-analysis and systematic review concern the epidemiological burden of psychoactive substance abuse among Ethiopian students, it is known that several influencing factors played a great role in the burden.

The analysis of overall lifetime prevalence of psychoactive substance abuse among the regions revealed that the highest pooled prevalence of psychoactive substance abuse was found in Somalia region 53% (95% confidence interval (CI): 49 to 57) followed by Harari 43% (95% confidence interval (CI): 20 to 69) and this discrepancy might be due to accessibility psychoactive substance, social norms of the locality, geographic location and religious perspectives which might be acceptable in taking certain psychoactive substances.

4.1. Comparison with other meta-analysis

This systematic review and Meta-Analysis is different from the

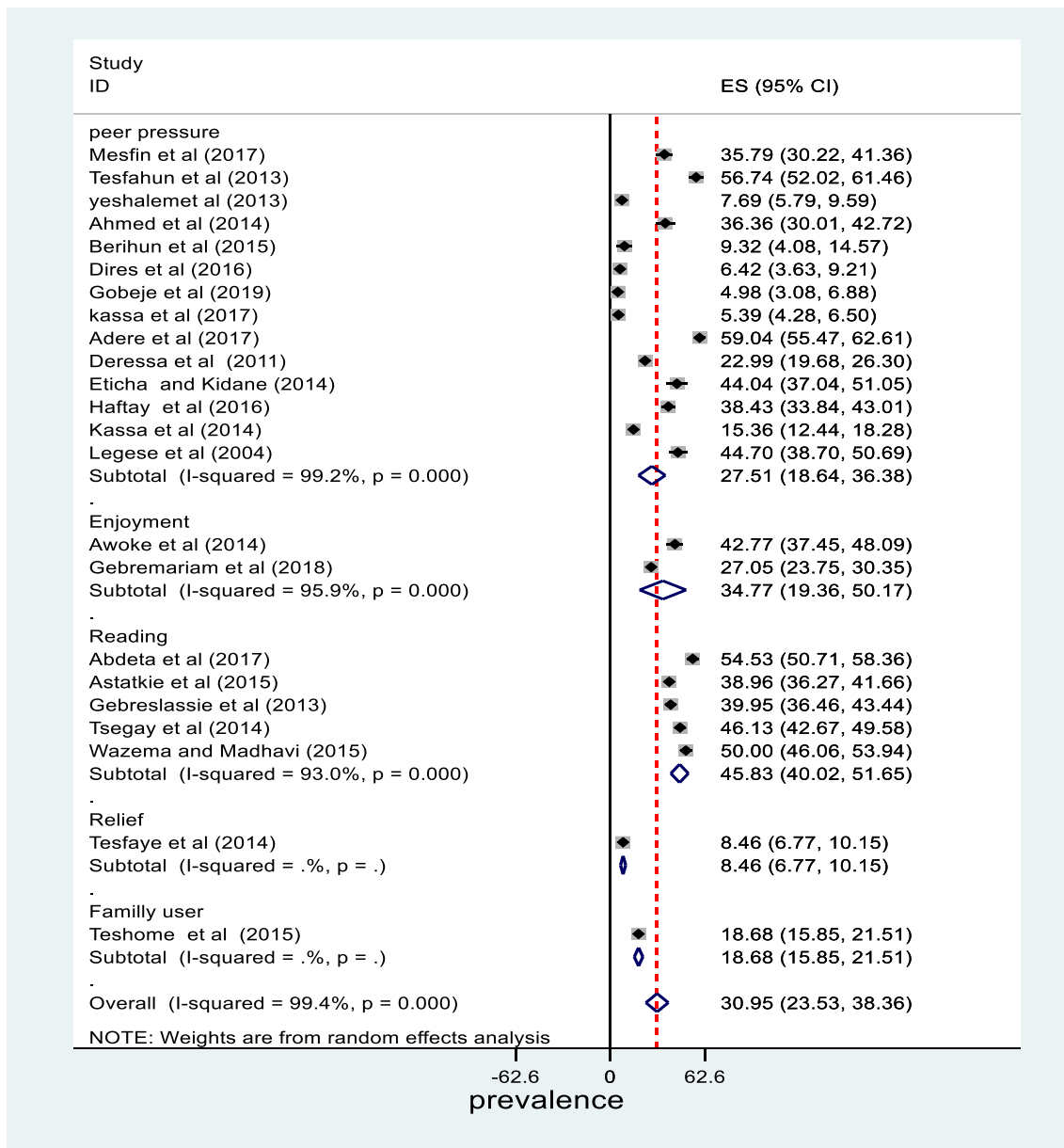


Fig. 5. Forest plot for subgroup analysis of prevalence of Khat chewing among students by reasons: The midpoint of each line illustrates the prevalence; the horizontal line indicates the confidence interval, and the diamond shows the pooled prevalence.

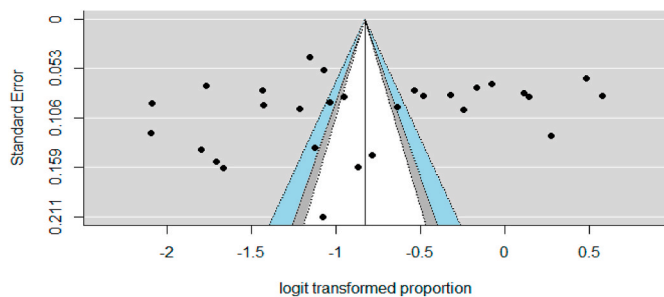


Fig. 6. Funnel plot to assess publication bias: The vertical line indicates the effect size whereas the diagonal line indicates the precision of individual studies with a 95% confidence interval.

previous Meta-Analysis conducted among University students in several ways. First of all, this systematic review was mainly intended to investigate the prevalence of psychoactive substances among high school students which is not addressed previously. The previous Meta-Analysis was conducted in a specific substance like Alcohol, Khat, and Cigarette smoking among University students only unlike this systematic review which investigates the overall and specific psychoactive substance abuse among students above high school. Secondly, no systematic review and Meta-Analysis is investigating on the prevalence of psychoactive substance among high school and college students who are the gear changers of community development.

4.2. Quality of evidence

The systematic review and meta-analysis included many studies with an adequate sample size. The methodological quality of included studies was moderate to high as evaluated with the Joanna Briggs Institute assessment tool for meta-analysis of observational studies. However,

substantial heterogeneity associated with differences in included studies by sample size, design, and location could affect the overall quality of evidence.

4.3. Limitation of the study

The review incorporated plenty of studies with a large number of participants but the majority of studies included in this review didn't report data on risk factors to investigate the reasons for psychoactive substance use among students.

4.4. Implication for policy

Body of evidence revealed that the prevalence of psychoactive substances among students is very high. It is very shocking having the prevalence of psychoactive substances among high school students who are supposed to handover and sustain the countries development. Technological innovation, discovery, and societal development are not expected if the young productive populations are suffered from psychoactive substances. Therefore, different strategies are required as early as possible to prevent substance abuse among students. This could be achieved by awareness creation about the impacts of substance abuse, the anti-drug club at the school level, the inclusion of substance abuse and its impacts in the curriculum, regulations on substance production and advertisement.

4.5. Implication for further research

The meta-analysis revealed that the prevalence of psychoactive substances among students was very high and the main reasons for substance use were identified. However, the included studies were too heterogeneous, and cross-sectional studies also don't show a temporal relationship between mortality and its determinants. Therefore, further observational and randomized controlled trials are in demand for a specific group of patients by stratifying the possible independent predictors.

5. Conclusion

The review revealed that one-third of the high school and higher education students in Ethiopia have reported using the different psychoactive substances for non-medical reasons and suffering from the addictive consequence of the psychoactive substance. Therefore, interventions aiming at reducing the burden of non-useful psychoactive substance use thorough awareness creation strategies should be targeted to curb the increasing trend of use among high school and higher education students. Besides, policymakers and other stakeholders should implement mitigating strategies to control the production, usage, advertisement on media, and distribution of psychoactive substances.

Availability of data and materials

Data and material can be available where appropriate.

Competing interests

The authors declare that there are no competing interests.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors declared that there is no conflict of interest.

Acknowledgments

The authors would like to acknowledge Dilla University for technical support and encouragement to carry out the project.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102790>.

Ethical approval

Not applicable.

Sources of funding

No funding was received.

Author contribution

Semagn Mekonnen Abate conceived the idea and design of the project. Semagn Mekonnen Abate and Yigrem Ali Chekole, Solomon Yimer Minaye involved in data management, entry, analysis interpretation, and manuscript preparation. All authors read and approved the final manuscript.

Consent

Consent was not applicable as it was systematic review and meta-analysis.

Registration of research studies

This review was registered in Prospero international prospective register of systematic reviews (CRD42020146656).

Guarantor

Semagn Mekonnen Abate, Corresponding Author Assistant professor of Anesthesiology Department of Anesthesiology College of Health Sciences and Medicine Dilla University Tel:+251913864605 Email: semmek17@gmail.com/semagnm@du.edu.et.

References

- [1] H. Gebremedhin, G. Gebreegziabihier, B. Desalegn, Prevalence of substance abuse and associated factors among university students, Tigray, Ethiopia, 2016, *International Journal of Development Research* 6 (11) (2016) 10066–10071.
- [2] Drugs UNOo, Crime, World Drug Report 2018, United Nations publication, 2018. Sales No. E. 18. XI. 9.
- [3] A. Peacock, J. Leung, S. Larney, S. Colledge, M. Hickman, J. Rehm, et al., Global statistics on alcohol, tobacco and illicit drug use: 2017 status report, *Addiction* 113 (10) (2018) 1905–1926.
- [4] C.J. Murray, J. Abraham, M.K. Ali, M. Alvarado, C. Atkinson, L.M. Baddour, et al., The state of US health, 1990–2010: burden of diseases, injuries, and risk factors, *Jama* 310 (6) (2013) 591–606.
- [5] L.J. Horwood, D.M. Fergusson, M.R. Hayatbakhsh, J.M. Najman, C. Coffey, G. C. Patton, et al., Cannabis use and educational achievement: findings from three Australasian cohort studies, *Drug Alcohol Depend.* 110 (3) (2010) 247–253.
- [6] A. Odejide, Status of drug use/abuse in Africa: a review, *Int. J. Ment. Health Addiction* 4 (2) (2006) 87–102.
- [7] T.B. Gebremariam, K.B. Mruts, T.K. Neway, Substance use and associated factors among Debre Berhan University students, Central Ethiopia. Substance abuse treatment, prevention, and policy, 13, 2018, pp. 1–8, 1.
- [8] A. Olawole-Isaac, O. Ogundipe, E.O. Amoo, D. Adeloje, Substance use among adolescents in sub-Saharan Africa: a systematic review and meta-analysis, *South African Journal of Child Health* 12 (SPE) (2018) s79–s84.
- [9] E. Gebrehanna, Y. Berhane, A. Worku, Khat chewing among Ethiopian University Students-a growing concern, *BMC Publ. Health* 14 (1) (2014) 1198.
- [10] M. Gebreslassie, A. Feleke, T. Melese, Psychoactive substances use and associated factors among Axum University students, Axum Town, North Ethiopia, *BMC Publ. Health* 13 (1) (2013) 693.

- [11] T. Abdeta, D. Tolessa, K. Adorjan, M. Abera, Prevalence, withdrawal symptoms and associated factors of khat chewing among students at Jimma University in Ethiopia, *BMC Psychiatr.* 17 (1) (2017) 142.
- [12] A.H. Mavhandu-Mudzusi, T. tesfay Asgedom, The prevalence of risky sexual behaviours amongst undergraduate students in Jigjiga University, Ethiopia, *Health SA Gesondheid* 21 (2016) 179–186.
- [13] G. Tsegay, Psychoactive Substances Use (Khat, Alcohol and Tobacco) and Associated Factors Among Debre Markos University Students, North-West Ethiopia, 2013, 2014.
- [14] T. Eticha, F. Kidane, The prevalence of and factors associated with current smoking among College of Health Sciences students, Mekelle University in northern Ethiopia, *PLoS One* 9 (10) (2014), e111033.
- [15] T.B. Mossie, G.B. GebreMichael, A.D. Ayele, Magnitude of psychoactive substance abuse among university students, Adigrat, North Ethiopia: cross-sectional study, *J Psych* 18 (2015) 281.
- [16] W. Deressa, A. Azazh, Substance use and its predictors among undergraduate medical students of Addis Ababa University in Ethiopia, *BMC Publ. Health* 11 (1) (2011) 660.
- [17] W. Mulu, M. Yimer, B. Abera, Sexual behaviours and associated factors among students at Bahir Dar University: a cross sectional study, *Reprod. Health* 11 (1) (2014) 84.
- [18] A. Kassa, F. Tadesse, A. Yilma, Prevalence and factors determining psychoactive substance (PAS) use among Hawassa University (HU) undergraduate students, Hawassa Ethiopia, *BMC Publ. Health* 14 (1) (2014) 1044.
- [19] G. Teshome, Magnitude and factors associated with khat chewing among undergraduate students of Adama university, Oromia national regional state, January 2012, 01, *Open Access Library Journal* 2 (2015) 1.
- [20] G. Tesfaye, A. Derese, M.T. Hambisa, Substance use and associated factors among university students in Ethiopia: a cross-sectional study, *Journal of addiction* 2014 (2014).
- [21] A. Kassa, N. Wakgari, F. Tadesse, Determinants of alcohol use and khat chewing among Hawassa University students, Ethiopia: a cross sectional study, *Afr. Health Sci.* 16 (3) (2016) 822–830.
- [22] M. Tadesse, Substance abuse and sexual HIV-risk behaviour among Dilla University students, Ethiopia, *Educ. Res.* 5 (9) (2014) 368–374.
- [23] A. Astatkie, M. Demissie, Y. Berhane, A. Worku, Prevalence of and factors associated with regular khat chewing among university students in Ethiopia, *Subst. Abuse Rehabil.* 6 (2015) 41.
- [24] A. Adere, N.B. Yimer, H. Kumsa, M.L. Liben, Determinants of psychoactive substances use among Woldia University students in Northeastern Ethiopia, *BMC Res. Notes* 10 (1) (2017) 441.
- [25] T. Damena, A. Mossie, M. Tesfaye, Khat chewing and mental distress: a community based study, in jimma city, southwestern Ethiopia, *Ethiopian Journal of Health Sciences* 21 (1) (2011) 37–46.
- [26] S.F. Natae, M.K. Negawo, E. Dinku, Substance Use and Contributing Factors Among Ambo University Students Ethiopia; 2016. Substance, 2017, p. 39.
- [27] A.M. Birhanu, T.A. Bisetegn, S.M. Woldeyohannes, High prevalence of substance use and associated factors among high school adolescents in Woreta Town, Northwest Ethiopia: multi-domain factor analysis, *BMC Publ. Health* 14 (1) (2014) 1186.
- [28] A. Gobeje, G. Measo, A. Ageb, T. Chanie, Prevalence of substance use and associated factors among preparatory students of N/Wollo Woldia Town, north east Ethiopia, 2015, *Acta Scientifical Nutritional Health* 3 (2019) 25–33.
- [29] A. Kassa, E. Loha, A. Esaiyas, Prevalence of khat chewing and its effect on academic performance in Sidama zone, Southern Ethiopia, *Afr. Health Sci.* 17 (1) (2017) 175–185.
- [30] A.Y. Mohammed, Assessment of substance use and associated factors among high school and preparatory school students of Ginnir Town, Bale Zone, Southeast Ethiopia, *Am. J. Health Res.* 2 (6) (2014) 414–419.
- [31] Y. Mulugeta, Khat chewing and its associated factor among college students in Bahir Dar Town, Ethiopia, *Sci. J. Publ. Health* 1 (5) (2013) 209–214.
- [32] Z.H. Kahsay, A.G. Tesema, A.N. Bazzano, A qualitative study of drivers of psychoactive substance use among Mekelle University students, Northern Ethiopia, *Subst. Abuse Treat. Prev. Pol.* 14 (1) (2019) 11.
- [33] M. Birega, B. Addis, M. Agmasu, M. Tadele, Descriptive study on magnitude of substance abuse among students of Aman Poly technique college students, Bench Maji zone south west Ethiopia, *J. Addiction Res. Ther.* 8 (320) (2017) 2.
- [34] E. Ware, G. Tura, T. Alemu, E. Andarge, Disparities in risky sexual behavior among khat chewer and non-chewer college students in Southern Ethiopia: a comparative cross-sectional study, *BMC Publ. Health* 18 (1) (2018) 558.
- [35] K. Meressa, A. Mossie, Y. Gelaw, Effect of substance use on academic achievement of health officer and medical students of Jimma University, Southwest Ethiopia, *Ethiopian journal of health sciences* 19 (3) (2009).
- [36] A. Gebrie, A. Alebel, A. Zegeye, B. Tesfaye, Prevalence and predictors of khat chewing among Ethiopian university students: a systematic review and meta-analysis, *PLoS One* 13 (4) (2018), e0195718.
- [37] A. Fekadu, A. Alem, C. Hanlon, Alcohol and drug abuse in Ethiopia: past, present and future, *Afr J Drug Alcohol Stud* 6 (1) (2007) 40–53.
- [38] E. Gebrehanna, Y. Berhane, A. Worku, Prevalence and Predictors of Harmful Khat Use Among University Students in Ethiopia. Substance Abuse: Research and Treatment vol. 8, SART, 2014, p. S14413.
- [39] M. Alebachew, DRUG ABUSE AMONG STREET YOUTH IN ADDIS ABABA: THE CASE OF YEKA SUB-CITY, 2014.
- [40] W. Abebe, Prevalence and consequences of substance use among high school and college students in Ethiopia: a review of the literature, *African Journal of Drug and Alcohol Studies* 12 (2) (2013).
- [41] S. Kotina, G. Sawant, P. Kokiwar, A study to determine causes, prevalence and knowledge regarding consequences of substance abuse: a community based cross sectional study, *International journal of community medicine and public health (Gujarat)* 3 (3) (2016) 730–734.
- [42] T.G. Tshitangano, O.H. Tosin, Substance use amongst secondary school students in a rural setting in South Africa: prevalence and possible contributing factors, *African journal of primary health care & family medicine* 8 (2) (2016) 1–6.
- [43] A. Lakew, B. Tariku, N. Deyessa, Y. Reta, Prevalence of catha edulis (khat) chewing and its associated factors among ataye secondary school students in northern shoa, Ethiopia, *Adv. Appl. Sociol.* 4 (10) (2014) 225.
- [44] A.A. Reda, A. Moges, S. Biadgilign, Wondmagegn By, Prevalence and determinants of khat (Catha edulis) chewing among high school students in eastern Ethiopia: a cross-sectional study, *PLoS One* 7 (3) (2012), e33946.
- [45] M. Kassa, G. Buruh, S. Berhe, A. Aregay, H. Berhe, Prevalence and determinants of substance abuse among street children in Mekelle city, Tigray, Ethiopia, *J. Bio. Innovat.* 3 (6) (2014) 269–282.
- [46] G.N. Ani, Prevalence of substance abuse among senior secondary students in Mainland Local Government, Lagos, *Global J. Med. Publ. Health* 3 (6) (2014) 1–9.
- [47] C. Mokrysz, R. Landy, S.H. Gage, M.R. Munafo, J.P. Roiser, H.V. Curran, Are IQ and educational outcomes in teenagers related to their cannabis use? A prospective cohort study, *J. Psychopharmacol.* 30 (2) (2016) 159–168.
- [48] D.M. Fergusson, J.M. Boden, Cannabis use and later life outcomes, *Addiction* 103 (6) (2008) 969–976.
- [49] Organization WH, Atlas on Substance Use (2010): Resources for the Prevention and Treatment of Substance Use Disorders, World Health Organization, 2010.
- [50] J.S. Brook, J.Y. Lee, S.J. Finch, N. Seltzer, D.W. Brook, Adult work commitment, financial stability, and social environment as related to trajectories of marijuana use beginning in adolescence, *Subst. Abuse* 34 (3) (2013) 298–305.
- [51] A.E. Maraolo, Una bussola per le revisioni sistematiche: la versione italiana della nuova edizione del PRISMA statement, *BMJ* 372 (2021) n71.
- [52] D.F. Stroup, J.A. Berlin, S.C. Morton, I. Olkin, G.D. Williamson, D. Rennie, et al., Meta-analysis of observational studies in epidemiology: a proposal for reporting, *Jama* 283 (15) (2000) 2008–2012.
- [53] B.J. Shea, B.C. Reeves, G. Wells, M. Thuku, C. Hamel, J. Moran, et al., AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both, *BMJ* 358 (2017).
- [54] G. Fufa, D. Shiferaw, T. Kinati, M. Desalegn, The nexus between khat and other drug use among undergraduate students of Jigjiga University in Ethiopia; Contributing Factors and Prevalence Rates, *Publ. Health Res.* 7 (2) (2017) 49–54.
- [55] E. Dires, M. Soboka, H. Kerebih, G.T. Feyissa, Factors associated with khat chewing among high school students in Jimma Town Southwest Ethiopia, *J Psychiatry* 19 (4) (2016) 372.
- [56] HA. Berihun, Exploring the trends & challenges of substance Abuse among Ayer Tena secondary school Students in Addis Ababa, AAU Repository (2015). <http://localhost/xmlui/handle/123456789/1772>.
- [57] D.H. Wazema, K. Madhavi, Prevalence of Khat abuse and associated factors among undergraduate students of Jimma University, Ethiopia, *Int J Res Med Sci* 3 (7) (2017) 1751–1757.
- [58] T. Aklog, G. Tiruneh, G. Tsegay, Assessment of substance abuse and associated factors among students of debre markos poly technique college in debre markos town, East Gojjam Zone, Amhara Regional State, Ethiopia, 2013, *Global J. Med. Res.* 13 (4) (2013) 1.
- [59] G. Megeresa, Assessment of the Determinants and Associated Risks of Khat Chewing Among Students of the University of Ambo Woliso Campus, Addis Ababa University, 2014.