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A Systematic Review on Effect of Electronic Media among Children and Adolescents on Substance Abuse.

Review Article

A Systematic Review on Effect of Electronic Media among Children and Adolescents on Substance Abuse

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Abstract

Background: Substance abuse is one of the most significant global public health issues among youths. Electronic media has become a part of day-to-day life for all. This systematic review is undertaken to comprehensively explore the effect of electronic media on substance abuse among children and adolescents. **Methodology:** Two review authors independently searched various electronic databases and other sources. **Selection Criteria:** Randomized control trials that assessed the effect of exposure of electronic media (defined as television, internet, gaming, mobile phones/phones, and radio) among participants in the age range of 5–19 years on substance abuse were included in the review. **Data Collection and Analysis:** Two reviewers independently extracted data. We used an approach proposed by the Cochrane Collaboration. We used GRADE profiler to assess the overall quality of the evidence. **Main Results:** We retrieved 6003 studies and found 15 studies that fulfilled our inclusion criteria. Since included studies differed in the type of intervention and reporting of outcomes, we did not undertake meta-analysis and choose to describe studies narratively. Quality of evidence was rated as "very low" due to too little information or too few data to be able to reach any conclusions. **Authors' Conclusions:** Clinicians, policymakers, and educators to partner with caregivers and youth to support electronic media use that promotes positive outcome in these areas.

Registration of Systematic Review: This systematic review has been registered at PROSPERO International prospective register of systematic reviews (Registration number: PROSPERO 2018 CRD42018086935) available at https://www.crd.york.ac.uk/prospero/display_record.php?RecordID = 86935.

Keywords: Adolescent, electronic media, substance abuse, systematic review

Introduction

Substance abuse denotes the harmful usage of psychoactive substances, which encompasses tobacco, alcohol, and illicit drugs (e.g., opioids, cannabinoids, and cocaine) and also psychoactive medicament drugs. The usage of psychoactive substances is one of the most significant global public health issues among youths.[1,2] In most Western countries, the initiation of smoking rises mostly during adolescence, killing half of the all lifetime.[3] Greater than half of the adolescents in the U.S. report alcohol use, and approximately one-fourth report exposure to illicit drugs.[4] In the Netherlands, the UK, and the US, smoking rates increased from 7% of 11 years old to 45% by the age of 14 years and 62% by age 17 years in 2009.[5] Smoking epidemic and its consequence are more common in the developing countries in South Asia such as Pakistan, India, Bangladesh, and Nepal, as the major section of

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their population involves adolescents.[6] Global Youth Tobacco Survey in India showed that 3.8% of students smoke and 11.9% use smokeless tobacco.[7] Cannabis, heroin, and some medicinal agents are commonly abused drugs in India.[8] Drugs or alcohol abusers often land up in grave consequences such as accidents, overdoses, crime, underachievement in school, violence, teen pregnancy, depression, and suicide.[9,10]

Adolescence is characterized by biological, cognitive, emotional, and social changes that are important for strengthening habits of adult life. Adolescence is associated with greater proclivity to undertake perils which may stimulate curiosity in testing new manners and activities. Developmental alterations in the brain can cause behavioral qualities characteristic of adolescence including higher tendency for drug abuse.[11]

Electronic media has become a part of day-to-day life for all, and particularly more so for children and adolescent. Children and adolescents are exposed to electronic media for considerable time daily, and exposure to electronic media may be beneficial as well as harmful. However, the content of exposure, timing of exposure, duration of exposure, and sociodemographic characteristics of children and adolescents influences the impact of exposure to these interventions. Electronic media may be useful for creating positive social behavior, prevent violence, and enhance academic performances. The intervention may also be used to prevent or quit the habit of substance abuse.[12] On the other hand, negative effects of exposure of electronic media may be drug and tobacco abuse, unhealthy eating habits and obesity, sexual aggression, and poor academic performances.[10]

The efficacy of mass media campaigns in impacting behavior in adults have been evaluated recently in review by Bala *et al*.[13] Other reviews have stated varied findings regarding the efficacy of mass media. We did not find any systematic review undertaken to comprehensively explore the association or influence of electronic media on substance abuse among children and adolescents. The subject is of grave apprehension for parents as well as educationalists, health providers, policymakers, and campaigners. It is a current necessity to comprehend well how to overturn the undesirable influence of media and make it more desirable. Under this background, we undertook a comprehensive systematic review to assess (both the positive and negative) impact of electronic media on substance abuse with a special reference to low- and middle-income countries (LMICs).

The aim of the systematic review is to synthesize current published and nonpublished pragmatic evidence on the effect of exposure to electronic media on substance abuse among children and adolescents.

Methods

Criteria for considering studies for this review

We included randomized control trials (RCTs) that evaluated the effect of exposure of electronic media (defined as television, internet, gaming, mobile phones/phones, and radio) in both male and female participants from rural as well as urban areas in the age range of 5–19 years on substance abuse. We linked multiple reports of the same study together as a single study. We considered studies published in languages other than English.

Main outcome measures were the children and adolescent health outcome, in terms of the beneficial effect of interventions.

1. Prevention of substance abuse among adolescents
2. Reduction of substance abuse among adolescents
3. Quitting substance abuse among adolescents.

Search methods for identification of studies

Three review authors (AG, PB, and DS) searched databases such as MEDLINE, EMBASE, CENTRAL, PubMed, PLoS, and Ovid for relevant studies. We carried searches on subject-specific databases (such as EPPI-Center database of health promotion research and Database of Promoting Health Effectiveness Reviews) and on-going clinical trials registries (on http://www.controlled-trials.com, http://apps.who.int/trialsearch/, http://clinicaltrials.gov/, https://eudract.emea.europa.eu/).

Search strategy for MEDLINE was as: Adolescen* OR pre-adolescen* OR preadolescen* OR teen* OR pre-teen* OR child* OR boy* OR girl* OR young* OR youth* OR minor* AND "electronic media" OR electronic-based OR cyber* OR web-based OR computer-based OR internet OR internet-delivered OR online* OR "computer game*" OR "video game*" OR "mobile game*" OR "online game*" OR "mobile app*" OR "short message service" OR SMS-based OR "text messag*" OR telecounselling OR tele-counselling OR e-health OR facebook OR whatsapp OR twitter OR "social media"* OR television* OR laptop* OR phone* OR smartphone* OR mobile* OR telephon* OR desktop* OR computer*.

We also searched for conference proceedings and contacted authors and experts in the field to obtain information on unpublished or undergoing trials.

Selection of studies

We employed systematic review methods developed by Cochrane Handbook of Systematic Reviews.[14] Two reviewers (MNK and MA) prescreened studies identified in electronic search using an online software Rayyan.[15] We obtained full texts of all potentially relevant studies, and two reviewers (AG and PB) examined these full papers for inclusion. A third reviewer (ZQS) resolved discrepancies between two primary reviewers.

Data extraction and management

After the inclusion of the study in the review, two reviewers (MK and MA) independently extracted data using a data extraction form and the third reviewer (UB) cross-checked these data.

Assessment of risk of bias in included studies

We used an approach proposed by the Cochrane Collaboration to assess the risk of bias (RoB). Two reviewers (MK and MA) assessed the RoB using an approach suggested by the Cochrane Collaboration under domains of selection bias, performance bias, detection bias, attrition bias, reporting bias, and other sources of bias. A third reviewer (UB) resolved discrepancies among primary reviewers in the assessment of RoB.

Measures of treatment effect and data synthesis

We had planned to use effective measures as odds ratio, risk ratio, or risk difference for dichotomous data, and mean difference (MD) or standardized MD for continuous variables. However, as we found considerable variation in the type of intervention and outcomes reported, we did not perform meta-analysis. Explicit assumptions were made of any methods used to handle with missing data. We had intended to undertake sensitivity analyses to gauge how sensitive results are to rational alterations in postulations made. We had planned to measure the extent of heterogeneity by Chi-square statistics. For quantifying inconsistency across studies and to assess its impact on the meta-analysis, we had planned to use I^2 statistics. We had planned to use funnel plots to gauge the potential for bias associated to the size of studies, which would have indicated likely publication bias. We had planned to undertake a separate subgroup analysis, wherever appropriate, with regards to duration, timing, and content of exposure to electronic media as well as different forms of electronic media such as internet, television, gaming, mobile phones, and radio.

Grading of studies

Two reviewers (AG and DS) reviewed the data on each health outcome and assessed the quality of studies and the weight of evidence they present in relation to the review question using GradePro software. Studies were graded as per the quality standards provided by GRADE pro.[16] Accordingly, studies were graded as "high" quality (if further research is very unlikely to change our confidence in the estimate of effect), "moderate" quality (if further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate), "low" quality (if it is found that the further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate), and "very low" quality (when we are very uncertain about the estimate).[16]

Results

Results of search

We combed various electronic databases and other resources as listed in the methods section and retrieved 6003 studies after removal of duplicates. We excluded 5921 studies on the basis of title and abstracts and screened full texts of 60 articles for eligibility. We found 15 studies that fulfilled our inclusion criteria. However, we could not include any study in quantitative synthesis as they differed in type of intervention and reporting of outcomes. Details of the search strategy have been outlined in the PRISMA flow diagram [Figure 1].

Details of included studies

Study details

We have described included trials in detail in the characteristics of included studies table [Table 1].

Eleven studies were conducted in the USA,[17-27] three in the Netherlands,[28-30] and one in the UK.[31] We did not find any studies done in LMICs including India.

Types of studies

All included studies were parallel RCTs [Table 1] except three cluster RCTs.[28-30]

Participants

Details of participants are described in Table 1. The age of participants ranged between 9 and 19 years. Arnaud *et al*.[32] included residents of Sweden, Germany, Belgium, and Czech Republic; while three studies: Jander *et al*.,[29] de Josselin de Jong *et al*.,[30] and Bannink *et al*.,[28] included mainly Dutch participants. Four studies by Mason *et al*.,[17-19] included African American, White, and others. Bowen *et al*.[23] included white Americans; while Mermelstein and Turner,[20] included Whites/Latins/Blacks. Patten *et al*.,[21] while Lee *et al*.[22] included participants mostly of Caucasian ethnicity (68.33%). Three studies, namely Cameron *et al*.[31] Schwinn and Schinke,[24] and Maio *et al*.[25] included mixed participants.

Interventions

Details of the interventions are described in Table 1. Included studies provided computer-based/web-based or telephone-based/mobile-based or television-based interventions in the treatment arms. Ten studies provided computer-based/web-based interventions,[21-25,28-32] and four studies[17-19] provided smartphone-based intervention (texting and internet), and one study delivered television-based advertisement.[27] One study delivered both web-based and telephone-based interventions.[20]

Shortest studies were of 1 month,[23,27] and the longest study was on 6 years.[24] One study was of 3 months,[32] one was of 4 months,[29] nine studies were of 6 months,[17-20,31] one study was of 9 months,[21] and one study was of 12 months.[25]

Funding

All studies were funded/supported by funding agencies/institutes except one,[29] which did, not reported the funding status [Table 1].

Risk of bias in included studies

Since we included only RCTs, almost all included studies were at low risk of selection bias. Except for one study,[32] all other studies were at low or unclear risk of performance bias. For detection bias, all included studies were at unclear RoB except few studies[23,25,28,30] which were at low RoB. Three studies[28,29,31] were at high risk of attrition bias due to high dropout rates. Many studies[17,20,22,24,25,27,30] were at low risk of attrition bias. Most of the included studies were at low risk of reporting bias.

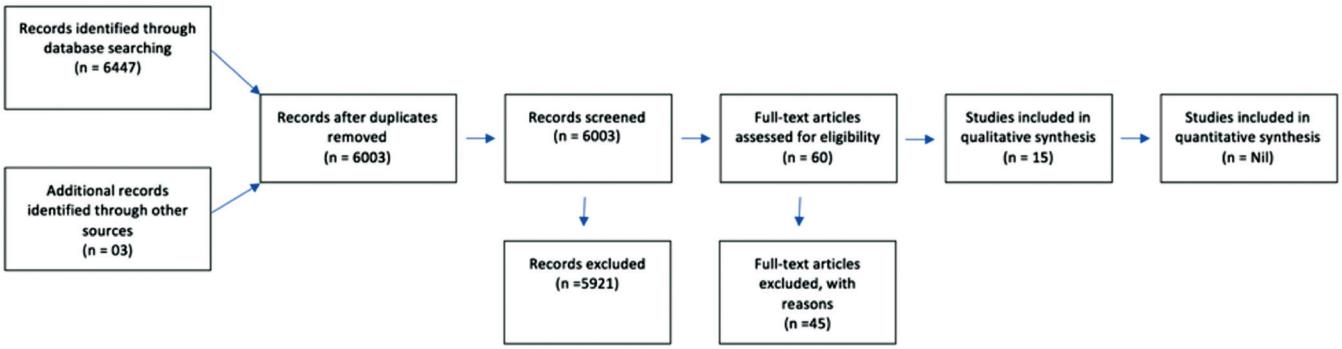

Figure 1: PRISMA flow chart

Findings from included studies

Prevention of substance abuse

de Josselin de Jong *et al*.,[30] and Cameron *et al*.[31] studied the effect of computer-based intervention on smoking initiation and alcohol consumption. Findings of de Josselin de Jong *et al*.[30] found that Dutch students in computer-tailored program called "smoke alert" reported lower smoking initiation at 6-month follow-up ($P < 0.001$) and thereby suggested that this program can be an effective method of counteracting smoking initiation among adolescents [Supplementary File 1].

A similar study by Cameron *et al*.,[31] show that theory-based online health behavior intervention delivered during entry in university prevented nonsmokers from starting smoking and had a significant effect on smoking status at 6-month follow-up [Supplementary File 1]. However, the intervention did not show the effect on number of days binge drinking in the previous 7 days ($P = 0.674$) and reduced alcohol levels significantly ($P = 0.038$) [Supplementary File 1].[31]

Reduction in substance abuse

Arnaud *et al*.,[32] and Mason *et al*.[17] studied the effect of motivational interventions through text messages on substance abuse among adolescents. Arnaud *et al*.[32] indicated that young European adolescents with excessive drinking can benefit from targeted short-term motivational interventions in an automated web-based format which can be effective in reducing alcohol consumption in terms of drinking frequency, frequency of binge drinking, and typical quantity of drinks [Supplementary File 1]. However, this study[32] did not find a significant effect of intervention on illegal drug use frequency or Polydrug use among these at-risk adolescents [Supplementary File 1]. Pattern *et al*.[33] observed that adolescent smokers usually took help from support groups and other internet-based electronic media. Mason *et al*.[17] observed that societal stress associated with expending time with smoking peers may lead to relapse and that decreasing time spent with peers who smoke through motivational interviewing-based peer network counseling text messages may decrease social stress, which in turn decreases craving and ultimately decreases smoking [Supplementary Files 1 and 2]. Another study by Mason *et al*.,[26] tested time-varying effects of tobacco outlets and found that during months 2 and 6, association between tobacco outlet density and smoking was significantly stronger in control condition thereby suggesting that treatment dampens this association during these time periods. The intervention also significantly reduced smoking and suggested that increasing support to participants during months 2 and 4 may help suppress smoking.[26] It has been observed that if a teen is willfully thinking of not smoking, teen may opt to reduce number of cigarettes smoked as a primary step toward making this long-term change. Mason *et al*.[18] demonstrated the effectiveness of a text-based intervention at reducing number of cigarettes smoked, increasing intents not to smoke, and increasing peer support as compared to controls. However, the study did not observe effect on the number of days smoked during the past 30 days[18] [Supplementary File 1]. Findings from Mason *et al*.,[19] provide support for the significance of peer-focused automated text-messaging smoking cessation interventions with urban adolescents and provide insight into the mechanisms of change for the text-based intervention. The study suggests that treatment increased readiness to stop smoking ($P < 0.05$), which then reduced friend adolescent smoking, resulting in adolescents smoking fewer cigarettes per day ($P < 0.01$) [Supplementary File 1]. These studies support that creating minor alterations within adolescents' peer network through peer counseling text messages can be an active component in smoking cessation for adolescents.[17,18,26]

Jander *et al*.,[29] Schwinn and Schinke,[24] and Lee *et al*.[22] studied the effect of computer-based intervention on reducing substance abuse among adolescents. Jander *et al*.[29] found that web-based intervention was effectual for adolescents regarding binge drinking ($P = 0.07$) and was not significantly effective in reducing excessive drinking ($P = 0.13$) [Supplementary File 2]. Schwinn and Schinke[24] studied long-term records of a computer-based prevention program for adolescents at-risk for substance use. After 6 years, youths in the treatment arm reported lesser rates of drinking ($P < 0.01$), lesser rates of heavy drinking ($P < 0.01$), lesser rates of cigarette use ($P < 0.05$), and fewer incidences of negative alcohol-related consequences as compared to youths in the control arm[24] [Supplementary File 1]. Adolescents in the intervention arms were also found to have better alcohol-refusal skills in spite of comparable numbers of friends who were on alcohol[24] [Supplementary File 1]. This study highlights the potential of computer-based methodologies for the prevention of alcohol.[24] Lee *et al*. did not find that web-based intervention produced

Table 1: Characteristics of included studies

Study (country)	Population description			
	Number of participants in each group	Age (years)	Gender distribution (male/female)	Ethnicity/race/residents (%)
Arnaud *et al*.[32] (Sweden, Belgium, the Czech Republic, and Germany)	Total: *n*=211 IG: *n*=715 CG: *n*=734	Mean age±SD IG: 16.81±0.75 SD CG: 16.85±0.74 SD	Male/female (%) IG: 53/47 CG: 52.2/47.8	Residents of Sweden, Germany, Belgium, Czech Republic
Cameron *et al*.[31] (UK)	Total: *n*=2621 IG: *n*=1340 CG: *n*=1274	Mean age±SD IG: 18.73±2.01 CG: 18.89±2.68	Male/female (%) IG: 44.19/55.81 CG: 45.13/54.87	White British, white mixed, Asian and Asian British, Black and black British
Mason *et al*.[17] USA	Total: *n*=200 IG: *n*=100 CG: *n*=100	Mean age±SD IG: 16.3±1.4 SD CG: 16.2±1.3 SD	Male/female (%) IG: 45.7/54.3 CG: 44.8/55.2%	African American, White, and Others
Mason *et al*.[18] (Virginia, USA)	Total: *n*=72 IG: *n*=37 CG: *n*=35	Mean age±SD 16.4±1.38 SD Age range: 14-18 years	Male/female (%) 56.6/43.4	Black or African American (90.8%), white (5.3%), and others (3.9%)
Mason *et al*.[19] (Virginia, USA)	Total: *n*=200 IG: *n*=87 (FU) CG: *n*=85 (FU)	Mean age±SD 16.2±1.39 SD Age range: 14-18 years	Male/female (%) 47.5/52.5	African American (90.5%), White (6.5%), and others (3%)
Duke *et al*.[27] (USA)	Total: *n*=3665 IG: *n*=1811 CG: *n*=1854	Age range: 13-17 years	Not reported	Not reported
Jander *et al*.[29] (The Netherlands)	Total: *n*=2649 IG: *n*=1622 (BL) →456 (FU) CG: *n*=1027 (BL) →368 (FU)	Mean age±SD IG: 16.0±1.2 SD CG: 16.7±1.2	Male/female (%) IG: 47.23/52.22 CG: 61.25/38.56	Dutch (81.81%), NonDutch (12.19%) CG: Dutch (86.85%), NonDutch (13.15%)
Bannink *et al*.[28] (The Netherlands)	Total: *n*=1702 IG1: *n*=533→392 IG2: *n*=554→430 CG: *n*=615→434	Mean age±SD IG1: 15.84±0.70 IG2: 15.95±0.70 CG: 15.79±0.66	Male/female (%) 54.70/45.3 IG1: 56.9/43.1 IG2: 56.0/44.0 CG: 51.4/48.6	IG1: Dutch (79.3%), NonDutch (20.7%) IG2: Dutch (74.4%), NonDutch (25.6%) CG: Dutch (75.1%), NonDutch (24.9%)
de Josselin de Jong *et al*.[30] (The Netherlands)	89 schools Total: *n*=4979 IG: *n*=2469 CG: *n*=2510	Mean age±SD IG: 13.7±1.0 SD CG: 13.7±1.1 SD	Male/female (%) IG: 49.41/50.59 CG: 51.71/48.29	Dutch students
Mermelstein and Turner[20] (USA)	Total: *n*=351 IG: *n*=181 CG: *n*=170	Age range: 14-19 years Mean age±SD IG: 16.3±1.04 CG: 16.6±1.14	Male/female (%) IG: 44.8/55.2 CG: 47.6/52.4	IG: White (67.2%), Latino (4.4%), Black (20%), and Others (8.3%) CG: White (5.9%), Latino (5.9%), Black (6.5%), and Others (5.3%)
Patten *et al*.[21] (USA)	Total: *n*=139 IG: *n*=70 CG: *n*=69	Mean age±SD 15.7±1.3 SD	Male/female (%) 50/50	Caucasians (90%)
Lee *et al*.[22] (USA)	Total: *n*=341 IG: *n*=171 CG: *n*=170	Mean age±SD 18.03±0.31	Male/female (%) IG: 42.69/57.31 CG: 48.23/51.76	Caucasian (68.33%), Asian (15.54) African American (1.47%), Hispanics (16%), Native Americans (0.88%), Hawaiian/Pacific Islander (59%) Others or not indicated (7.04%)
Bowen *et al*.[23] (USA)	Total: *n*=113 IG: *n*=64 CG: *n*=49	Mean age IG: 14.8 years CG: 14.4 years	Male/female (%) IG: 47/53 CG: 29/71	IG: American Indian (91%), White (3%), and Others (6%)
Schwinn and Schinke[24] (New York, USA)	Total: *n*=513 IG1: *n*=130 IG2: *n*=152 CG: *n*=131	Mean age±SD IG1: 10.80±0.99 IG2: 10.80±1.00 CG: 10.90±1.00	Female (percentage mean±SD) IG1: 0.56±0.50 IG2: 0.50±0.50 CG: 0.5±0.50	Black (53%), Hispanic (28%), White (9%), and Others (10%)
Maio *et al*.[25] (USA)	Total: *n*=580 IG: *n*=295 CG: *n*=285	Mean age±SD IG: 16.0±1.5 CG: 15.9±1.4	Male/female (%) IG: 67/33 CG: 6 6/34	IG: White (71%), Black (15%), and Others (14%) CG: White (73%), Black (14%), and Others (13%)

SD: Standard deviation

overall reductions in marijuana use or marijuana-related consequences among students receiving feedback compared to a control group[22] [Supplementary File 1].

Quitting substance abuse after exposure to interventions

Mermelstein and Turner[20] and Patten *et al*.[21] studied the effect of web-based intervention on smoking among adolescents. Mermelstein and Turner[20] established promising support for advantages of complementing a Web-based appendage to a face-to-face cluster smoking cessation program, the ALA NOT program for adolescents as NOT Plus condition had better overall quit rates than the control condition ($P < 0.05$) [Supplementary File 2]. Patten *et al*.[21] found that point-prevalence smoking abstinence rates for adolescent smokers randomized to a clinic-based, brief office intervention (BOI) and stomp out smokes (SOS), a home-based Internet intervention were 13% as compared to 6% at 36 weeks, with no significant differences. Among adolescent who continued to smoke, SOS was related with a considerably larger decrease in average number of days smoked as compared to BOI ($P = 0.006$) [Supplementary File 2]. The study[21] suggested strengthening SOS form of intervention with additional structured, and upbeat patient-education modules provided in-person through telephone or e-mail.

Adverse effects

Duke *et al*.[27] showed that e-cigarette advertising through television influences youth perceptions about and intention to try e-cigarette. The study found that after watching four e-cigarette advertisements, youths had greater intention to use e-cigarettes ($P < 0.001$) and youth not on e-cigarettes beforehand observed e-cigarettes as cooler, healthier, and an enjoyable option [Supplementary File 1]. Approaches previously used to reduce the effect of tobacco advertising on youth such as regulations prohibiting tobacco advertising on television may be effectively applied to e-cigarettes. Bannink *et al*.[28] found negative effect on drug use among boys (in terms of alcohol consumption, smoking, and drug use in the past 4 weeks) and backed the usage of E-health4Uth and consultation intervention in encouraging well-being of adolescents at risk of mental health issues [Supplementary File 2].

Since included studies varied in backgrounds, duration, type, content of intervention, lengths of follow-up, methods of assessment and also in descriptions and measurement of outcomes, we did not undertake meta-analysis or undertake subgroup analysis with regards to duration, timing, and content of exposure to electronic media as well as different forms of electronic media. As we did not find studies from India or other LMICs, we could not present the evidence from this developing region of the globe.

Quality of evidence

The quality of evidence was rated as "very low" for all the outcomes due to too little information or too few data to be able to reach to any conclusions.

Discussion

This review highlights the effectiveness of electronic media for substance abuse among children and adolescents. We found fifteen studies that met our inclusion criteria. Since included studies varied in backgrounds, duration, type, content of intervention, length of the follow-up, methods of assessment and also in descriptions and measurement of outcomes, we did not undertake meta-analysis. There is a trivial body of evidence that we were able to include in this review, which restricts the conclusion we can frame. We did not find evidence about the effectiveness of electronic media in LMICs. Limited data from very few included studies in this systematic review endorses the necessity for additional sizeable RCTs with a long-term follow-up focusing on the evaluation of the effect of electronic media as well as adverse events associated with it. We look forward to such trials especially from LMICs being presented for addition in forthcoming updates of this review.

We identified one recently published Cochrane systematic review,[13] that assessed the efficacy of mass media interventions in decreasing smoking among adolescents. Similar to our review, the included studies in this review[13] varied in type, duration, and content of intervention. Included studies in this review also differed in the length of follow-up, definitions methods of assessments and also in definitions and measures of smoking behavior used.[13] The review found that widespread tobacco control programs, which comprise mass media drives, could be effectual in shifting smoking in adolescents. However, the suggestion is derived from diverse studies of different methodological qualities. No constant association was detected among efficiency of campaign and age, education, ethnicity, or gender.[13]

The quality of evidence for all our outcomes was very low, meaning we have little confidence in the effect estimate and the true effect may be substantially different from the estimate of the effect. In general, the assessment of the quality of included studies was limited by deficiencies in terms of quality of methodology and reporting of adequate data to allow reasonable conclusions to be made. This review does not provide a reliable indication of the likely effect.

We have estimated that the potential bias in this review is low. The search was as all-inclusive, and the evaluation of studies for inclusion was done independently in pairs. None of the authors of this review was associated with any included or excluded studies. Moreover, none of the authors has any commercial or any other conflict of interest. We have tried to decrease bias in the review process by undertaking screening of studies for inclusion, data extraction, and evaluating the quality of studies in duplicates. Nevertheless, the possibility remains that we may have missed some unpublished studies. We undertook the review in line with the recommendations of Cochrane as outlined in the Cochrane Handbook for Systematic Reviews of Interventions.[14] Authors of this review are from diverse fields with diverse backgrounds (e.g., Public Health, Mental Health, Clinical Medicine, Reproductive and Child

Health, and Physiology and Biostatistics). We contemplate this internal diversity of expertise to be an asset of this review and use of it by duplicating steps during the review process.

Conclusions

Although the quality of evidence is low for all outcome measures, overall, the current results supports the potential promise of electronic media in preventing substance abuse among children and adolescents. We postulate recommendations for clinicians, policymakers, and educators in connecting with caregivers and adolescents to encourage the use of electronic media that promotes positive outcomes in substance abuse. Future studies designed to assess the effect of electronic media on substance abuse, especially from LMICs including India are warranted.

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Conflicts of interest

There are no conflicts of interest.

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