Drug and Alcohol Dependence xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Full length article

Smoking in male patients with schizophrenia in China: A meta-analysis

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ARTICLE INFO

Article history:
Received 18 November 2015
Received in revised form 15 February 2016
Accepted 28 February 2016
Available online xxx

Keywords:
Smoking
Schizophrenia
Male
Meta-analysis
China

ABSTRACT

Background: The aim of this study was to examine the prevalence of current smoking in male patients with schizophrenia in China.
Method: A systematic literature search was conducted from database inception until June 20, 2015 without language restrictions in PubMed, EMBASE, China National Knowledge Infrastructure (CNKI) and WanFang Database. Studies fulfilling the following criteria were included: (a) data available in male schizophrenia patients and (b) data available on current smoking status. Statistical analyses were performed with the Comprehensive Meta-Analysis program.
Results: A total of 23 studies met eligibility criteria for the meta-analysis. The pooled prevalence of current smoking was 59.1% (95% Confidence interval [CI]: 53.3–64.7%). Current smoking was significantly more frequent in inpatients than in outpatients (61.3% vs. 48.2%, Q = 7.5, P = 0.006), and higher in chronic compared to first-episode patients (74.5% vs. 45.1%, Q = 32.3, P = 0.0001). Furthermore, using a median split, patients aged 38.2 years or older smoked more often than those aged below 38.2 years (65.8% vs. 52.3%, Q = 6.4, P = 0.01). There were no significant associations between prevalence of current smoking and definitions of smoking, study publication year, sample size and illness duration.
Conclusions: The pooled prevalence of current smoking of male patients with schizophrenia in China is lower compared to Western and other Asian countries. Possible relationships between lower prevalence of current smoking and psychopathology in patients with schizophrenia require further investigation.

1. Introduction

Smoking is one of the major public health problems worldwide; more than five million deaths are caused by direct tobacco use in the world and up to half of tobacco users die because of smoking-related diseases (WHO, 2015). Approximately 80% of the world's one billion smokers live in low- and middle-income countries (WHO, 2015). The prevalence of smoking in patients with schizophrenia is about 5.3-fold higher than that in the general population (de Leon and Diaz, 2005) and higher than the figures obtained in patients with other major psychiatric disorders; including 44% in bipolar disorder and 43% in major depression (Dickerson et al., 2013; Pratt and Brody, 2010).

Schizophrenia patients have an approximately 20% reduced life expectancy compared to the general population (Hennekens et al., 2005) with smoking-related diseases being major contributors to premature death (Irwin et al., 2014; McClave et al., 2010; Ruther et al., 2014). Identifying the patterns of smoking and its correlates in schizophrenia and implementing effective control strategies to

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http://dx.doi.org/10.1016/j.drugalcdep.2016.02.040
0376-8716/

reduce its prevalence and harmful consequences is important for policymakers and health professionals.

Correlates of smoking in schizophrenia include male gender, early onset of the illness, severity of psychiatric symptoms, more frequent hospitalizations, cognitive deficits, high doses of antipsychotic medications, frequent substance use, and poor treatment adherence and response (Botts et al., 2004; Culhane et al., 2008; de Leon et al., 1995). Smoking patterns can be best understood in the given sociocultural context (Chen et al., 2009; Hou et al., 2011; Kelly et al., 2008; Tang et al., 2007a). Most previous findings on smoking were obtained in Western settings, which may not be applicable to other cultural contexts. In past years, several cross-sectional surveys examined the frequency of smoking in patients with schizophrenia in China; due to the consistently low prevalence of smoking in female patients (Tang et al., 2007a), most studies focused on male patients showing great variations in prevalence that ranged between 29.3% and 87.1% (Chen et al., 1999; Liu et al., 2011; Tang et al., 2014; Xiao, 2012; Xu et al., 2014). The large discrepancy in smoking frequencies across studies could be attributed to differences in the illness stage or severity, definition of smoking and sampling methods.

To the best of our knowledge, there has been no meta-analysis pooling the data on the prevalence of smoking in patients with schizophrenia in China. Considering that males account for the majority of smokers with schizophrenia, a meta-analysis was conducted aiming to determine the frequency of smoking in male patients with schizophrenia in China as well as in relevant clinical subgroups.

2. Methods

2.1. Search strategy

A systematic review of the PubMed, EMBASE, China National Knowledge Infrastructure (CNKI) and WanFang Database until June 20, 2015 was performed with the following search items: ("smoking" or "tobacco" or "cigarette" or "nicotine") and "schizophrenia" and ("China" or "Chinese"). The reference lists of relevant studies were also searched manually. Two reviewers (LY and CXL) independently conducted the literature search by reviewing titles and abstracts. The full texts of potentially relevant articles were downloaded for further screening. Papers fulfilling inclusion criteria were identified according to pre-defined inclusion and exclusion criteria as described below. In case of disagreement about the inclusion of a paper, another author (BLZ) was consulted and a consensus decision was made.

2.2. Inclusion and exclusion criteria

Articles that fulfilled the following criteria were included in the meta-analysis: (a) study sample comprising male schizophrenia patients in China; (b) data on current smoking were available or could be computed from the study samples. Studies with potentially biased samples, such as pharmacological trials, smoking treatment interventions, or patients with special characteristics including prisoners, children and adolescents, elderly, twins or conscripts were excluded. If the same data were reported in more than one article, only the paper with complete data and the largest sample was included in the meta-analysis.

2.3. Data extraction and quality assessment

Data extraction was independently performed by two authors (LY and CXL). Relevant variables extracted from articles included: first author, year of publication, study sites, types of patients (in- or outpatients or mixed), first-episode or chronic illness stage, mean age and mean illness duration, sample size, number of current smokers and frequency of current smoking. The 22-item Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) was used to assess the quality of included articles (von Elm et al., 2007). Studies with a score of 11 or less were classified as "poor quality" (Cao et al., 2015).

2.4. Statistical analysis

The pooled current smoking prevalence of Chinese male schizophrenia patients was calculated with a fixed or random effect model. The I^2 statistic was used to evaluate the heterogeneity across studies. When the I^2 statistic was larger than 50%, the random effect model was preferred as the pooling method (Higgins et al., 2003), otherwise, the fixed effect model was applied. In this meta-analysis, all the I^2 statistics were larger than 50% in all the primary and subgroup analyses indicating significant heterogeneity across studies. Therefore, only the random effect model was performed. Forest plots were drawn to visualize the extent of heterogeneity across studies. Publication bias was examined by the contour-enhanced funnel plots and their symmetry was measured using the Egger's linear regression tests. Subgroup analyses were performed to explore the potential heterogeneity. Continuous variables including age, year of publication, sample size and illness duration were dichotomized by a median split prior to the analysis. Patients were divided into three groups according to smoking: no smoking reported, $\geq$1cigarette per day and $\geq$5 cigarettes per day. All statistical analyses were conducted using the Comprehensive Meta-Analysis software, Version 2 (Biosta, Inc., USA).

3. Results

3.1. Search results and patient characteristics

A total of 635 potential articles were identified by the search strategy. The identification process and reasons for exclusion are shown in Fig. 1. Twenty three papers (Bi et al., 2013; Chen et al., 2009; Chen et al., 1999; Du et al., 2009; Hou et al., 2011; Li, 2006; Li et al., 2011, 2012, 2010; Liu et al., 2011; Lu and Liu, 1998; Ma et al., 2010; Mao et al., 2006; Sun and Zou, 2000; Tang et al., 2014, 2007b; Xiao, 2012; Xu et al., 2014; Ye et al., 2014; Zhang et al., 2010a,b,c, 2012) with a total of 4834 male schizophrenia patients were included in the meta-analysis (18 papers in Chinese and 5 in English). Characteristics of the included studies are shown in Table 1. Studies were published between 1998 and 2014. Sample sizes ranged between 48 and 934. Of the included studies, 8 were conducted in Beijing, 3 in Sichuan, 2 each in Liaoning, Zhejiang, Chongqing, Hubei and Guangdong and 1 each in Jiangsu, Yunnan, Hunan, Hebei and Shanghai (Fig. 2).

Patients were on average 37.6 ± 7.2 years old and had a mean duration of illness of 11.4 ± 7.5 years. All of them were Han-Chinese, and most (4052, 83.8%) were inpatients. Altogether, 416 patients (15.2%) had a first episode of schizophrenia, while the remaining patients had chronic illness (n = 2328, 84.8%). Most studies used questions to assess current smoking, such as "have you smoked 1 cigarette daily in the past month", or "have you smoked more than 10 cigarettes daily in the past 6 months" or "have you smoked 7 cigarettes per week and smoked at least 1 month". The assessment of smoking was not introduced in five studies (Mao et al., 2006; Tang et al., 2014, 2007b; Zhang et al., 2012, 2010a).

Please cite this article in press as: Li, Y., et al., Smoking in male patients with schizophrenia in China: A meta-analysis. Drug Alcohol Depend. (2016), http://dx.doi.org/10.1016/j.drugalcdep.2016.02.040