



Review Article

A commentary on the effects of methamphetamine and the status of methamphetamine abuse among youths in South Korea, Japan, and China

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ABSTRACT

Methamphetamine (MA) abuse continues in East Asia and shows an increasing trend among youths in South Korea, Japan, and China. Although the negative effects of MA abuse on youth are considered as significant problems, few studies have been conducted on the topic in these countries. This paper focuses on the effects of MA on the human body and current MA abuse among youths in South Korea, Japan, and China. To investigate the negative effects of MA on the human body, we searched the keywords “MA,” “human,” and “effect” for studies published from 2013 to 2017. MA activates the neurotransmitter system and the central nervous system, and when used at high dosage or for long term, MA can cause severe neurotoxicity and cardiovascular problems. Online networks contribute to MA abuse by sharing methods for preparing synthetic MA. Despite efforts to reduce MA abuse, social crimes associated with its abuse continue and numbers of illegal MA users are increasing steadily in Korea, Japan, and China. In young users, diverse factors associated with drug addiction, such as curiosity and peer effect, lead to MA abuse and its attendant personal and social problems.

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1. Introduction

Psychotropic drugs can induce hallucinations by activating the central nervous system (CNS) and when abused or misused carry

considerable health risks. Of the diverse psychotropic drugs, amphetamine-type stimulants (ATS) are abused worldwide, and because ATS can be easily synthesized, it is difficult to determine accurately the quantity illegally produced. Amphetamine (AM) is abused in Europe except for the Czech Republic, Slovakia, Estonia, and Latvia [1], and methamphetamine (MA) is commonly abused in Korea, Japan, and China [2,3]. The Japanese National Police

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Agency reported that China, Korea, and the Golden Triangle (Myanmar, Thailand, and Laos) are primary regions of MA abuse [3]. MA abuse has been reported to have steadily increased in Korea since the 1980s [4–6] and crystal MA abuse is increasing in China [3]. MA is considered as a common synthetic addictive agent in Iran [7] and Taiwan [6], and in the USA, the illegal use of MA is of serious concern [8], although the main drugs of abuse are marijuana, hallucinogens, and cocaine [9]. As can be appreciated from the above, MA abuse is a significant issue that has negative influences on people and nations worldwide.

Because MA abuse causes serious problems among youths, investigations on MA abuse are needed to understand aspects of MA abuse and to define relevant reduction policies. Some studies have investigated MA use and sexual risk behaviors in US high school students [10] and have identified the prevalence and predictors of MA abuse among club-going young adults in New York City [11]. MA use patterns among street-involved youth were studied to identify the means of encouraging MA cessation in Canada [12]. In Iran, one study investigated MA abuse among youths [13], and in Thailand [14], faced with a continuous increase in MA abuse among youths, a strong relationship was found between MA abuse and depressive symptoms [15]. In South Korea, Japan, and China, illegal trade of MA is a concern because of the proximities of potential suppliers.

Therefore, we aimed to describe the comprehensive effects of MA, such as its general effects and the negative effects of MA abuse on the brain, heart, and other organs. This paper also focuses on the recent status of MA abuse in East Asia, especially in South Korea, Japan, and China, and differs from previous reviews on MA [1,8,16–19] because it highlights MA abuse and the negative effects of abuse among youths in South Korea, Japan, and China. This paper will encourage researchers to investigate, analyze, and monitor MA abuse among youths.

2. Methods

A comprehensive literature search was conducted, particularly on the effects of MA, on the human body and on the current status of its abuse among youths in South Korea, Japan, and China. Searches were conducted in PubMed for relevant studies published between 2000 and 2017. To determine its effects on the human body, we searched for the following keywords: “MA,” “brain,” “organ,” “human,” and “adverse effect.” To determine the status of MA abuse among youths in South Korea, Japan, and China, we searched for the following keywords: “MA,” “abuse,” “illegal use,” “youth,” “South Korea,” “Japan,” and “China,” especially studies published from 2013 to 2017. Duplicate papers were excluded, and relevance was checked. Papers that addressed the negative effects of MA abuse and current status of MA abuse among youths in South Korea, Japan, and China were of primary interest, and less relevant papers were excluded. Finally, we selected 54 papers, and of these, 19 papers provided information on MA abuse in countries other than Korea, Japan, and China, 16 addressed the general and negative effects of MA on the human body, and 19 addressed the recent status of MA abuse in Korea, Japan, and China.

3. Results

3.1. General effects of MA on the human body

MA activates the components of the neurotransmitter system such as dopamine, norepinephrine, and serotonin, moderately increases blood pressure and pulse rate, and induces cutaneous vasoconstriction. MA also elevates body temperature as well as heart and breathing rates. Because MA users experience rewarding effects such as reduced fatigue and appetite, increased sexual

desire, self-esteem, and euphoria, MA has a high potential risk for addiction, which can lead to anxiety, sleep disturbance, offensive acts, paranoia, and hallucinations [1,8,16–18,20].

3.2. Negative effects of MA abuse on the brain and behavior

MA is an indirect agonist of dopamine, norepinephrine, and serotonin receptors, reorganizes brain structure, and influences the CNS [1,8,16–22]. Continuous MA use at high dosages can lead to increased dopamine concentrations in the brain, thus leading to serious neurotoxicity [20]. The negative effects of MA abuse on the brain have been previously reviewed [1,8,16–19]. Because of the importance of investigations on the negative effects of MA abuse on the brain, improved techniques have been developed. One study [16] extensively reviewed the use of positron emission tomography (PET), structural magnetic resonance imaging (MRI), and functional MRI (fMRI) for this purpose from 2000 to 2012. Others have reviewed the results of animal studies [17,18]. In the human brain, long-term MA abuse caused severe neurotoxic effects and cognitive impairment and subsequently reduced the level of dopamine and dopamine transporter in the striatum of the human brain [23]. However, acute MA abuse has a lesser association with cognitive impairment than chronic MA abuse because results of cognitive tests conducted on acute MA abusers were within the range of age- and gender-matched healthy controls [21]. Cognitive impairment is associated with reduction in dopamine levels caused by chronic MA abuse. Many studies have reported that chronic MA abuse has negative effects on diverse functional domains including executive function, information processing time, and language and can lead to cognitive impairments and increase the potential risk of Parkinson’s disease [1,19,21,24]. In addition, MA abuse causes cortical and subcortical inactivation and poses serious effects on behavior such as decision-making [16], thus causing neurologic dysfunctions such as strokes, frontal lobe hemorrhages, abnormal movement, and repetitive behavior [20]. To recover from these cognitive impairments, MA abusers must withdraw from MA for at least 6 months [25].

3.3. Negative effects of MA abuse on other organs

High dosages of MA increase alertness and induce obsessive or repetitive acts, dizziness, fever, sweating, rapid breathing and pulse, and tremors, that is, adrenergic effects [1,8,16–18,20]. In particular, long-term MA abuse can cause significant impairments of the cardiovascular, pulmonary, and other organ systems and can diminish physical health [20,26–32].

MA abuse has been reported to have the following adverse effects on the cardiovascular system: hypertension, coronary vasospasm, acute myocardial infarction, cardiomyopathy, angina, myocardial fiber hypertrophy, atherosclerosis, necrosis, and even death; and thus, cardiovascular dysfunctions resulting from MA abuse are considered serious issues [28–31]. Short-term MA abusers show acute stress cardiomyopathy, while long-term MA abusers show cardiovascular impairments including atrial and ventricular remodeling and dilated cardiomyopathy. Chronic MA abusers who are predominantly young exhibit left ventricular remodeling with hypertrophy and fibrosis [28]. Long-term MA abuse also leads to serious problems such as arrhythmia and coronary artery impairment, which commonly occurred in young individuals [20]. In addition, MA abuse can increase the risk for myocardial injury in females who experience a heart attack [32]. Such cardiac dysfunctions can be improved by abstinence, and on the other hand, they may be exacerbated by continued abuse [30].

Chronic MA smokers can suffer from respiratory problems and nephrotoxicity, such as bronchitis, pulmonary hypertension [17], acute

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