

## The 'old' new growing concern - still talking about (waterpipe) tobacco smoking

João Mauricio Castaldelli-Maia<sup>1,\*</sup>, Antonio Ventriglio<sup>2</sup>, Dinesh Bhugra<sup>3</sup>

<sup>1</sup>Dept. & Institute of Psychiatry, University of São Paulo, São Paulo, Brazil, <sup>2</sup>University of Foggia, Foggia, Italy, <sup>3</sup>Institute of Psychiatry, King's College, London, United Kingdom

**\*Corresponding Author:**

Email: jmcmaia2@gmail.com

Smoking is the leading cause of preventable deaths in the world according to the World Health Organization. Approximately 6 million people die annually as a result of tobacco-related diseases.<sup>(1)</sup> It is estimated that there will be 8 million deaths related to cigarette consumption by the year 2030.<sup>(1)</sup> Despite a recently decrease<sup>(2)</sup> currently daily smoking is still high reaching around 19% of individuals in the world.<sup>(3)</sup> Nicotine dependence is recognized as a medical condition in the fourth edition of the Diagnostic and Statistical Manual (DSM-IV)<sup>(4)</sup> of the American Psychiatric Association and nicotine dependence is included in the tenth edition of the International Classification of Diseases (ICD-10)<sup>(5)</sup> of the World Health Organization (WHO, 1992).

In this editorial, we explore the state-of-art knowledge on tobacco composition, how it works in the human body, explaining on an ancient form of tobacco use<sup>(6)</sup> – the waterpipe – which has been a growing concern because of its quickly dissemination among boys and girls from Asian and the Middle Eastern countries, but also in countries Westerners as the United States.<sup>(7)</sup>

### What is tobacco and how does it work?

There are many different classifications for tobacco plants. The genus *Nicotiana* has more than 60 known species. Within these there are two species which are grown commercially:<sup>(8)</sup> *Nicotiana rustica*, for collection of nicotine and solanesol - raw material for many high-value biochemicals, including coenzyme Q10 and vitamin K analogs<sup>(9)</sup> - and *Nicotiana tabacum* for use as a cigarette, pipe, cigar, snuff and chewing tobacco. The modern commercial tobacco is extensively derived from the latter.<sup>(8)</sup> *Nicotiana tabacum* is not a natural form of plant, but was created by the human cultivation. It is a hybrid of two species of *Nicotiana*.<sup>(10)</sup> Although it is widely produced for producing the cigarette, it has also been cultivated for the purpose of use of nicotine and other pyridines as insecticides and as a chemical precursor for various products.<sup>(11)</sup>

To date, approximately 5700 components of tobacco were identified.<sup>(12)</sup> If you also count the components of tobacco smoke, this number reaches almost 9000 components.<sup>(13)</sup> Note that this number does not include the components added to tobacco in cigarettes such as flavoring and hundreds of enzymes and protein components.<sup>(12)</sup> There still probably many

components of tobacco to find in the coming years. In 1988, we knew of the existence of almost 3000 components of cigarette only.<sup>(14)</sup> Since then, thousands of scientific papers have been produced in this field. However, there has been a slowdown in the discovery of new components since the 2000s, which may reflect the proximity of the knowledge of almost all components of tobacco.<sup>(12)</sup> Despite this huge progress in this field, which reflects a major evolution of analytical chemistry and the great curiosity of scientists, this advance on the knowledge of the components of tobacco and its smoke does not seem to be a very important issue for the advancement of science.<sup>(12)</sup> What is really important is to know that nicotine is responsible for the direct additive properties of cigarette, and it represents only 1.5% of wet weight of blended tobacco cigarette, or 1.8% of its dry weight.<sup>(12,13)</sup> It also accounts for various types of cancers such as lung carcinomas of small cells and non-small cell, as well as, head and neck, gastric, pancreatic, liver, colon, breast, cervical, bladder, and kidney.<sup>(15)</sup> Other important components of tobacco cigarette are: water (12%); cellulose (10%); carbohydrates (12.5%); acid (9%); phenol (6.5%); metal (5%); waxes and resins (8%).<sup>(13)</sup>

Waterpipes are one of the several types of way of consuming tobacco.<sup>(15)</sup> Cigarettes manufactured tobacco products are widely used all over the world (96% of total sales worldwide). They consist of crushed or reconstituted tobacco, processed with hundreds of chemicals and various flavors (optional), and rolled into a cylinder, wrapped in paper.<sup>(15)</sup> Other types of tobacco products are kreteks (Indonesia), roll-your-own cigarettes (Europe and New Zealand), bidis (South Asia), sticks (Papua New Guinea), cigars and pipes. There are also available various forms of products of smokeless tobacco, but these are very less common forms of tobacco use.

Inhaling a lit tobacco cigarette quickly distills nicotine from it. Smoke particles lead nicotine to the lungs, where it is rapidly absorbed into the pulmonary venous circulation. Nicotine then enters the blood circulation and moves quickly from the lungs to the brain, where it binds to nicotinic acetylcholine receptors.<sup>(17)</sup> Tobacco smoking is a highly effective way of administering drugs. The stimulation of nicotinic cholinergic receptors in the brain releases several substances, including dopamine, which generates a

pleasant experience and is critical to the positive reinforcing effects of nicotine and also other drugs of abuse, and physiological activities.<sup>(17)</sup> The nicotine withdrawal causes the person various psychological symptoms such as irritability and depressive symptoms, which are a strong incentive to keep smoking.<sup>(18)</sup> The relief of withdrawal symptoms is probably the main reason for this improved performance and elevated mood<sup>(19)</sup> and also for drop-out and failure in smoking cessation treatment.<sup>(20,21)</sup> Although nicotine is the principal addictive component of tobacco, other substances are also performing this role to a lesser degree, such as monoamine oxidase.<sup>(22,23)</sup>

### **Waterpipe (Narguilé)**

The use of tobacco waterpipe seems to be a new epidemic.<sup>(24)</sup> A Web-based survey<sup>(25)</sup> showed that waterpipe use has been increasing steadily since 2004 in four countries (Australia, Canada, U.K. and U.S.), where its use was not common as in North Africa, Mediterranean region, and parts of Asia. The search volume for waterpipe was higher than for electronic cigarettes in three of four locations, with the largest volume in the U.S. Online surveys were aimed primarily at waterpipe products for domestic use, followed by research for waterpipe cafes and lounges.<sup>(25)</sup> In the most common form of waterpipe used today, burning lumps of coal are placed on top of a perforated aluminum sheet separating them from a mixture of flavored tobacco. When the smoker draws air through the nozzle, the heated air becomes smoke as it passes through the mixed tobacco, as the bubbles pass through the water, cooling the smoke before the inhalation.<sup>(24)</sup>

The water pipe used for smoking tobacco was invented in India during the reign of Emperor Akbar (1556-1605) by a physician named Hakim Abul Fath, who suggested that tobacco smoke should pass through a small container with water before being inhaled, aiming a less harmful effect to human health.<sup>(6)</sup> Unfortunately, Fath was wrong, and the tobacco smoke derived from waterpipe seems to be associated with most of the damaging effects of cigarette smoke, being addictive and serving as a gateway for tobacco cigarette use.<sup>(6,26,27)</sup> There are some references that there may be even larger cardiovascular harm than with the use of manufactured cigarettes.<sup>(28)</sup> Moreover, waterpipe smokers generally share the same nozzle (passing it from person to person), which can facilitate the spread of communicable diseases such as colds, respiratory infections, tuberculosis, hepatitis and herpes.<sup>(6,29,30)</sup> There are also reports of drug-resistant tuberculosis transmitted via waterpipe.<sup>(6)</sup>

Many features of this way of tobacco smoking concern the researchers. A recent multi-national study showed that the perception of health risks related to use of waterpipe is much smaller than the perception of those related to manufactured cigarettes.<sup>(31)</sup>

Furthermore, the use of this type of tobacco product also appears to be associated with sporadic use of tobacco in moments of socialization, encouraging people who would never smoke cigarettes to smoke.<sup>(32)</sup> Data from a recent cohort of school children in Jordan show that the prevalence of waterpipe use is progressively higher as time goes on, and that the prevalence of waterpipe use is always greater than manufactured cigarettes, both for boys and for girls.<sup>(33)</sup> However, the use of waterpipe seems to be associated with other non-desirable behaviors depending on the culture of each country. In Sweden, the use of it does not seem to be an alternative to tobacco use in adolescents – its current use in youth aged 15 was strongly associated with smoking cigarettes, snus, binge drinking, drunkenness, and recent use of illicit drugs.<sup>(34)</sup>

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