Alcohols, COVID-19 Pandemic, and Coronavirus Infection

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Abstract

In this paper we present a perspective view on alcohol use, alcohol-related healthcare and COVID-19 pandemic. In addition, interconnection among these three factors is discussed. More importantly, through the data mining of Centers for Disease Control and Prevention (CDC) data, the relation between COVID-19 mortality and some countries' hard liquor consumption is analyzed. Last, an extremely-small-scale 10-month test was conducted to explore a brand-new approach to the high-degree alcoholic prevention of coronavirus infection.

Keywords: alcohols, COVID-19 pandemic, coronavirus infection, and mortality.

Introduction

Alcohol consists of organic molecules from carbon (C), oxygen (O), and hydrogen (H) atoms. When two carbons are present, the alcohol is called ethanol, which is the main ingredient of beer, wine, and distilled spirit (i.e., hard liquor). Hard liquor normally has an over 35% Alcohol by Volume (ABV), while beer and wine typically contain less than 15% of alcohol content. Early distillation dated back to 1st century in Egypt [1], early centuries of the Christian era in India [2], and 1st-2nd centuries in China [3]. Hard liquor with more than 60% ABV includes strong baijiu, normal tsikoudia, and barrel proof whisky. Liquor with more than 40% ABV catches fire when it is heated to 260C.

Although alcohol was originally produced for recreational purposes, its later use or consumption had a wide array of short-term and long-term societal impacts. In this paper, alcohol use, related healthcare, and COVID-19 pandemic are the three factors that are reviewed; a correlation between COVID-19 mortality and alcohol use is also discussed. Furthermore, high-degree alcoholic prevention of coronavirus infection is proposed with the result of an extremely-small-scale test in a period of 10 months.

Alcoholic Healthcare Use and Societal Misuse

Alcohols were used as an antiseptic, a disinfectant or an antidote in history dated back to the 14th century [4, 5].

Alcoholic products in various forms were applied in disinfecting people's hands and other areas, cleaning patients' skins before and after surgeries, and being used in mouthwashes [6, 7]. Ethanol was used in treating ethylene glycol toxicity orally or through vein injection [4]. According to the yellow emperor's classic of internal medicine, alcohol was used for treating meridian blockages, fainting and tinnitus in Asia as early as 300 BC [8], even though the degree of liquor was low.

In comparison, some other disinfectants and antiseptics, chlorine and hypochlorite, were discovered by the Swedish chemist Scheele and the French chemist Berthollet in the 18 century, respectively [5]. Chloroxylenol (i.e., para-chloro-meta-xylenol) was first manufactured in 1927 as an antiseptic and a disinfectant for surface disinfection [6]. Glutaraldehyde is a dialdehyde, which is an effective disinfectant against various microorganisms, including spores [9]; it came into medical use around 1960s [10]. The strong toxicity and irritation of these substances limit their application scopes as confined within external use in low concentration solutions (chlorine 0.1%, chloroxylenol 4.8%, and glutaral 2%). On the contrary, 60% through 90% of alcohol is an effective range for disinfection.

One major misuse of alcohols is alcoholism (i.e., alcohol dependence or use disorder), which refers to inability to control excessive alcohol drinking due to addiction, resulting in significant mental or physical health problems [11]. The short term effects [12-14] of excessive alcohol drinking include (i) lethargy, (ii) sedation, (iii) poor body balance, (iv) blurred vision, (v) mental confusion, (vi) impaired speech, (vii) staggering, (viii) dizziness, (viv) vomiting, (vv) respiratory depression, and (vvi) unconsciousness; the long term consequences of alcohol dependence are [15-18] (i) bone fracture, (ii) liver damage, (iii) pancreatitis, (iv) epilepsy, (v) polyneuropathy, (vi) alcoholic dementia, (vii) heart disease, (viii) nutritional deficiency, (viv) peptic ulcers, (vv) sexual dysfunction, and (vvi) general brain damage. Alcoholism causes various societal problems [19-23]: (i) assault, (ii) burglary, (iii) child abuse, (iv) domestic violence, (v) drunk driving, and (vi) loss of employment. Therefore, a moderate amount of intake is a key to avoid the undesired consequences of alcohol misuse.

COVID-19 Pandemic

Coronavirus disease (COVID-19) is a novel respiratory illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It originated in 2019 and still causes an ongoing pandemic. So far, about 80 million cases have been identified

with more than 1.8 million deaths attributed to this disease worldwide. The first incidence of such disease was identified in Wuhan, China, in December 2019 [24, 25]. One claimed cause of the disease is the consumption of wild animals sold at Huanan Seafood Wholesale Market. COVID-19 belongs to a member of coronavirus family and is contagious among humans or animals [26, 27]. Coronaviruses are essentially a group of RNA viruses and the earliest study on animal coronavirus was reported in the late 1920s [28]. Later, human coronavirus was first studied by Kendall, Bynoe and Tyrell in 1960s through extraction of the viruses from patients with common colds [29, 30]. The genome size of coronaviruses is in a range of 26 through 32 kilobases [31]. The coronaviruses have characteristic club-shaped spikes projected from their surfaces with a surface morphology of a solar corona [32]. The viruses are further categorized into gamma, beta, delta and alpha subgroups [33]. Beta and alpha subgroups originate from bats, while gamma and delta subgroups spread among birds and pigs [34]. COVID-19 belongs to the beta subgroup, and its genome structure is 96% similar to that of bat coronaviruses [35, 36]. We are still not clear about the exact route through which the virus jumped from bats to humans prior to this pandemic.

The main transmission path of COVID-19 is a respiratory route from an infected person to spatially neighboring people via cough, sneeze, talk, or breath [37]. Virus-containing particles exhaled by the infected person travel in space during a cough or a process of breathing in the form of respiratory droplets or aerosols [38]. These droplets or aerosols may reach the mouth, nose, or eye of the neighboring persons. It is believed that an infection would occur if over 1000 infectious coronavirus particles are accumulated [39]. In order to avoid the infection, it is crucial to wear a face mask to minimize the number of SARS-Cov-2 virions that enter a human body; it is also equally important to find a solution for disinfecting those SARS-Cov-2 virions that were received through respiratory transmission. In the next section, we propose a method to address the disinfection of coronavirus particles inhaled into the human body.

Based upon the best knowledge of the author, there is almost no, if any, existing study or activity related to alcohol use for fighting coronavirus infections. On the opposite side, some studies [40] or announcements [41] have been conducted or given regarding the poisoning and ineffectiveness of alcohol drinking. From the viewpoints of traditional Asian medicine and the anatomy of a respiratory system of human, application of a moderate amount (i.e., approximately 30 ml each time) of high-degree alcohol (i.e., more than 60% alcohol by volume) may have the following effects:

Slow drinking (i.e., intermittent sipping only) of the liquor disinfects mouth, tongue, pharynx, and epiglottis.

Sniffing of the liquor for a few seconds may have a certain effect on disinfecting nasal cavity, larynx and lung.

To explore a possible link between coronavirus and high-degree alcohol use, data mining of public medical data was conducted. Figure 1 shows the relation between hard liquor consumption and COVID-19 mortality on May 14, 2020 and

January 2, 2021, respectively. The COVID-19 mortality is defined as a ratio of the total number of deaths to the total number of infected patients in each country; the unit of hard liquor consumption is liter per person per year. An approximate downtrend may be observed from this figure. The detailed data of this figure is given in Tables 1 and 2. Note that this figure contains only a number of countries in which the hard liquor consumption is high, excluding the countries in Africa where the hard liquor consumption is almost zero. The comparison between Tables 1 and 2 indicates that the COVID-19 mortality was higher on May 14, 2020, which was around the peak of the coronavirus spread in a time axis.

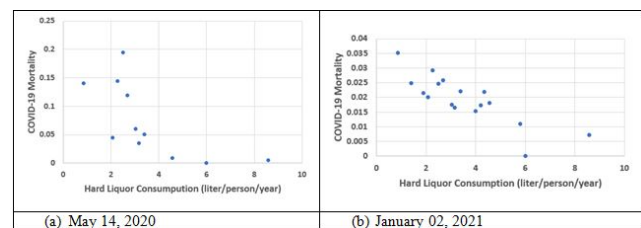**Figure 1:** COVID-19 mortality and hard liquor consumption among different countries.

(a) May 14, 2020   (b) January 02, 2021

Table 1: COVID-19 Mortality and Hard Liquor Consumption on May 14, 2020

Country	Hard Liquor Consumption (liter/person/year)	COVID-19 Mortality
Russia	4.57	0.009146825
Poland	3.4	0.050127732
Grenada	6	0
US	3.03	0.059860839
Italy	0.86	0.140663677
France	2.5	0.194503546
Germany	2.07	0.045235632
Spain	2.69	0.118786957
UK	2.27	0.144266094
Czechia	3.16	0.035054022
Belarus	8.575	0.005640221

Table 2: COVID-19 Mortality and Hard Liquor Consumption on January 2, 2021

Country	Hard Liquor Consumption (liter/person/year)	COVID-19 Mortality
Russia	4.57	0.018095238
Poland	3.4	0.022137405
Grenada	6	0
US	3.03	0.0175
Italy	0.86	0.035238095

France	2.5	0.024621212
Germany	2.07	0.02
Spain	2.69	0.025906736
UK	2.27	0.029133858
Czechia	3.16	0.016438356
Belarus	8.575	0.007142857
Jamaica	1.9	0.021428571
Romania	1.41	0.024842767
Lithuania	5.79	0.011041667
Ukraine	4.2	0.017272727
Slovenia	4.36	0.021774194
Latvia	4	0.015384615

An Effective Way to Fight COVID-19 Infection and Mortality

Although no medical association has recommended alcohol use [15], we suggest a High-Degree Alcoholic Prevention method for fighting coronavirus infections as an alternative or a supplementary to vaccinations and a cocktail of existing medications (drugs for other deadly infectious diseases [42] and antibodies [43]). The proposed method is described in Table 3.

Table 3: High-degree Alcoholic Prevention of Coronavirus Infection

Step	Description
1	Select a good-quality hard liquor with more than 60% Alcohol by Volume (ABV)
2	Pour one U.S. fluid ounce (30 ml) of liquor into a 40ml cup
3	Sniff the liquor for a few seconds
4	Intermittently sip the liquor a small amount each time
5	Hold the liquor in your mouth, especially around your throat region, for a while before swallowing it

Step 1 in Table 3 is very important because there are many low-quality high-ABV liquors in the market and those liquors are detrimental to human health [40]. In the U.S. consumer market, a good-quality hard liquor is barrel proof Tennessee whiskey, Jack Daniel's, with 65% ABV. A 40ml cup of step 2 is a representative cup in Asian liquor drinking. Figure 2 illustrates the selected liquor and a cup. The frequency of applying the aforementioned steps is once a day after returning from work or visit outside your residence.

Figure 2: Jack Daniel's whiskey and a representative cup.

Two test subjects (#1 and #2) underwent a 10-month trial of the proposed method between March 1, 2020 and January 1, 2021. The trial was conducted in the state of Michigan, U.S.A. This state has the eighth highest COVID-19 death number among all the states in U.S. with 363,611 infected patients as of January 2, 2021 out of 9.9 million residents. Information about the test subjects is provided in Table 4. Test subject #1 is a female physician (age: 56) who contacted about 30 patients within a radius of 2 feet each day for three days a week, and test subject #2 (age: 58) traveled outside his residence approximately one time to four times a week. Both test subjects successfully avoided COVID-19 infection by following the protocol in Table 3 as well as a face mask protocol.

Concluding Remarks and Future Research

Through history, almost all academic studies in western countries have pointed to the negative impacts of alcohol use. The excessive drinking culture in many of these countries did indeed cause a significant number of short-term harmful effects and long-term detrimental consequences, leading to various societal problems that severely damaged family stability, child development, and even infant birth. On the other hand, traditional Asian medicine advocated for disciplined and delicate alcohol use for various medical purposes, as exemplified by the yellow emperor's classic of internal medicine [8].

Although there is generally no clear relation between COVID-19 infection and alcohol use [41], it seems that there exists a trend between COVID-19 mortality and hard liquor consumption among the countries with the hard liquor consumption above 1 liter per person per year. The extremely-small-scale pilot study of this paper might shed light on a new alternative way to combat coronavirus infection, even though there is no statistical significance due to a very small test sample size at the current stage.

Future research will be focused on a least side-effect and universally applicable method to prevent coronavirus infections with use of face mask as a precondition.

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