

Alcoholism as a risk factor for COVID-19: Boosting inflammatory response

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Abstract

Alcoholism is a condition associated with psychiatric and psychiatric problems, where the respiratory system is damaged through the mucociliary ladder mechanism and alveolar macrophage dysfunction. In the time COVID-19 has been observed a dramatic increase in alcohol consumption mediated by levels of anxiety and situations of confinement. In this work we analyze the relationship between alcoholism and SARS, especially with SARS-CoV-2, explained by a degradation of the host defenses of the respiratory epithelium by changing the barrier function, the discharge of cytokines and the functions of the cilia. All of them involved in the defense mechanism. of the lungs. This leads to a worse prognosis for patients precisely because of alcohol consumption. Based on this approach, alcoholism will exacerbate the consequences of COVID-19.

Keywords: Alcohol, cytokine, proinflammatory, COVID-19, SARS-CoV-2

Introduction

Lives of a huge number of people had changed intensely when pandemic of severe acute respiratory syndrome corona virus 2 appeared in 2019. The outburst commenced in December 2019 from the Wuhan city of china and till March 2020, the WHO had announced it as a pandemic¹. COVID-19 is an extremely contagious transferable disease, most frequently initiates muscular pain, fatigue, fever, dry cough and dyspnea. What differentiates this recent disease from others is its extremely quick spread and comparatively high death rate. This was endorsed in mid of the March 2020 when patients were documented in around 135 countries, approximately 12 weeks after the 1st case had appeared. On 1st March 2020, death rates extended >3.5 % in China and 1.5% in countries other than China². The whole situation is certainly a catastrophe sensed by great numbers of individuals, leading to challenging psychological reactions. It requires substantial strength to re-adapt to an unidentified and ambiguous condition and how to deal with numerous distressing emotions, regular frustrations, and the outlook of a susceptible material presence to family and oneself. Because of the famous and recognized effects of impeding the nervous system, psychoactive ingredients including alcohol are utilized by numerous people in search of relief from anxiety, irritating or displeasing emotions, stress, or depression³⁻⁵. This entreats the query of whether the substantial escalations in sales of alcohol, observed in numerous countries are because of the pandemic when associated with the similar period in the preceding year. As an illustration, a study i.e. conducted in March 2020 by the Nielsen Company in United States of America establish 240% escalations in sales of alcohol by means of internet, counting wines by 66%, spirits by 75 percent, and beers by 42%. There have also been informations in press reporting amplified domestic brutality, which has long been related with alcohol misuse⁶. This is not merely a financial issue or a considerable one-time incident, however a compound and complicated experience disturbing billions of people all around the world in provinces for instance: political, medical, economic, geopolitical, religious, axiological, societal, cultural, and civilizational aspects. Hence, this includes nearly all regions in the existence of societies and individuals⁷.

Impact of COVID 19 pandemic on mankind

Right now the state of pandemic i.e. challenging mankind can be contemplated to be somewhat a multiple-stage complicated calamity, distressing the numerous facets of health, counting psychological health; in both individual and societal aspects ⁸. Nevertheless the risk presented by the virus itself, numerous psychological issues may appears from the obligatory quarantine and lockdown together with the financial threats. Among other things the studies conducted upon animals have revealed the negative influence that loneliness has on enhancing stress levels in the body with both raised responsiveness to stress and neuroendocrine reactions ⁹. All this can provoke a broad range of diseases of changing brutality, principally difficulties in concentrating, depression, anxiety, anger, insomnia, violence, and interpersonal clashes. The severity of these symptoms may at least in fragment be because of the degree and extent of the quarantine, a sensation of isolation, distress of infection, and approach to suitable or unsuitable facts and figures ¹⁰. Existing evidence proposes the involvement of organ results from uninterrupted viral-encouraged and cytokine arbitrated impairment ¹¹. In the attempt to generate a reaction to the entrance of SARS-CoV-2, there is a secretion of immune cells such as pro-inflammatory cytokines which frequently becomes amplified and originates fluctuating degrees of damage to the tissues. Raised pro-inflammatory cytokines for instance TNF- α , IL-6, IL-1, and interferon- γ have been linked with advanced severity of disease in COVID-19 ¹². The pulmonary system is the principal system involved in COVID-19. Apart from general symptoms for instance sore throat, cough, and rhinitis; respiratory manifestation of acute respiratory distress syndrome (ARDS) o severe acute respiratory syndrome coronavirus (SARS) is the foremost reason of demise in corona virus disease-19 ¹³. Additionally, there is a proof that people who have survived from this deadly COVID-19 could progress post-recovery fibrosis in lungs ¹⁴. The liver is similarly influenced by COVID-19. Indicators of hepatic injury for instance raised aminotransferases, bilirubin, and GGT (gamma-glutamyl transferase) have been establish to associate with severity of disease ¹⁵. Though the particular mechanism of hepatic damage is not identified, there are assumptions that this is because of viral-arbitrated damage to cell as a

consequence of the existence of angiotensin-converting enzyme 2 in cholangiocytes and cytokine-persuaded hepatic injury ^{16,17}. Moreover, hepatic damage could be messed up with the usage of antiviral drugs used in the management of Corona virus disease-19 ¹⁷. Severe inflammation in muscles of pericardium, shock, arrhythmias, and cardiac failure have also been described as cardiac signs of COVID-19 ^{8,18}. Because of the existence of angiotensin converting enzyme-2 in the heart, it is considered that both viral-arbitrated and cytokine-prompted damage are accountable for damage to the cardiac muscles ¹⁹. Involvement of heart with or deprived of pulmonary failure has been linked in as much as forty percent of corona virus disease deaths ²⁰. Escalated cardiac enzymes for instance creatinine kinase MB, troponin I, troponin T, and proBNP which are also indicators of cardiac damage have been established to relate with the threat of admissions to the ICU and demises ²¹. Proteinuria, hematuria, raised creatinine and BUN have been stated in patients of COVID-19; with approximately 5 % of them coming with severe kidney damage ^{22,23}.

Alcoholism

Alcohol dependency, explains a state in which a person's societal role is diminished and they develop physical acceptance for alcohol and abstinence from it may cause withdrawal symptoms ²⁴. Abuse of Alcohol discusses about a form of consumption that originates adverse effects across one or more foremost domains of life (e.g. work or relationships). The lifetime incidence for depending upon alcohol ranges from country to country, fluctuating from 1.8-32.4%. In the USA, 8 to 14% of the people are dependent upon alcohol, and 50% of those who are dependent on alcohol are possibly to become alcohol addicts ²⁵. If genders are to be concerned, then males are more anticipated to be dependent upon alcohol and abuse alcohol as compare to female, though, there has been a progressive rise in consumption of alcohol in females with a decrease in the difference amid female and male alcohol intake from the past few years ^{25,26}. Similarly, younger grownups have the greatest frequency rates of alcohol dependence and abuse, with those amid the ages of 21-25 years being the most distressed ²⁶. Apart from the distinguishable environmental factors related with alcoholism, research projects have pointed at a prospective hereditary

susceptibility in alcohol addicts. Progresses in the area of neurobiology's research have associated alcohol abuse with neural pathways by means of which hereditary susceptibilities to consumption of alcohol can be illuminated ²⁵. Study has revealed that 18 to 27 percent of male children born to parents who regularly consume alcohol develop complications with alcohol abuse even when raised by foster parents, in contrast with 6 percent of male kids from parents who are not alcoholic. Research studies on monozygotic twins revealed that there were numerous comparisons in the consuming frequency of monozygotic twins than non-monozygotic twins ²⁷. In contrast with the popular belief that intake of alcohol in least quantities from time to time aids to prevent disorders for instance diabetes, dementia, cardiac disease and cognitive deterioration; numerous research studies have revealed that even modest consumption of alcohol contributes to more than sixty acute and persistent conditions of health ²⁸⁻³⁰. Great number of health inferences of alcohol take place by means of mechanisms arising from other states of disease for instance carcinoma, hepatic ailments, high blood pressure, cardiac disease, violence, road accidents, and interpersonal clashes ²⁸.

Alcoholism and its effects on systems of the body and COVID 19

It would be anticipated that the negative effects of alcohol on the human body become intensified when associated with COVID-19 which correspondingly has multisystemic outcomes; and so far is in itself linked with a health response of community that persuades a big deal of psychological suffering and an enhanced probability of alcohol abuse, activating a vicious cycle. The harmful effects of alcohol on the pulmonary system have been defined in various research projects Among them one is compromised mucociliary stairway mechanism because of less sensitive cilia which is an significant adjustment for the eradication of particulate material, mucus and infectious agents from the airways has been documented ³¹. This is associated with an enhanced risk of pulmonary infections. An compromised function of pulmonary cilia has also been related to other pulmonary ailments for instance asthma, COPD, bronchiectasis, and pulmonary abscess ³². In persistent alcoholics, defense mechanism of host against infectious diseases are undermine.

Tight epithelial junctions of broncho-alveoli, an significant constituent of the innate immunity against infectious agents, are interrupted ³³. Additionally, alcoholism has been made known to cause dysfunction in alveolar macrophages ³⁴. The threat of ARDS has been establish to be three to four times greater in alcoholics in contrast with the common population ³². An significant antioxidant, glutathione, has been revealed to be reduced in the alcoholic's alveolar epithelial substance ³⁵. Reduction in alveolar glutathione is also a distinctive discovery in acute respiratory distress syndrome which is the principal reason of demise in COVID-19 ^{17,35}. Effects on heart in alcoholics depend on the extent of use, dosage, and distinct particularities of alcohol ³⁶ extensive dosage and prolonged use of alcohol have been associated with harmful consequences on the heart ³⁶. Diseases of cardiac muscles in alcoholic is distinguished by cardiomegaly because of hypertrophy in heart wall, expanded chambers of heart, and interstitial fibrosis; all of which come up with decreased capacity of contraction, cardiac failure, and unexpected death of heart ³⁷. Other negative effects of prolonged alcoholism on the heart comprises of dyslipidemia, hypertension, and cardiac arrhythmias ³⁸. Hepatic disease is an significant cause of alcohol-associated morbidity and fatality, because alcohol is principally processed by liver cells ³⁹. In contrast, the frequency of hepatic injury amid patients of COVID-19 varies from 14.8-53%, described by disturbed LFTs ¹⁶.

The development process of SARS-CoV-2 contagion can be defined in 2 stages: in the 1st stage, an early inherent defense happens in an effort to give pulmonary defense. Subsequently by a resulting 2nd stage of inflammation-related tissue damage. In vulnerable people, SARS-CoV-2 infection can advance to acute viral pneumonia and can lead to acute respiratory distress syndrome (ARDS). Acute respiratory distress syndrome is a diffuse, critical, inflammatory pulmonary damage that frequently needs mechanical air circulation. In reaction to such a “storm of cytokine”, unrestrained hyperinflammation can cause a failure in multiple organs. It is identified about how substantial consumption of alcohol might affect in infection of COVID-19. Whereas <15% of drunk alcohol go into the lung, exhalation is nevertheless an important process for elimination of alcohol, as demonstrated by the common utilization of the Breathalyzer test to

consistently evaluate levels of blood alcohol ⁴⁰. Excessive consumption of alcohol deeply alters inherent and adaptive immunity of lungs, leading to cause greatest degrees of viral pneumonia ⁴¹, RSV infection ^{42,43}, influenza A infection ⁴⁴, and microbial pneumonia ⁴⁵⁻⁴⁷. In 1918 Spanish flu pandemic, substantial consumption of alcohol was identified as a risk factor for deprived consequences ⁴⁸. Numerous current publications reporting patients of COVID- 19 failed to involve history of alcohol use ^{13,49}. More than half of the people scanned in China discusses intensifications in anxiety, depression, or stress in reaction to COVID-19 ⁵⁰. Throughout the period of social segregation, AUDs (alcohol usage disorders) amplified in province of Hubei in contrast with other provinces of China because of COVID-19 outburst. Hubei, the province in central china undergone a ten times escalation in harmful consumption contrasted with other provinces having smaller number of limitations ⁵¹. In the US, sales of alcohol showed a 477 percent raise in April 2020 compared to the similar week in month of April 2019 ⁵². Loneliness, Social isolation and quarantine have long been identified as a inclining factor for problem of alcohol consumption ⁵³. Depending upon confined situations of economy throughout the pandemic of COVID-19, in the initial phase people may drunk a smaller amount of alcohol because of monetary limitations, but ultimately surge in consumption of alcohol was a result of enhanced stress with passage of time ⁵⁴. Another way alcohol can stimulate infection is because of the myths that consuming alcohol can defend against infection of COVID-19. This misconception was spread in Iran that consuming alcoholic drinks or gargling or with it would sterilize the mouth or internal parts of the body and prevent contamination by destructing the virus. Since production of alcohol is illegal in Iran, it is characteristically acquired by means of the black market. As a minimum 180 individuals in Iran expired by consuming black market alcohol that was adulterated with methyl alcohol, with more than 2500 looking for medical care ⁵⁵. The misconception that alcohol averts infection of COVID-19 encouraged the WHO (World Health Organization, 2020) and the NIAAA (National Institute on Alcohol Abuse and Alcoholism, 2020) to announce that excessive consumption of alcohol does not prevent or cease COVID-19. However it has a harmful effects on innate immunity of lungs ⁵⁶. It has extensively been identified that alcohol damages the capability of the pulmonary system to combat infection

⁵⁷. A distinctive feature of infection COVID-19 is shortness of breath. So far Alcohol is related in number of situations with shortness of breath ⁵⁸, therefore implying the threat for enhanced dyspnea in the patients of COVID-19 along with alcohol use disorder. Alveolar phagocytes play an indispensable part in protecting the respiratory system from viral diseases. Rats that were deficient of alveolar phagocytes have more acute hypoxia and pulmonary failure in reaction to viral influenza ⁵⁹. Substantial use of alcohol considerably decreases production of pulmonary macrophage cytokine ⁶⁰ and intensely disturbs the functions of alveolar macrophage ^{34,61}. Alcohol also weakens the function of macrophage ensuing engulfment, as antigen demonstration, along with numbers of lymphocyte, are decreased by alcohol ³⁹. After consumption Alcohol begins to absorb by means of the ciliated epithelium straight across the respiratory circulation. Evaporation in the course of exhalation is followed by the process of condensation because the air in the trachea makes the vapors cool ultimately leading to a greater alcohol concentration ⁶² which alters host defenses of respiratory epithelium by changing barrier function, cytokine discharge, and functions of cilia ⁴³. This modification in defense mechanism of lungs could increase the threat of getting SARS-CoV- 2 infections. Furthermore, acute respiratory distress syndrome is expected to be more severe in patients who have a damage to the pulmonary system by infectious agents including viruses. Meta-analysis of thirteen longitudinal studies establish an relationship between consumption of alcohol and the possibility of developing SARS among adults ⁶³. This proposition has thoughtful consequences as consumption of alcohol is extensive all over the world. Furthermore, alcohol is barely identified as harmful substance for the health of lungs in contrast with other organs for instance the liver generally by the public.

Conclusion

Alcohol negatively affects nearly each and every cell of the pulmonary system and a lot of these alterations strongly put those who consume alcohol in large quantity at greater risk of developing COVID-19, more severe acute respiratory distress syndrome and pneumonia. Further extensive research is required to assist in understanding how to better manage those who consume alcohol or are addicts of alcohol with COVID-19.

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