Update on Evidence-based Practices in Health Policy and Systems

The burden of alcohol use: an update on the local and global picture

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DOI: https://doi.org/10.4038/jccpsl.v25i2.8212

Received on: 21 June 2018

Accepted on: 30 June 2019

Introduction

Ethanol is popularly referred to as alcohol, although all organic compounds with an -OH segment attached to the alkyl chain are known as alcohols (1). Ethanol is water soluble, because alkyl chain is very short with just two carbon atoms (1). The boiling point of ethanol is 78°C and the density is 0.79 g/ml (1). In this article, the term alcohol refers to ethanol.

Use of alcohol as a psychoactive substance and a cultural and culinary implement has a long history (2). While alcohol has had a significant impact on human civilisation, the chemical alcohol also has various short- and long-term effects on different organs of the body (3). The acute effect on the function of brain is the so-called psychoactive effect.

The primary acute effect of alcohol on brain in the short term is depression of the electrical activity of the brain, hence the name 'CNS depressant'(4). Alcohol potentiates the inhibitory effects of gamma-amino butyric acid (GABA) and dampens the excitatory effects of glutamate by antagonising N-methyl-D-aspartate (NMDA) receptors (5). Benzodiazepines are the other CNS depressant group among the well-known psychoactive substances. They also act on GABA receptors, and, understandably, show cross-tolerance (4-5). CNS depressants produce increased reaction time, somnolence, respiratory depression; and they do suppress anxiety and insomnia, but only briefly (4-6). While anaesthetics rapidly depress global brain activity, alcohol first impairs highly integrated functions, such as skilled dextral performance (6).

The pattern of alcohol use (Table 1), usually over 12 months, is recognised as a psychiatric disorder when characterised by certain diagnostic criteria (7). The most severe form of alcohol use

Table 1. Types of alcohol use

Category of alcohol use	Diagnosis	Description
Pathological alcohol user	Alcohol dependence	More severe form of alcohol use disorder
Pathological alcohol user	Harmful use of alcohol	Less severe form of alcohol use disorder
Non-pathological alcohol user	None	User without an alcohol use disorder
Non-user of alcohol or abstainer or teetotaller	None	User who has not taken alcohol for a considerable period of time (usually 6 to 12 months or lifetime)

disorder is 'alcohol dependence', which is characterised by features such as tolerance to alcohol and withdrawal state when blood alcohol level is lowered (7). The less severe one is named 'harmful use of alcohol', where the main feature is use of alcohol despite experienced harm usually sans tolerance and withdrawal (7). People who use alcohol but fail to meet diagnostic criteria for dependence and harmful use are 'non-pathological' drinkers. Others are 'abstainers' or teetotallers. Individuals may shift from one category to another over time.

Health burden

Alcohol affects almost all organs of the body through various mechanisms. Some of these effects are visible during or soon after a session of alcohol use (short-term effects), while most are visible following repeated regular use (long-term effects). Some of these effects are summarised in Table 2.

Table 2. Effects of alcohol on individual organs

Organ	Mechanism	Effect/ condition
Short term effects		
Brain	Increased GABA activity and reduced glutamate activity	Depression of CNS activity
Pituitary	Inhibits secretion of vasopressin	Polyuria
Blood vessels	β-adrenergic blockade	Peripheral vasodilatation
Long term effects		
Brain	Inflammatory process causing neuronal death	Frank dementia to subtle alterations in cognitive functions
Liver	Direct hepatotoxic effects of ethanol and its metabolites (acetaldehyde-acetate, fatty acid ethanol esters, ethanol-protein adducts)	Almost all heavy alcohol users develop fatty liver while a minority develop cirrhosis
Pancreas	Fibrosis mediated by an inflammatory process	Chronic pancreatitis
Lipid metabolism	Increase in high-density lipoprotein (HDL) type cholesterol with lower level of alcohol intake, increase in both HDL type cholesterol and low-density lipoprotein (LDL) type cholesterol with frequent heavy alcohol intake	Reduced ischaemic events on low-moderate alcohol users with no reduction in overall mortality (Refer Figure 1)
Heart	Multiple mechanisms including toxic effects of acetaldehyde on cardiac muscle	Cardiomyopathy
Blood vessels	Inflammatory process Alterations in catecholamines and angiotensin II secretion	Atherosclerosis Hypertension
Lung	Altered oropharyngeal flora, oesophageal motility, and alveolar barrier function	Increased risk of acute respiratory distress syndrome
Muscle	Impaired protein synthesis and other mechanisms	Chronic alcoholic myopathy
Bone	Oxidative damage of osteoblasts and multiple other mechanisms	Osteopenia
Immune system	Impairment of immune system	Increased risk of tuberculosis, chest infections and malignancies
Mouth, pharynx, larynx, oesophagus, colon, rectum, liver and the female breast	Damage to DNA, especially from acetaldehyde	Malignancies

Sources: (3, 5, 8-14)

The controversy on the health benefits of alcohol use, especially protective effects against ischaemic heart diseases, has been simmering for many decades while generating much research (15). The so-called J-shaped curve of mortality in alcohol users has been seriously challenged. Increasingly, the evidence base on health effects of alcohol is becoming clearer (15).

The giant high-quality meta-analysis by Wood and colleagues published in 'The Lancet' in 2018 on the risk thresholds for alcohol consumption arguably put an end to the above controversy (16). The researchers have studied individual-participant data of nearly 600,000 current drinkers from 83 prospective studies to identify the levels associated with the lowest risk for all-cause mortality and for cardiovascular disease (13). This meta-analysis has found that the relationship between mortality (due to whatever cause) and alcohol consumption is positive and curvilinear, and not a j-shaped curve (Figure 1). It was only the cardiovascular diseases, especially ischaemic heart diseases, that showed a j-shaped curve, which still is not a real benefit, as the mortality did not show such a relationship (13).

The minimum risk of death is found in the group who used 100g of alcohol or less per week, i.e. one to two drinks a day, who were shown to lose six months of future life at 40 years of age due to alcohol consumption (13). The group who used more than 350g of alcohol per week would lose four to five years of future life if they were aged 40 years (13). Despite the inevitability of the alcohol industry and their allies ridiculing these findings as "implausible and impracticable", public health proponents need to actively and objectively focus on the scientific merit and impact of these important findings (16).

In addition to the health burden to the individual, landscape of which is described above, the magnitude of global health burden due to alcohol use is staggering. The number of disability-adjusted life-years (DALYs) attributed to the total health burden due to alcohol use was 99.2 million (95% uncertainty interval (UI)=88.3, 111.2) in 2016, according to the data compiled by GBD 2016 Alcohol and Drug Use Collaborators (17). This includes, not only the direct health burden due to alcohol use disorders, which was 16.2 million DALYs (95% UI=13.0, 20.0), but DALYs attributable to conditions contributed to by alcohol ranging from communicable and non-communicable diseases to injuries. Injuries carried the highest proportion out of the total health burden due to alcohol, which was 21 million DALYs (95% UI=15.9, 26.3). Health burden attributable to cardiovascular disease related to alcohol use was a close second with 20.8 million DALYs (95% UI=14.9, 27.1), while alcohol related malignancies were

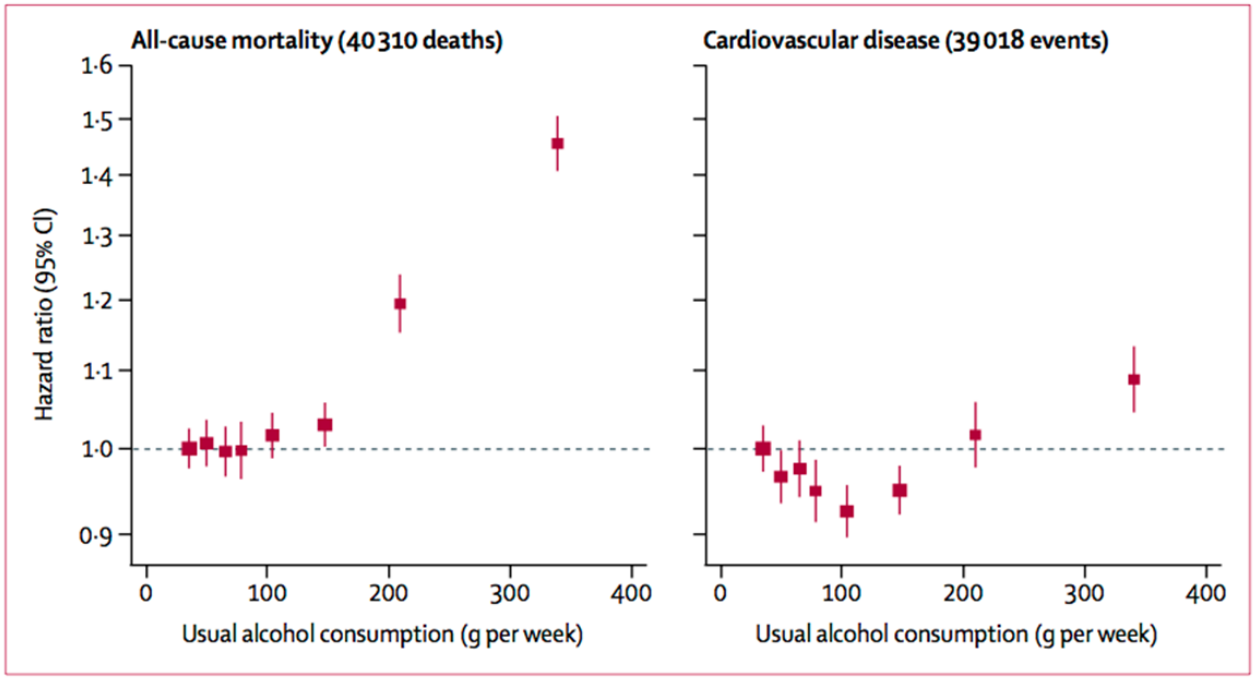

Figure 1. Associations of usual alcohol consumption with all-cause mortality and the aggregate of cardiovascular disease in current drinkers (Reproduced from The *Lancet* 2018; 391: 1513-1523)

responsible for 14.8 million DALYs (95% UI=13.5, 16.1) (17). The Global Status Report on Alcohol and Health (GSRAH) published by the World Health Organization (WHO) calculates the total health burden attributable to alcohol use to be even heavier at 132.6 million DALYs (10).

The GSRAH reports that the 15y+ per capital alcohol consumption in 2016 to be 6.4 litres for the world, 4.5 for South-East Asia region and 4.3 for Sri Lanka (10). It also reports that the unrecorded alcohol consumption in Sri Lanka to be 0.4 litres of pure alcohol per capita in 2005, 1.5 in 2010 and 1.6 in 2015 (2, 10). The sudden, almost four-fold, rise within five years between 2005 and 2010 is to be noted. Significant doubt has been expressed over these estimates in the sales and survey data analysis report compiled by Leifman et al titled 'Trends and Patterns of Alcohol Consumption in Sri Lanka: 1981-2017' (18). Leifman et al reports unrecorded and recorded alcohol use, respectively, to be 0.09-0.18 litres and 2.4 litres of pure alcohol per capita (15+). They also note that the total recorded consumption in Sri Lanka peaked in 2012 at 2.9 litres and declined since then (18).

Health burden of the world due to alcohol is lesser than that of tobacco. As 2.8 million deaths (95% UI=2.4, 3.3) were attributed to alcohol use in 2016 (17), tobacco was responsible for 6.4 million deaths (95% UI=5.7, 7.0) and 148·6 million (95% UI=134.2, 163.1) DALYs in 2015 (19).

In Sri Lanka deaths due to alcohol related cirrhosis, traffic injuries and malignancies were 4,201 per 100,000 population (15y+) in 2016 (10).

Economic burden

De Silva et al reported in 2010 that in Sri Lanka 43.5% earned less than USD 76 per month while spending more than 40% of their meagre income on alcohol and tobacco (20). Although the current income levels are higher in Sri Lanka, this still highlights the economic burden of alcohol on individual families.

Alcohol is hailed as a boost to economy by the alcohol industry and its allies, including some economists, while the costs are largely, mostly intentionally, ignored. The costs of curative health care (inpatient, outpatient and patient's out-of-pocket expenditure) for alcohol related diseases including intentional and unintentional injuries to self and others was revealed to be a staggering USD million 388.39 in 2015 through a major study conducted by the National Authority on Tobacco and Alcohol (NATA), the WHO, the Ministry of Health and Nutrition of Sri Lanka and the Sri Lanka Medical Association (21). They reported an even higher non-health care cost of USD million 497.50 due to absenteeism and premature death. According to this study, the total economic cost of alcohol was over USD million 885.89 in Sri Lanka in 2015 (21).

The economic cost of alcohol is shown to be, in the UK, in excess of GBP million 21,000 in 2015 (22), USD million 9,627 in Thailand in 2006 (23), and South African Rand million 245,933-280,687 (approximately USD million 16,000-18,000 based on 2019 exchange rates) in South Africa in 2009 (24).

The author, being a psychiatrist, finds that the burden borne by the alcohol user, his loved ones and others in the community is still not fully captured by the statistics given in this paper. The heartache experienced by the spouse and children of a man who spends hours drinking alcohol with few others at a family wedding, the frustration felt by them as he is not fit to drive them back home, the shame felt by them as he staggers and dances becoming the laughing stock are few examples of the burden that is routinely missed to be captured in numbers. The deterioration in personality of the chronic heavy alcohol user making him unrecognisable to his loved ones and the long-lasting negative impact on the personality development of his children are elusive to measurement, too. Interestingly, the attempt to scientifically study the harm to others from alcohol use has now started (25-26). The author is a member of an international research team currently studying this in Sri Lanka and in few other countries.

Way forward

The shift in the public attitude towards tobacco from commodity to product harmful to health over the last half century is a critical part of the narrative of the tobacco control in today's world (27). The health, economic and personal burden of alcohol use is extensive. However, the public, political and academic discourse is not yet ready to accept a paradigm shift in their attitude towards alcohol use similar to what happened in the case of tobacco smoking.

The current attitude towards alcohol is evident in the Global Status Report on Alcohol and Health published by the WHO, which denotes harm due to alcohol use by the dubious term 'harmful use of alcohol' (10). This term gives rise to confusion, as it is the same term that is used to denote a type of alcohol use disorder (Table 1) in the ICD-10 Classification of Mental and Behavioural Disorders published by the WHO (7). Furthermore, 'harmful use of alcohol' does not effectively capture harm due to 'non-pathological alcohol use' such as traffic injury following alcohol use in persons who do not have pathological drinking.

A prerequisite to traverse the road towards a future world that perceives the role of alcohol and alcohol industry in public health the way it perceives the role of tobacco and tobacco industry today, is to induce a progressive alteration in the public, political and academic discourse. The author has already pointed out the need of a revision of taxonomy in alcohol, and suggested two new terms, 'value' given to alcohol and 'promotion' of alcohol use (28). The letter calls on doctors to be vigilant at all times to detect how they become, intentionally or unintentionally, involved in promotion of alcohol and its use (28).

Perhaps, the time is right to call for a shift in our attitude towards alcohol; towards a more progressive and scientific one – not towards a prohibitionist one. Such a futuristic attitude would make us consistently and assertively question the 'value' given to alcohol and the ways it is 'promoted' across social, academic and other platforms. With the publication of the findings of Wood et al, it is now confirmed that even small amounts of alcohol are harmful to individual health. Furthermore, evidence of harm to others from alcohol use in the primary user is being synthesised currently. In this context, alcohol use and alcohol industry start to look increasingly similar to tobacco smoking and tobacco industry. The need of an international Framework Convention for Alcohol Control (FCAC), similar to the WHO's Framework Convention on Tobacco Control (FCTC) has been highlighted (29). It may not be essentially unwise to assume that the call for the attitude shift has already begun.

Declaration of the author: Mahesh Rajasuriya is a member of the Expert Committee on Tobacco, Alcohol and Illicit Drugs of the Sri Lanka Medical Association, the founding director of the Centre for Combating Tobacco at the Faculty of Medicine, University of Colombo, and the Chairman of the Alcohol and Drug Information Centre (ADIC) Sri Lanka.

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