Screening For Alcoholism: What Role For The Dentist?

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ABSTRACT

The role of alcohol as a major factor in traumatic death worldwide is inestimable, ranging from mortality due to motor vehicle accidents, falls, fires, drowning, homicides, cultism, and suicides. Hence, scientists are globally creating innovative screening tools for blood alcohol concentrations (BAC) to establish a baseline for safety or impairment to drive on the highways. The utilization of these tools has revealed results necessitating enactment of legislation against high BAC in order to protect the population. The dentist, as a healthcare provider, can also play a leading role in screening for alcoholism, as well as restrain from prescribing mouthwash with alcohol, so as not to contribute to higher levels of BAC. The convenience of using various screening tools is highlighted and the dentist can decide the easiest approach to screenings.

INTRODUCTION

In developed countries such as Canada and the United States, dentists are already playing a leading role in the cessation of tobacco smoking.[1] A study by Campbell et al[2] found that 58.5% of patients surveyed believes that dental offices should provide tobacco cessation services. If so, why not alcohol screening too, which has similar or more devastating effects on our well-being? As an integral part of the health provider, dentists can also contribute to cessation of alcoholism with their patients after thorough screening and establishing the blood alcohol concentration (BAC) of the patients. Most alcoholics are known to be smokers and therefore have halitosis, which can easily expose them as having a problem. Apart from halitosis, other dental diseases may cause them to visit the dentist for treatment.

As a role model, the dentist, in collaboration with medical counterparts, can be part of rehabilitation team for such victims. For example, Nigeria, like other third-world countries, has witnessed the proliferation of drugs and substance misuse or abuse in the management of dental diseases. Anecdotal reports show that alcohol is one of the leading substances commonly applied as therapeutic regimen to treat dental lesions. The Health Media Watch column in the recent issue of the Journal of the American Dental Association summarized a study from Pediatric Dentistry that demonstrated mouth rinses containing alcohol could be life-threatening if ingested by young children.[3] The clinician is faced with dilemma of rationalizing its use, be it for tooth decay or social purposes. Whatever the use, the BAC level is of

significance to the safety of the victim and his immediate environment. Alcohol is the most widely used drug by young persons between the ages of 12 and 17 years.[4] Alcohol abuse should therefore be screened by all health providers including the dentist. This paper reviews the impact of substance abuse on the socio-economic life of the populace and enumerates simple methods of alcohol detection that can be routinely used in the dental clinic.

IMPACT OF ALCOHOL ABUSE ON GLOBAL AND NATIONAL HEALTH

Alcohol abuse produces significant threats to health worldwide. It has been ranked as the fourth leading cause of disability and healthcare burden in a global report.[5] In the United States, alcoholism has a high lifetime prevalence rate of 10%.[6] At least 15.4 million adults have alcohol-related problems.[7] Alcohol-related costs adversely impact the United States healthcare system and society at large. This healthcare problem affects many individuals, while creating enormous social, physical, and psychological problems for the individual, the family unit, and society.[8] The Ninth Special Report to Congress indicates increasing costs, estimated at $166.5 billion per year, in direct and indirect healthcare and social costs.[9]

Alcohol has been identified as a factor in 50% of all motor vehicle crashes, burns, interpersonal violence, including homicides, as well as an increased crime rate.[8-10] More years are lost to alcohol-related causes than to heart disease, a rate second only to cancer.[11]

Alcohol abuse is a serious problem for elderly adults affecting as many as 17% of that population.[11,12] Until recently, problem drinking in the elderly has been ignored and minimized by both healthcare professionals and the general public. The treatment of persons with coexisting mental and substance abuse disorders is a subject of growing importance, which may involve 40% to 50% of the persons with a psychiatric diagnosis.[10]

With alcohol-impaired drivers contributing to motor vehicle-related fatalities and other violent death, all health professionals must network to screen their patients and ensure compliance to legislation, where it exists. In the United States, the legal level of blood alcohol varies from 0.8 g/L to 1.0 g/L for drivers over 21 years, depending on the state.[13] A bill requiring states to enact legislation lowering the allowable BAC from 0.10 to 0.08 was signed by President Bush in October 2000.[14] Countries with legislation against alcohol abuse can be sorted into groups, according to the permitted blood alcohol level:[13]

- Legal limit less than or equal to 0.8 g/L: South Africa, Austria, Belgium, Canada, Denmark, Spain, Great Britain, Italy, Luxembourg, Germany, Switzerland, United States
- Legal limit less than or equal to 0.5 g/L: Australia, Finland, France, Greece, Iceland, Israel, Japan, Norway, Netherlands[14]
- Legal limit less than 0.5 g/L: Bulgaria, Hungary, Poland, Rumania, Czechoslovakia, Russia[14]
- Legal limit less than or equal to 0.2 g/L: Sweden.

There is no such legislation in Nigeria to deter drivers, thus contributing to high rate of motor vehicle accidents with attendant mortality and morbidity.

Alcohol screening identifies individuals in a patient population who have begun to develop or who are at risk for developing alcoholism.[15] Recent studies indicate that physicians in various healthcare settings often do not recognize and treat alcoholism.[16-18] These findings underscore the need for effective and accurate procedures that will enable

clinicians to screen for alcoholism. Although dentists routinely take patients' dental histories, the habit of using standard alcoholism detecting instruments is not considered. These instruments provide structured and consistent means to detect individuals at risk.

METHODS AVAILABLE FOR SCREENING

Two major approaches for screening are available, self-reported questionnaires/ structured interviews and clinical laboratory tests, which can be invasive or non-invasive.[19] The validity of the second method is based on sensitivity and specificity and can be expressed mathematically by application of Widmark's Formula or Fast Eddies 8/10 calculation method.

The calculation assumes that body alcohol concentration and blood alcohol concentration are not the same thing. That is because adipose tissue (fat) and bone do not hold alcohol. In other words, the alcohol does not spread throughout the body evenly. Very little of it is distributed to the fat and bone. Almost all of it is dissolved in the water-rich tissues of the body (muscle, blood, and organs) and it is dissolved in these water-rich tissues in just about equal concentration.

Therefore, in order to calculate the blood alcohol concentration, we must divide the weight of the alcohol by the weight of only the portion of the body that holds the alcohol, rather than the weight of the whole body. Widmark's original research, still valid today, found that the average man's body can hold alcohol in even distribution in 68% of its weight. In other words, 68% of a 150-pound man's body holds all the alcohol he consumes, in even distribution. 68% of 150 pounds is 102 pounds. (See equation 1).

Equation common sense body alcohol concentration

$$\frac{15\ \text{lb}}{150\ \text{lb}} = 0.0010 \quad 0.0010 \times 100\% = 0.10\%$$

Self-Reported Questionnaires and Structured Interviews

The CAGE questionnaire (C = Cut down on drinking; A = Annoyance with criticisms about drinking; G = Guilty about drinking; E = Using alcohol as eye opener).[20,21] is a self-reported screening instrument that is well-suited to a busy medical setting, when there is limited time for patient interview.[22] CAGE, which can be self-administered or conducted by a clinician, poses 4 overt yes or no questions and requires about 1 minute to complete. The test may identify individuals with alcohol problems who might have been missed otherwise.[21]

The Michigan Alcoholism Screening Test (MAST) is a formal, 25-item questionnaire that requires about 25 minutes to complete.[22] The focus is on the consequences of drinking problems and on the subjects' perception of their own alcohol problems. Two shortened forms of the MAST (a 13-item SMAST[23] and a 10-item b-MAST)[24] have been constructed from the original test and are highly discriminating for alcoholism.

The Self-Administered Alcoholism Test 25 is a 35-item questionnaire interview with a yes or no format. A score of 10 or greater denotes probable alcoholism; Hurt et al[26] evaluated its use.

The Alcohol-Dependent Scale (ADS)[27] is a self-reported questionnaire designed to measure elements of the alcohol dependence syndrome described by Edwards and Gross.[28] ADS and MAST have approximately equivalent specificity and severity. It is an index for alcohol dependency withdrawal symptoms and loss of control.

Other screening tools include Adolescent Drinking Inventory (AD-I),[29] a self-reported instrument devel-

oped to screen adolescents. It is 25-question survey that focuses on loss of control as well as social psychological and physical symptoms of alcohol problems. This screening tool has been used successfully by Allen and colleagues.[20] T-ACE was developed by Sokol and colleagues[30] for pregnant women who consume quantities of alcohol that potentially can damage the fetus. ACE is the same as CAGE, except the "G" is replaced by "T" for tolerance. The investigators considered a woman tolerant if she needs more than 2 drinks to feel the effect of alcohol.

Clinical Laboratory Procedures

Gas chromatography is invasive, long, and too tedious for ideal dental settings.[31] The spectroscope is too expensive and therefore not practical.[32] Finally, evidential breath analysis has advantages in law enforcement in that it is non-invasive, fairly hygienic, and a result is gained almost immediately. This method has been developed for almost 50 years. It began as chemical testing but most evidential breath testing is now performed by infrared light absorption.[33] Initial versions of Breathalyzer were introduced in the 1960s, such as Breathalyzer 900 or Breathalyzer 900a and, recently, Breathalyzer 1000. Other newer versions were Drager Alco Test 7110 employs the principle of absorption of infrared light at a wavelength of 9.5 mm by alcohol in a sample of air. The amount of the infrared light absorbed is used to measure alcohol in that sample.[34]

Blood Breath Ratio

In 1956, the National Safety Council in the United States (through its Committee on Alcohol and Drugs) made a recommendation that blood-breath ratio should be accepted as 2100:1, (that is the numeric relationship of alcohol in breath and blood). 41 This was based on research by Harger, Forney, and Baker,31 so that this value was not only accepted in the United States but also in Australia and several other countries. Since the mid 1970s, a ratio close to 2300:1 has become accepted by nearly all researchers as being a more realistic figure.32-34 Recent data put the ratio at 000048:1 while saliva is 1:1 thus making it a more reliable screening tool for BAC.35

Breath analyzing methods include: the Color-coded balloon, which is fun to use;[36] LAN a portable breath alcohol tester that is simple to use;[7] Alert J4X.ec, an evidential breadth alcohol tester;[38] and Drive Safe, a personal Alcohol Tester.[39]

Saliva Alcohol Screen: An Easy Approach For Dentists

The use of saliva makes it easier and more convenient for the dentist to screen for alcoholism, a notable example is Alco-Screen (Chematics Inc, North Webster, IN). It is a rapid test for the estimation of BAC and takes about 2 minutes. It is convenient, economical, and versatile. It is also quite sensitive. The ratio between the amount of saliva alcohol and blood alcohol is 1:1, while breath is 000048:1 making saliva-testing more sensitive.[39] In the procedure, the dentist must abstain from placing anything in the mouth for 15 minutes prior to the test. This includes non-alcoholic drinks, tobacco products, coffee, breath mints, food, etc. Simply open the package and remove the left strip and observe the light cream color of the strip. If it is dark tan or otherwise discolored, then discard it. Place in the mouth for at least 2 minutes, observing the color change to green or blue indicating the presence of alcohol and therefore a positive result. After 2 minutes and 30 seconds, the results can be erroneous. Estimate the approximate BAC by comparing the color of the regard pad with the color chart appearing on the test

packages. The more alcohol present, the darker the green color will be. Color standards printed on each package indicates the intensity of green colors for different ranges of BAC such as 02,04.08. User compares the color obtained from the mouth with the chart standards. A result where the reagent pad shows no color change (white or cream color) should be interpreted as negative.[36] The dentist is at great advantage with Alco-Screen since the saliva obtained from the mouth is his main domain of operation. Selection of each screening tool is at the discretion of the clinician, based on his or her knowledge, availability, ease and convenience for the patients as well as the dentist.

Other non-invasive methods that use saliva are AlcoScan AL-2500, one of latest digital alcohol breath analysis.[38]

Please note that the name of the tester depends on the laboratory manufacturing the product just like trade names for drugs. Q.E.D. Saliva Alcohol Test can be used for the quantitative determination of alcohol in saliva for in vitro diagnostic use.[39] The Q.E.D. Saliva Alcohol Test uses alcohol dehydrogenase to catalyze the oxidation of ethanol to acetaldehyde, with the simultaneous reduction of nicotinamide adenine dinucleotide (NAD).[39] An alkaline pH and an acetaldehyde trapping agent force the reaction to generate one mole of NADH for each mol of alcohol present.

The OnSite Alcohol tester is a disposable test that can detect alcohol in urine or saliva in 2 minutes or less and has been approved for use by the Department of Transportation.[40] Sometimes, however, blood may not be available, so other specimens may be used, such as urine, serum, spinal fluid, blood clot, vitreous humor, liver, brain, gastric contents, and other tissues, to give relative information.[41-43] The following average tissue/blood ratios have been calculated as conversion factors.[44-50]

Blood	1.00 (unity)	Spinal fluid	1.20
Liver	0.63	Vitreous humor	1.20
Brain	0.66	Urine	1.28
Serum	1.25	Breath	1:2,100 (1:2,300)

Significance of Oral Cavity and Mouthwash on BAC

A recent study by oral healthcare providers shows that alcohol-free mouthwashes are preferred. The reason is that alcohol dries out the mouth, thus making it an ideal playground for bacteria. Bacteria decompose into sulfur compounds, which is the cause of halitosis.[51] Other effects on the oral cavity include aggravation of any inflammation in the mouth, which is responsible for its own irritation and burning sensation because it is a solvent for plastics. It also softens those tooth-colored fillings, which accounts for changes in color and increases in stains and wear.

Dental implication of alcoholism should compel dentists to learn various screening methods for alcoholism and decide on a rationale for screening.

The introduction of alcohol to children and chemically dependent adults is of major concern. Alcohol in mouthwash can be as high as 54-proof liquor (beer is 5% to 7% alcohol, and wine is 12% alcohol).[51] Hence, new products such as Rembrandt mouth refreshing rinse are now highly recommended because it does not contain alcohol. Listerine, as a mouthwash, is known to contain 26.9% alcohol, which is more than 5 times the alcohol concentration of beer and more than twice that of table wine. Therefore, the ADA Scientific Council recommended child-resistant packaging and that the container carry a warning of keep out of reach of children. The study on acute ethanol toxicity from ingesting mouthwash in children found that as much as 1.9% of alcohol, which is potentially lethal, can be ingested from some mouth rinses.[51]

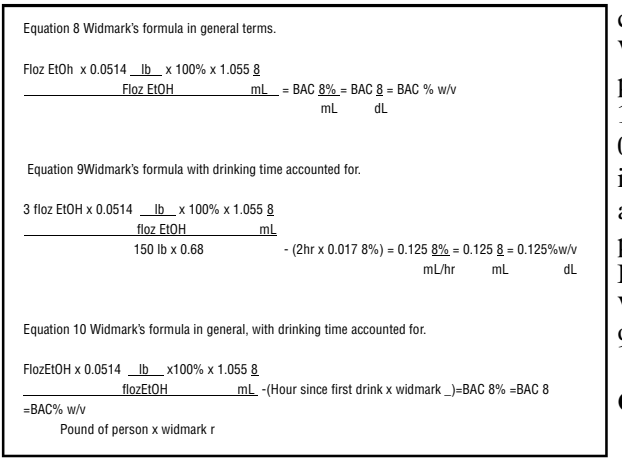

Figure 1. Equations 8, 9, and 10 of Widmark's formula.

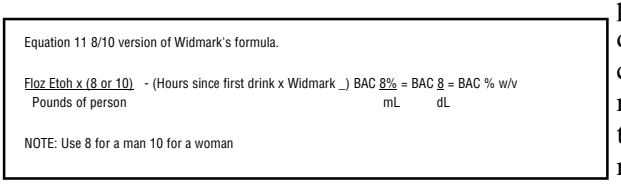

Figure 2. Equation 11 of Widmard's formula.

Biological Markers

Recent studies have revealed the role of biological markers as important to BAC screening. Several markers have been tried but the most potent are Gamma Glutamyltransferase (GGT) in hemolyzed blood and carbohydrate deficient transferrin (CDC) in dialyzed plasma, with CDC being the more specific and sensitive.[52,53]

Calculation Methods of BAC

Common sense is the best approach to explaining BAC calculation.5[4] According to Equation 1, if a 150-lb. person drinks 0.15 lbs. of pure alcohol, their BAC will be 0.10%. There are many stages involved in Widmark's formula, but only Equations 8, 9, and 10 are illustrated here for brevity(Figure 1).

The 8/10 Method of BAC Calculation

For an easier-to-use formula that's almost as accurate as that in Equation 10, just do all the multiplication and division of the numbers that don't change.[55] For a man, with a Widmark "r" of 0.68, just multiply 0.0514 by 100 and then by 1.055. Then divide the result by 0.68. If you get 7.97, then you did it right. Now round this off to 8 and put it in the equation in place of all the other numbers. For a woman, with an average Widmark "r" of 0.55, the result is 9.86. Round it off to 10 (Figure 2).

Computer Method

The EZ-ALCTM Blood Alcohol Chart software runs on personal computers and produces calculated BAC charts for courtroom use.[56] The 8/10 method is certainly much simpler than any previously described method of calculating BAC, but EZ-ALC is ideal for obtaining calculations of the various ranges of BAC at the time of driving, arrest, and chemical test. In addition, the program has the ability to calculate the alcohol in the body based upon a given BAC.[56]

CONCLUSION

Various methods for alcohol screening have been highlighted and the dentist as an active healthcare provider should be conversant with some of these methods. In keeping with alcohol screening, dentists should avoid prescribing mouthwash that will further elevate their patients' BAC. The enormity of psychosocial destruction and the mortality/morbidity from alcohol-impaired drivers makes it imperative for all healthcare providers to collaborate in identifying victims and referring them to appropriate personnel for treatment.

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