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ORIGINAL ARTICLE

Effect of Alcohol Swabbing of Venepuncture Site on Serum Alcohol Concentration: A Quantitative Analytical Study

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ABSTRACT

Aims & Objective: To find out whether there is any significant effect of alcohol swab application at venepuncture site prior to sampling on serum alcohol concentration.

Materials & Methods: Ten adult and healthy volunteers were selected randomly from staff working in Department of Forensic Medicine of Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospitals, Pune. Samples collected were preserved in commercially available Grey topped bulbs with preservatives as Sodium Fluoride; and were processed on same day for Serum Alcohol Concentration estimation by Alcohol Dehydrogenase method.

Results: Irrespective of alcohol content of swab applied for cleaning, insignificant values of serum alcohol concentration as <10 mg/dl i.e. lower than the limit of detection of the enzymatic assay were detected.

Conclusion: There is no significant effect of Alcohol swab application prior to sampling at venepuncture site on serum alcohol concentration.

INTRODUCTION

Under section 129 A of Bombay Prohibition Act 1949, a prohibition officer or police officer, who has reasonable grounds for believing that a person has consumed intoxicant, it is necessary that the accused should be medically examined and his blood be collected for being tested for determining percentage of alcohol therein; vide Bombay Prohibition Medical Examination Blood Test Rules 1959. [1] As per this rule the medical examiner shall clean the surface of, part of such persons body, from which he intends to withdraw the blood, with sterilised water and swab and no alcohol shall be touched at any stage while withdrawing blood from the body of the person. [2] Many of Indian reference textbooks also reflect the same rules and regulations. At present there are few assumptions and speculations regarding effect of application of using alcohol swabbing to clean venepuncture site while withdrawing blood for alcohol estimation. Some think that this will contaminate the blood sample and will give false serum alcohol concentration levels, especially more in cases where collection is within 30 seconds of application swab. Many other quote that alcohol is being absorbed through intact skin and thus leading to contamination of blood samples and false laboratory results. [3] However there is no any Indian study done so far to check the reliability of these assumptions quantitatively, which establish need of this study.

MATERIAL AND METHODS

The current study is quantitative and analytical type of study done on pilot basis. Staff working in the Department of forensic medicine and toxicology of Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospitals, Pune constituted material of the study. Ethical approval from Institutional ethical committee was obtained prior to study. Individuals who were adult i.e. age more than eighteen years, healthy, not being chronic alcoholic and who gave voluntary consent for participating in study were included and others were excluded. Accordingly blood samples were collected from ten staff individuals working in the department. Blood thus collected was sent for estimation of Serum Alcohol Concentration by Alcohol Dehydrogenase method in a NABL accredited laboratory. Except for following changes in cleaning of venepuncture site, standard procedure of venepuncture as per World Health Organization guidelines was followed. [4] Out of 10 individuals, five random individuals were selected to form Test group and remaining five to form Control group. All of them had their last meal minimum six hours prior to collection of blood. Amongst test group, individuals' blood was collected after applying standard alcohol swabs with content as isopropyl alcohol 70% (v/v). In rest of five individuals i.e. control group, non alcoholic swab was utilized for cleaning venepuncture site, out of which one willing individual was asked to consume 30 cc of whiskey one hour prior to collection of blood. In all these cases venepuncture for blood collection was done immediately within 5 to 10 seconds of applying swabs, irrespective of content of swab. Five ml of blood was withdrawn and blood was collected in commercially available Grey topped bulbs with preservatives as Sodium Fluoride. It was strictly followed that while withdrawing syringe from the skin only non alcoholic swabs were used. The samples were immediately sent to NABL accredited laboratory for Serum Alcohol Concentration estimation where laboratory experts were kept totally blind about this trial and methodology of collection. Reports obtained from laboratory were then observed for any variations of serum alcohol concentration among the test group individuals and control group individuals.

RESULTS

All participants of this study were males. Average age of participants was 31.7 years with youngest being 28 years old and eldest being 50 years old. Within control group, out of five individuals, as expected, only one individual who has consumed alcohol (30 cc of whiskey) one hour prior to collection of blood showed serum alcohol concentration of 12 mg/dl. However, others had serum alcohol concentration reported as <10 mg/dl or < 0.01 g/dl or < 0.01% i.e. lower than the limit of detection of the enzymatic assay. While observing results obtained from five individuals of Test group, it was noticed that, irrespective of application of 70% isopropyl alcohol swab to clean venepuncture site, Serum Alcohol Concentration in all of them was less than 10 mg/dl or 0.01 g/dl or 0.01% i.e. lower than the limit of detection of the enzymatic assay.

DISCUSSION

Majority of studies done in past and recently are in line with the observations of present study that swabbing skin with alcohol prior to sampling does not affect blood, plasma and serum alcohol levels significantly. [5-8] However methodologies followed by previous authors are different and not comparable directly. On the other hand, to the best of our knowledge, there is no any Indian study done reported till date with this or similar subject of interest. It is worth mentioning here that serum and plasma ethanol levels are greater than whole blood ethanol levels. [9] As ethanol preferentially distributes into the aqueous rather than the cellular phase of blood, higher levels are obtained with serum. Thus, the whole blood ethanol concentration is approximately 15% lower than the serum concentration. The serum/whole blood ratio is approximately 1.14. [10] If this fact is taken into consideration, in present study we can say that blood alcohol concentration will be negligible as serum alcohol concentration itself is less than 0.01%. This observation should definitely be reconfirmed by other Indian authors, such as to have impact on judicial hearings in such cases where blood alcohol concentration levels are of importance. Yigit O et al reported a case where they encountered high levels of blood alcohol i.e. 453 mg/dl, in a 20 year old worker brought to emergency department who did not give any history of alcohol consumption. Laboratory also denied any issue with the method or malfunctioning of any device. On further investigation it was found that nurse who collected blood used alcohol swab followed by povidone iodine swab prior to sampling. New sample collected again after povidone iodine swabbing measured blood alcohol levels as 0.3mg/dl. [11] However we feel that only alcohol swab applications could not result in such a drastic blood alcohol level rise, and there might be some other factors which

may have gone unnoticed. Secondly apart from this single observation, we could not find any other quantitative study to favour false positive results in blood, plasma or serum alcohol concentration due to alcohol swabbing prior to sampling. Lippi G et al also concluded that using ethanol containing antiseptics before venepuncture may not be considered important cause of spurious or false positive results of alcohol measurement, however they suggested collection of blood samples for alcohol testing should be preferably repeated if, needle touched or swabbed by cotton or gauge pad soaked with alcohol, if venepuncture performed with needle under pressure by cotton or gauge pad soaked with alcohol or if needle withdrawn from the vein while the blood tube was still aspirating. [3] One more argument may arise that in present study lower levels of alcohol may have occurred as alcohol is volatile and its concentration falls with time especially if not preserved well. However it is to be noted that, in present study blood samples were collected in commercially available Grey topped vacutainers with Sodium Fluoride as preservative and they were sealed immediately and were processed in laboratory on the same day within six hours, minimising slightest possibility of natural decay of volatile alcohol and disproving the argument. Even though alcohol is poorly absorbed through intact skin and irrespective of all above studies denying false positive results in blood alcohol concentration, in the case of legal proceedings, current recommendations in the literature support a challenge to the reliability of the evidence when a blood sample obtained for purpose of determination of alcohol content is drawn, following alcohol preparation of skin. [12-14] Field of medicine is advancing every day. Literature in Forensic Medicine written many years back needs to be counter checked and evaluated now, before following blindly. Evidence based literature in the field of Forensic Medicine and toxicology is need of an hour.

CONCLUSION

From above study it is very much clear that there is no any significant effect of Alcohol swab application prior to sampling at venepuncture site on serum alcohol concentration estimated by alcohol dehydrogenase method.

Limitations of Study

Small sample size is one of the important limitations of study along with use of only alcohol dehydrogenase method for determination of serum alcohol concentration making it difficult to comment on other methods of serum alcohol analysis.

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