

Biochemical markers used to ascertain exposure to cigarette smoking and environmental tobacco smoke

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Background: Self-reports of smoking status may not always be reliable, especially in situations where smokers feel under strong pressure to quit, but was not able to achieve. Meanwhile exposure to environmental tobacco smoke (ETS) is still a public health concern, and passive smokers are still at risks of possessing smoking-related health problems. Biochemical markers can be used to validate claims of nonsmoking and level of exposure to ETS which include measures based on carbon monoxide (CO) and cotinine. Traditionally, cotinine have been measured in hair, saliva and urine, but in our study, we used samples from saliva and urine. Previous research showed measurement of cotinine provides reliable means of determining smoking status and exposure over a period of 2-3 days. Levels of CO are easier to determine but may be raised through exposures unrelated to smoking.

Objective: To compare the methods used as biochemical markers of tobacco smoking and ETS.

Method: Subjects were selected from those attended quit smoking talk. At baseline, subject fill in an informed consent and a self-administered questionnaire giving details of smoking habits and demographic data. Subjects were recruited for a 6-months follow-up smoking cessation program. At the end of program, biochemical validations were done to ascertain smoking status. Subjects provided saliva and/or urine samples and also undertaken CO test in addition to their self-reported smoking status. PiCO⁺ Smokerlyzer® (Bedfont Scientific Limited) was used to determine the level of carbon monoxide (CO) in an expired air sample. HPLC-UV method was used for identification and quantification of cotinine in urine samples. The NicAlert® (Nymox Corporation), a semiquantitative method that used a dipstick was used to measure the level of cotinine in saliva samples. SPSS 12.0 was used for statistical analysis.

Result: Mean age is 34.99 ± 8.5 (range 20 to 57 years old). 96% are Malays. Saliva NicAlert® cut-off point for smoker and nonsmoker is 1 and 50 ng/ml in HPLC-UV. In CO test, the cut-off point is 8 ppm. The sensitivity of saliva NicAlert® to detect smokers is 99% and 30% smokers detected as nonsmokers using CO test were ascertained as smokers. 11% smokers identified as nonsmokers with CO test were identified as smokers with HPLC-UV urine cotinine detection.

Conclusion: The use of CO as a marker of nicotine exposure is useful but disadvantages such as the presence of environmental sources of CO other than tobacco and a short half-life of 4-5 hours, makes it a biomarker of recent exposure and increases the chance of false negative. Cotinine has a longer half-life of 15-19 hours in body fluid (urine or saliva) therefore cotinine levels accumulate throughout the day. In addition, cotinine is eliminated over a longer period of time plus its stability and ability to quantify long-term exposure; it is more suitable as a preferred biomarker of tobacco smoking and ETS exposure. In general, it is important to evaluate disease outcomes related to tobacco smoking and ETS, and cessation rates should incorporated the most sensitive and specific objective measurement for confirming self-report.

Keywords: Tobacco, self-reported, biochemical markers, carbon monoxide, cotinine