



TO EVALUATE THE TASTE SENSITIVITY TO PHENYLTHIOCARBAMIDE (PTC) IN SMOKERS AND NON-SMOKERS

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KEYWORDS :

AIM: To evaluate taste sensitivity to Phenylthiocarbamide (PTC) in smokers and non-smokers

OBJECTIVES:

- 1) To study and compare taste sensitivity to Phenylthiocarbamide (PTC) in smokers.
- 2) To study and compare the taste sensitivity to Phenylthiocarbamide (PTC) in non-smokers.
- 3) To study and compare the taste sensitivity to Phenylthiocarbamide (PTC) in smokers and non-smokers.

MATERIALS AND METHODS:

The study was conducted in a well-known tertiary care hospital. The participants are divided in to two groups. The smoker groups and non-smoker group. Smokers were selected from outdoor patients from the Department of Chest Medicine and the non-smokers were from the hospital staff. The participants of both the group were male between 18-45 years of age. The permission to conduct the said study was taken from the local ethical committee. Sample size: 122 voluntary participants Duration of the study: 2 years

Selection Of The Subjects:

The volunteers were selected according to pre-set criteria for selection. Consents of the subjects were taken. Detailed medical history of the subjects was taken regarding their diet, food, personal habits, drug use or medication or any significant medical history and detailed physical examination of the subjects was carried out.

Sample size: Total sample size for this study was 122 male subjects, 61 were smokers (Case) and 61 were non-smokers (control group) healthy male subjects.

Inclusion Criteria:

Male volunteers not on any long-term medication or on drugs that influence taste sensitivity (e.g. Quinine, Chloroquine, Coffee etc.) volunteers don't have any acute illness were included (e.g. difficulty in breathing, pain in abdomen etc.)

Volunteers in the study group included in this study were: -

Current smokers: Adult who have smoked 100 cigarettes in their life time and currently smoke cigarettes every day or some days defined as per Center of disease control and prevention. Smokers classified according to smoking index: -Jindal's classification in Indian COPD guidelines. (Smoking index = Number of cigarettes per day X Years of smoking) , Mild: (Smoking index < 100) , Moderate: (Smoking index 100 - 300) , Severe: (Smoking index > 300)

Volunteers in the Non-smokers: Adult who currently does not smoke cigarettes, including former smokers and never smokers. (Never smokers: Adult who have never smoked a cigarette or who smoked fewer than 100 cigarettes in their lifetime.),(Former smokers: Adult who have smoked at least 100 cigarettes in their lifetime, but currently they do not smoke) defined as per Center of Disease Control and Prevention.

Exclusion Criteria:

Volunteers who were known cases of hypersensitivity to PTC in past, who have organic disorders interfering with taste sensation (e.g. Otitis media, Deafness, etc.), who were chronically ill. (e.g. TB, DM, HTN etc.) , who were taking any medication. (e.g. , AKT, Sedatives etc.) Volunteers who had undergone any recent surgery of the oral cavity, having cardio-respiratory illness. having neurological disorder.

PROCEDURE OF THE STUDY:

Precautions:

The subjects were asked not to eat or drink anything except water (at room temperature) at least for one hour before the study

Taste sensitivity carried out with HARRIS AND KALMUS METHOD . A stock solution of 130 mg of PTC powder in 100 ml of distilled water was prepared as solution No.1, 50 ml of this solution was taken and 50 ml of distilled water was added so that concentration of (PTC) becomes half of that of the previous solution, i.e. 64 mg/100ml. The procedure was started using solution No.13 weakest concentration. Using dropper 2 to 3 drops of solution were put over the posterior part of tongue. Subject was asked to keep the solution on his tongue for 3 to 4 seconds. Subject was instructed not to swallow this solution at any time. The subject was asked to rinse his mouth with water and asked about the taste of solution. If the subject was not able to perceive bitterness of solution, then the subsequent solutions (solution No.12, 11,10,9,8,7,6,5,4,3,2, and 1) with higher concentration of (PTC) was used for test. The concentration at which the bitter taste was perceived is called threshold of (PTC) sensitivity for that subject. Tasters are those who were able to detect the bitter taste of PTC in solution No. 13 to solution No.5. Non taster are those subjects who were able to detect the bitter taste only in solution No.4 to solution No.1 or who could not detect the bitter taste in any solution.

RESULT :

Chi square test were used to find out the statistical significance of the results. The p-value less than 0.05 indicate that the results are statistically significant and the p-value less than 0.01 indicate that the results are highly significant statistically.

Table 1

GROUP	NON-SMOKERS	PERCENTAGE
Tasters	39	63.93%
Non-tasters	22	36.07%
Total	61	100%

Table 2

GROUP	SMOKERS	PERCENTAGE
Tasters	25	40.98%
Non-tasters	36	59.02%
Total	61	100%

Table 3

GROUP	SMOKERS	NON-SMOKERS	PERCENTAGE
Tasters	25(40.98%)	39(63.93%)	64(52.45%)
Non-tasters	36(59.02%)	22(36.07%)	58(47.55%)
Total	61(100%)	61(100%)	122(100%)

Test	Value	df	P value	Significant or notsignificant
Chi-square test	6.40	1	0.007	Significant

The numbers of tasters were 25 (40.98%) in smokers and the numbers of tasters in non-smokers were 39 (63.93%). This show significant more taste sensitivity to (PTC) in non-smokers as compared to smokers. According to the previous study, the percentage of the PTC taster individuals is 70.2%, whereas this rate is 29.8% for non-tasters (Demirsoy, 1998). (1)

DISCUSSION:

Subjects were divided in to tasters and non-tasters depending on ability to perceive bitter taste. The subjects who were able to detect PTC in Solution No. 5 to 13 (8.125 mg/100 ml to 0.032 mg/100 ml

concentration) were tasters and the subjects who were able to PTC in Solution No. 1 to 4 (130 mg/100 ml to 16.25 mg/100 ml concentration) or not able to test at all were non-tasters.

The data was analyzed statistically, and p value 0.007 which of < 0.05 was considered statically significant. In human being's taste sensitivity to PTC shows Mendelian inheritance pattern. The major gene on chromosome 7 responsible for this inheritance was identified as a member of the TAS2R bitter taste receptor gene family, TAS2R38. (2)

Family studies (Blakeslee and Salmon 1931) led to the conclusion that PTC non-tasting is a Mendelian recessive characteristic. Individual with two recessive alleles (t t) are non-tasters and individuals with the dominant allele and one recessive allele (TT or Tt) and those with two dominant alleles (TT) are tasters. Genetic ability to taste PTC has been linked to greater perceived bitterness of some bitter compounds. (3), (4) The ability to sense the bitter taste of PTC, a trait that is genetically determined by polymorphisms of a taste receptor gene (T2R38) (5) protects from the development of addiction to cigarette smoking (6) and reduces the positive reinforcement from smoking. (7). Miller and Reddy found that propylthiouracil tasters had more taste pores than non-tasters. The association between fungiform papillae and bitterness of propylthiouracil has further supported by more recent studies. (3), (8) Reed and co-workers (1999) localized the PROP gene to chromosome 5; a region on chromosome 7 may influence the phenotype. (9) Non-tasters lacked the receptor site for N-C=S group present in PTC and 6-npropylthiouracil (PROP). Taste threshold for the bitter substance PTC shows a bimodal distribution, leading to designation of "tasters" for the more sensitive individuals and "non-taster" or "taster blindness" for the less sensitive. (3). Cigarette smoke contains measurable quantities of carbon monoxide, ammonia, nicotine, hydrogen cyanide, particulates, and a number of carcinogens. Cigarette marked in India and China has higher tar 19-27 mg and nicotine (1-14mg) and nitrosamines viz, Nitrosoguvacoline (NG), Nitroguvacine (NGC), 3-methyl, Nitroso-aminopropion-aldehyde (MNAA). This trend of non-tasters being more dependent smokers suggests that bitter taste does provide somewhat protection against tobacco use.

This conclusion is comparable to the study carried out by Snedecor's study (2006). (7) If non-tasters tend to be more dependent smokers, then oral Nicotine Replacement Therapy (NRT) would be an appropriate smoking cessation option, as bitter taste would not prevent appropriate use of oral NRT. Bitter taste phenotype (BTP) can have important implications for subjects interested in smoking cessation, regardless of taste status. the ability to sense the bitter taste of PTC, a trait that is genetically determined by polymorphisms of a taste receptor gene (T2R38) (5) protects from the development of addiction to cigarette smoking (6) and reduces the positive reinforcement from smoking. (7)

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