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*Original Research Article*

# Phenylthiocarbamide (PTC) Taste Perception in HIV Naive Persons

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## ABSTRACT

**Background:** The present study was carried out to confirm our previous study where we reported that there was no association between contraction of HIV infection and PTC taste perception. In that study, we indicated our intention to confirm the observation with a larger sample size of apparently healthy asymptomatic HIV-infected persons (HIV naive group).
**Methods:** Study participants consisted of 121 seemingly healthy individuals negative for HIV antibody test (HIV negative group), 123 HIV naive persons and 116 symptomatic HIV-infected patients (HIV symptomatic group). They were enrolled in this study after clinical examination and informed consent was obtained from each participant. Antibodies to HIV were determined using determine HIV 1/HIV 2 test kit and Enzyme linked immunosorbent assay (ELISA) and then confirmed with Western blot (WB) and real time PCR. Tasters and non-tasters were determined using phenylthiocarbamide (PTC) taste strips (0.0143 mg/strip). Results: Of the 123 persons in the HIV naive group, 69.9% were tasters; 71.9% of the 121 persons in the HIV negative group were tasters while 41.4% of the 116 individuals in the HIV symptomatic group were tasters. Phenylthiocarbamide taste perception varied significantly among the 3 groups of participants ($p < 0.001$). Tasters of PTC in the HIV naive and control groups were not significantly different ($p = 0.73$). Tasters of PTC in the HIV symptomatic group were significantly lower than tasters in the HIV negative group ($p < 0.001$) and tasters in the HIV naive group ($p < 0.001$).
**Conclusion:** This study shows that acquisition of HIV infection is not dependent on PTC taste perception. However, the progression of HIV infection affects PTC taste sensitivity.

***Key words:*** HIV infection, PTC taste perception, HIV persons

## INTRODUCTION

Phenylthiocarbamide (PTC) taste perception is a genetically controlled trait that varies from one human population to another. The gene responsible for this phenotype has been mapped to the q-arm of chromosome 7 in humans. [1,2] There are three mutations which give rise to TAS2R38 polymorphism and correspond to two major haplotypes: the AVI recessive allele for non-taster and the PAV dominant allele for taster. These haplotypes combine differently to give PAV/PAV homozygote's who report PTC to taste bitterer than PAV/AVI heterozygote's and AVI/AVI homozygote's who report PTC to be tasteless. [3]

The ability to taste PTC by an individual is considered as a useful and important tool to study the genetic diversity in human populations. PTC taste perception

has been used as a tool to trace family lineages and population migration patterns and it was previously used in paternity testing before the advent of DNA markers. [4] The trait is of genetic, epidemiologic and evolutionary interest and has been shown to correlate with a number of dietary preferences and consequently important implications for human health. [5,6]

Literature reveals that human populations show variations in the frequency of tasters which ranges from 3% to 98%. [7] However, worldwide, 30% are non-tasters and 70% are tasters. [8,9] Phenylthiocarbamide taste sensitivity is correlated strongly with the ability to taste other naturally occurring bitter substances in cruciferous vegetables many of which are toxic.[10] Tasters (TT or Tt) are those who taste the PTC while non-tasters (tt) cannot taste it. Bitter taste perception occurs through bitter taste receptors located on the surface of taste cells of the tongue [11] and is thought to be a conserved chemical sense against the ingestion of naturally toxic substances in mammals. [12]

The ability to taste PTC or otherwise has been related to some diseases or disorders. Several studies have reported association or lack of association between PTC taste perception and different diseases/disorders. [8,13-17] For instance, non-tasters were said to be more susceptible to epilepsy, [13] dental caries [14] and tuberculosis [17] while malaria had been reported to be associated with the ability to taste PTC. [16] With regard to interaction between HIV infection and PTC taste perception, our initial finding showed no relationship between contracting the infection and PTC taste perception. [18] The present study was carried out to confirm our initial observation of no association between contraction of HIV infection and PTC taste perception.

## MATERIALS AND METHODS

This study was carried out in Osogbo, Southwestern Nigeria from November, 2015 to December, 2016. HIV-infected participants were drawn from patients attending HIV clinics of Ladoke Akintola University of Technology Teaching Hospital and Osun State General Hospital, Asubiaro both in Osogbo, Osun State, Nigeria while HIV naive persons and HIV negative persons were enrolled from apparently healthy persons who visited these health facilities for blood donation or routine investigation. Ethical approval for this study was obtained from the Ethical Committees of the College of Health Sciences, Ladoke Akintola University of Technology, Osogbo and Osun State General Hospital, Asubiaro, Osogbo, Nigeria.

A sample of 5 ml of venous blood was collected from each participant whose HIV status was not known (these include participants in HIV naive group and HIV negative group) into Ethylenediaminetetraacetic acid (EDTA) bottle for HIV test. Antibodies to HIV were determined using determine HIV 1/HIV 2 test kit and Enzyme linked immunosorbent assay (ELISA) and then confirmed with Western blot (WB) and real time PCR. Phenylthiocarbamide taste strips (0.0143 mg of PTC/strip) used was obtained from Carolina Biological Supply Company, North Carolina, and USA. Each participant was given a PTC taste strip and a filter paper (as control) and was asked to put each on their tongue and allow to be soaked in their saliva before describing their perception to each strip. Taste description of each participant was recorded. Informed consent was obtained from each participant. Questionnaire was administered to each participant to obtain relevant information.

**Statistical Analysis**

The statistical package for social sciences software package (SPSS version 14) was used for statistical analysis. Differences between percentages were tested by Chi-square test. A p-value of $< 0.05$ was considered to be significant.

## RESULTS

Out of 360 individuals that participated in this study, 123 (34.2%) were apparently healthy asymptomatic HIV infected persons (HIV naive group; 28 males and 95 females), 121 (33.6%) were apparently healthy persons negative for HIV antibody test (HIV negative group; 35 males and 86 females) and 116 (32.2 %) were symptomatic HIV-infected patients (HIV symptomatic group; 25 males and 91 females) of age ≥16 years. The age and sex distributions of the study participants are given in Table 1. The age group distributions of the 3 groups of the study participants were not statistically different ($\chi^2$ = 4.34, df = 8, p = 0.83). Also, the distributions of males and females among the 3 groups of the study population were not significantly different ($\chi^2$ = 2.03, df = 2, p = 0.36).

The distributions of PTC taste perception among the study participants are given in Table 2. Of the 116 HIV symptomatic patients, 48 (41.4%) and 68 (58.6%) were tasters and non-tasters respectively; 86 (69.9%) and 37 (30.1%) of the HIV naive persons were tasters and non-tasters respectively and 87 (71.9%) and 34 (28.1%) of the HIV negative controls were tasters and non-tasters respectively. Phenylthiocarbamide taste perception varied significantly among the 3 groups ($\chi^2$ = 29.01, df = 2, p < 0.001). Further Chi-square test showed that non-tasters of PTC in the HIV symptomatic group were significantly higher than those in the HIV negative group ($\chi^2$ = 22.51, df = 1, p < 0.001) and HIV naive group ($\chi^2$ = 19.74, df = 1, p < 0.001). However, there was no significant difference in PTC taste perception between HIV naive group and HIV negative group ($\chi^2$ = 0.12, df = 1, p = 0.73). Therefore, PTC taste sensitivity was not significantly associated with acquiring HIV infection but was significantly associated with the progression of HIV in infected individuals.

The percentages of non-tasters among the 3 study groups by sex are given in Table 3. Sixty-eight percent (68%) of the males and 56% of the females in the HIV symptomatic group were non-tasters ($\chi^2$ = 1.16, df = 1, p = 0.28); 32.1% of the males and 29.5% of the females in the HIV naive group were non-tasters ($\chi^2$ = 0.07, df = 1, p = 0.78) while 31.4% of the males and 26.7% of the females in the HIV negative group were non-tasters ($\chi^2$ = 0.27, df = 2, p = 0.60). Non-tasters males in the HIV naive group and those in the HIV negative group were not significantly different ($\chi^2$ = 0.004, df = 1, p = 0.95). But non-taster males in the HIV symptomatic group were significantly higher than non-taster males in the HIV negative group ($\chi^2$ = 7.84, df = 1, p = 0.005) and non-taster males in the HIV naive group ($\chi^2$ = 6.80, df = 1, p = 0.009). Similarly, non-tasters females in the HIV naive group and those in the HIV negative group were not significantly different ($\chi^2$ = 0.17, df = 1, p = 0.68). However, non-taster females in the HIV symptomatic group were significantly higher than non-taster females in the HIV negative group ($\chi^2$ = 15.60, df = 1, p < 0.001) and non-taster females in the HIV naive group ($\chi^2$ = 13.43, df = 1, p = 0.002).

**Table 1: Distribution of the Three Groups of Study Participants by Age and Sex**

| Variable | HIV Symptomatic (%) n=116 | HIV naive (%) n=123 | HIV Negative (%) n=121 | p |
|---|---|---|---|---|
| Age (years) | | | | 0.83 |
| 16-25 | 14(12.1) | 11(8.9) | 17(14.1) | |
| 26-35 | 45(38.8) | 51(41.5) | 43(35.5) | |
| 36-45 | 33(28.4) | 37(30.1) | 31(25.6) | |
| 46-55 | 13(11.2) | 16(13.0) | 20(16.5) | |
| ≥56 | 11(9.5) | 08(6.5) | 10(8.3) | |
| Sex | | | | 0.36 |
| Male | 25(21.6) | 28(22.8) | 35(28.9) | |
| Female | 91(78.4) | 95(77.2) | 86(71.1) | |

**Table 2: Distribution of Phenylthiocarbamide (PTC) Tasters and Non-tasters among the Three Study Groups**

| Group | Taster (%) | Non-taster (%) | Total (%) |
|---|---|---|---|
| HIV symptomatic | 48 (41.4) | 68 (58.6) | 116 (32.2) |
| HIV naive | 86 (69.9) | 37 (30.1) | 123 (34.2) |
| HIV negative | 87 (71.9) | 34 (28.1) | 121 (33.6) |
| TOTAL | 221 (61.4) | 139 (38.6) | 360 (100.0) |

**Table 3: Distribution of Tasters and Non-tasters by Sex among the Three Study Group**

| Group | | Taster (%) | Non-taster (%) | Total (%) |
|---|---|---|---|---|
| HIV symptomatic | Male | 8(32.0) | 17(68.0) | 25(21.6) |
| | Female | 40(44.0) | 51(56.0) | 91(78.4) |
| HIV naive | Male | 19(67.9) | 9(32.1) | 28(22.8) |
| | Female | 67(70.5) | 28(29.5) | 95(77.2) |
| HIV negative | Male | 24(68.6) | 11(31.4) | 35(28.9) |
| | Female | 63(73.3) | 23(26.7) | 86(71.1) |
| TOTAL | | 221 (61.4) | 139 (38.6) | 360 (100.0) |

## DISCUSSION

This investigation was carried out to test the hypothesis that susceptibility to HIV infection had no link with PTC taste perception. It was a follow up study to confirm our initial observation that acquisition of HIV infection was not dependent on ability or inability to taste PTC. [18] In that study, we had a sample size of 25 HIV naive persons and stated that collection of more data was ongoing. The result of the present study confirmed that PTC taste sensitivity had no association with contracting HIV infection. However, as the infection progresses, PTC taste perception is tampered with as observed in the HIV symptomatic group. Graham *et al.* [19] reported that progression of HIV virus was associated with taste losses which could be further enhanced by medication. [20] Igbeneghu *et al.* [18] reported that PTC taste losses in HIV-infected individuals were influenced by the combination therapy employed.

This study showed that PTC taste perception in HIV infection was independent of sex. Previous studies on PTC taste perception in Southwestern Nigeria reported no significant difference between male and female. [21] Similarly, reports in the State where the current study was carried out showed HIV infection was not dependent on sex. [22]

Currently, we are studying the trend in PTC taste sensitivity from the point at which an HIV naive person is detected to the point when he/she requires antiretroviral drugs and after initiation of such drugs. This would provide information on the impact of the infection alone and that of the medication on PTC taste perception.

## CONCLUSION

This study showed that acquisition of HIV infection was not dependent on PTC taste perception but HIV infection could significantly affect PTC taste sensitivity.

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