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# Allelic Frequency of Daibetes and Hypertension Among Tribal and Non-tribal Population of Himachal Pradesh

***Indira Devi* and Savitri Verma****

**Department of Bioscience, Himachal Pradesh University, Shimla, (HP)*
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**ABSTRACT : The present study involved one thousand individuals from Tribal and Non-Tribal population of Himachal Pradesh for each diseases i.e., Diabetes, Mellitus and hypertension. The study was conducted to see the difference between Tribal and Non-Tribal population by calculating the gene frequencies of these diseases. The allelic frequencies of the sample showed significant differences between Tribes and Non-Tribes population on Diabetes Mellitus and Hypertension. The allelic frequency data calculated of two successive generations of Tribes and Non-Tribes showed almost similar pattern of inheritance in tribal and Non- Tribal population.**

**Keywords :** Allelic frequency, Diabetes, Hypertension, Tribal and Non-tribal population, Himachal Pradesh.

## INTRODUCTION

The tribes and non-tribes occupy 40% and 60% of the total geographical area of the Himachal Pradesh. The density of population of tribes is very low in comparison to non-tribes. The people of tribal region like local made beverages and are mostly engaged in semi-agricultural activities. In recent years the importance of genetics (Ahluwalia, 1985) in understanding the disease of mankind is greatly appreciated (Mckusick, 1978; Hartl, 1983). Genetic factors (endogenous) are involved in all genetic diseases but environmental Factors (exogenous) are equally important in the expression of most of the inherited disease. The present study was conducted to evaluate the effect of inheritance by calculating the gene frequencies of these diseases.

## MATERIAL AND METHOD

The data for the given diseases were collected randomly (taken 1000 individual each from Tribes and Non-Tribe) from hospitals and on familial basis. The gene frequency was calculated by using Hardy and Weinberg Law of Equilibrium (1908) *i.e.*, $P + Q$ whole square is = 1 and $P$ square + $Q$ square + $2PQ = 1$.

The genotypic and phenotypic allelic frequencies were calculated according to Hardy and Weinberg Law of Equilibrium (1908). To test the significance of results, mean, Standard Deviation (S.D), Coefficient of variation (Snedecor and Cochran,1976) and Fisher "t-test were applied in the study.

## RESULT AND DISCUSSION

**Hypertension:** Among the non-tribes 48% individuals were observed affected with recessive alleles ($q$) whereas only 19.5% individuals observed among tribes. Recessive allele ($q$) is taken for affected individuals and unaffected individuals are considered with dominant alleles ($p$).

Comparative phenotype data (Table 1) showed significant ($p < 0.01$) difference between tribes and non-tribes on these diseases. The results suggest great variation between these two populations on these diseases. The coefficient of variation was highest for the recessive alleles ($q$) of the tribal region. This shows greater variation for this allele in the tribal population. The coefficient of variation for dominant allele ($p$) showed highest value in the non tribes than the tribes. Therefore, the dominant allele ($p$) shows greater variation in non tribes.

The genotypic frequency showed (Table 2) highly significant values ($p < 0.01$) in both the contrasting population's *i.e.* tribes and non tribes. The coefficient of variation is highest in $2pq$ and $p^2$ of non tribes and $q^2$ in tribes. This shows variation for heterozygous $2pq$ and dominant homozygous $p^2$ alleles in non tribes and recessive homozygous $q^2$ in tribes.

In brief, the present study showed high differences of phenotypic and genotypic frequencies of this disease between the tribes and non tribes, which suggest less prevalence of this disease among the tribes. It may be due to unexploited environment, high physical activity, and negligible intake of saturated fats and stress free life style. Many earlier researches (Gutmann and Benson, 1971; Colleto, *et al.*, 1993; Partha *et al.*, 1995) have also observed the roll of environmental factor responsible for hypertension. Both physical activity and fatty diets increase the blood pressure and insulin resistance in the human body (Laws and Reaven, 1991 and Mayer *et al.* 1993). Carmelli, *et al.* (1994) suggested that There is a common underlying factor that mediates the clustering of hypertension Diabetes and obesity. These common factors were generally influenced by both genetic and environmental factors.

**Diabetes:** Among the non-tribes 17% individuals were observed affected with diabetes where as in case of tribes it is only in 5.3%. Recessive allele (*q*) is taken for affected individuals and unaffected individuals are considered with dominant alleles (*p*).

The results in terms of phenotype data (Table 1) showed significant ($p < 0.01$) difference between tribes and non-tribes. The results show the coefficient of variation was highest for the recessive alleles (*q*) in the non tribes. This shows greater variation for this allele in the non tribe's population. The coefficient of variation for dominant allele (*p*) show highest value in the non tribes than the tribes. Therefore, the dominant allele (*p*) shows greater variation in non tribes.

**Table 1: Comparative Statistically Analyzed Data of Phenotypic Frequencies of Human Genetic Diseases.**

| *S. No. No.* | *Characters* | | *N.T. q* | *T q* | *P.D.* | *N.T. p* | *T p* | *P.D.* |
|---|---|---|---|---|---|---|---|---|
| 1. | Hypertension | R.V | 56-40 | 24-15 | | 60-44 | 85-76 | |
| | | X | 48.500 | 19.500 | | 51.500 | 80.500 | |
| | | S.D. | 4.601 | 3.028 | 7.95** | 4.601 | 3.028 | 56.31** |
| | | SEx | 1.455 | 0.096 | | 1.455 | 0.096 | |
| | | C.V. | 9.49 | 15.53 | | 8.93 | 3.76 | |
| 2. | Diabetes | R.V. | 21-13 | 9-2 | | 87-79 | 98-91 | |
| | | X | 17.000 | 5.300 | | 83.000 | 94.700 | |
| | | S.D | 2.749 | 2.214 | 57.28** | 2.749 | 2.214 | 14.10** |
| | | SEx | 0.869 | 0.700 | | 0.869 | 0.700 | |
| | | C.V | 16.17 | 41.77 | | 3.31 | 2.34 | |

The genotypic frequency showed (Table 2) highly significant values ($p < 0.01$) in both contrasting populations i.e. tribes and non tribes. The coefficient of variation shows highest value in $2pq$ and $p^2$ and $q^2$ in a similar pattern as shown by the phenotypic frequencies. The differences in phenotypic and genotypic frequencies of diabetes suggest the effect of environmental factors on these two populations. This shows variation for heterozygous $2pq$ and dominant homozygous $p^2$ and recessive homozygous $q^2$ alleles in non tribes.

**Table 2: Comparative Statistically Analyzed Data of Genotypic Frequencies of Human Genetic Diseases.**

| *S. No. No.* | *Characters* | | *N.T. $q^2$* | *T $q^2$* | *P.D.* | *N.T. 2pq* | *T 2pq* | *P.D. $p^2$* | *N.T. $p^2$* | *T* | *P.D.* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Hypertension | X | 0.484 | 0.196 | | 0.422 | 0.491 | 0.094 | 0.314 | | |
| | | S.D | 0.048 | 0.031 | 59.50** | 0.027 | 0.009 | 16.35** | 0.021 | 0.040 | 23.04** |
| | | SEx | 0.015 | 0.010 | | 0.008 | 0.003 | | 0.007 | 0.013 | |
| | | CV | 9.92 | 15.82 | | 6.40 | 1.83 | | 22.34 | 12.74 | |
| 2. | Diabetes | X | 0.169 | 0.052 | | 0.482 | 0,342 | | 0.349 | 0.606 | |
| | | SD | 0.027 | 0.022 | 69.23** | 0.012 | 0.055 | 29.05** | 0.039 | 0.076 | 73.64** |
| | | SEx | 0.009 | 0.007 | | 0.004 | 0.017 | | 0.012 | 0.024 | |
| | | CV | 15.97 | 42.31 | | 2.49 | 16.08 | | 11.17 | 12.54 | |

R.V = Range Variation, X = Mean, S.D. =standard Deviation, SEx = Standard Error of Mean, C.V = Coefficient of Variation ** = $P < 0.001$ *NT* + Non Tribes, *T* = Tribes, *Q* = Recessive, *P* = Dominant

Busch and Hegele (2001) reported the complexity of type-2 diabetes is related to the factors such as genetic heterogeneity, interaction between genes and modulating roll played by the environment. The result of the present study shows 17% individuals among the non tribes are affected with diabetes corroborated by the study of Chandrawansi et all (1994) who reported 13 .2% individuals in the urban population of Raipur (Madhya Pradesh).

Hence the results of the present study indicate the prevalence of both the diseases i.e. diabetes mellitus and Hypertension are higher among Non tribal populations than the tribal populations of Himachal Pradesh.

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