BASIC STATISTICS IN MEDICAL PRACTICE

Pages with reference to book, From 98 To 99

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Student's t -Test

We have been considering how to test the null hypothesis and our main interest has been to find whether there is any difference between the mean of a sample and the population mean. We have also considered the testing of the difference between the means of two samples.

Application of t-Test.

1. If the mean and standard deviation of a sample mean are known then we can find out the probability that a certain range round the sample mean includes the population mean. For example, if we have determined the mean vitamin 'A' level of cancer patients in a sample then it is possible to find for further guidance where the mean of the total population of such cases may be expected to lie. Our data of cancer patients is based on the following[1].

No. of observations = 55

Mean Vitamin A level 34.07

Standard deviation (S.D) =

Standard Error (S.E) = 5.44/ ~J 55 = 0.73

In order to find out confidence limits mean ± S.E. The degree of freedom is calculated which is minus 1 the number of observations.

The degrees of freedom (d.f) in our example comes to 54. The value of 't' at P <0.05 is 2. Therefore 95% confidence limits of the mean are:

Mean ± 2.00 (S.E.) 34.07±2.00(0.73) (32.61—35.53)

We may therefore say that with 95% chance of being correct the range 32.61 to 35.53 includes the population mean, meaning therefore by that vitamin A levels in 95% of cancer patients may fall with in this range.

2. use of the mean and standard deviation of a sample to find out the extent to which the sample mean differs from the postulated value.

Let us assume that the postulated value of vitamin A level is 36.0. We are interested in finding out whether our mean of cancer patients is low or other wise.

u = Mean of general population = 360

X = Mean of sample (Vitamin A level) = S.E. = Standard error of the sample mean =

Therefore t = = 0.73

Now entering the table (B) 't' value at 54 d.f. It is, therefore, unlikely that the sample with mean of 34.07 has come from the population with mean of 36.0. We therefore conclude that the sample mean is at least statistically low.

3. If the means and standard deviation of two samples are known then to find out how significant is the difference between the means.

X1 - X2 therefore t V7S.D~/nl + S.D~ /n2

After the value of 't' has been calculated a Table for the value of 't' is consulted. If the calculated value of 't' is greater than the value of 't' at a given level of significance[2], then the difference is said to be significant at that level of significance, other wise is not significant. So d.f. in this case will be ni-i + n2-1. Let us use the example of Vitamin A levels in cancer patient and age and sex matched controls.

0.73 In cases In control nl=55 n2=65 Xi = 34.07 X2 = 43.55

= 2.64 S.D1 = 5.44 S.D2 = 8.15

X1 X2 34.07—4335

V2 s.D2 /nl + S.D3 V(544)2/55 + (8.15)2/65 d.f = ni-i + n2-1 =54 + 64= 118 the table (B) value of 't' at 118 d.f at P <0.05 is 1.98. This value is less than the calculated value, so that difference in the mean levels of vitamin A in two groups is statistically significant ($P < 0.05$).

REFERENCES

1. Siddiqul, M. A. Role of Statistics in Medical Research, Pakistan Medical Research Council, Minhas House Annexe PECHS, Karachi. pp 60-61.

2. Swinscow, T.D.V. Statistics at square one. British Medical Association 1978. pp 58-81.