ADVANCED PHARMACEUTICAL BIOSTATISTICS

Dr. Mohammed S. Al-Lami
PhD Pharmaceutics

Lect 5

Chi – square Test

Introduction

- Chi-square test offers an alternate method of testing the significance of difference between two proportions.
- Chi-square test involves the calculation of chi-square.
- Chi-square is derived from the greek letter ‘chi’ (X).
- ‘Chi’ is pronounced as ‘Kye’.
- Chi-square was developed by Karl pearson 1900 DC.

- Chi-square test is a non-parametric test.
- It follows a specific distribution known as Chi-square distribution.

Calculation of Chi-square value

- The three essential requirements for Chi-square test are:
- A random sample
- Qualitative data
- Lowest expected frequency not less than 5

- The calculation of Chi-square value is as follows:

- Make the contingency tables

-Note the frequencies observed (O) in each class of one event, row-wise and the number in each group of the other event, column-wise.

-Determine the expected number (E) in each group of the sample or the cell of table on the assumption of null hypothesis.

	Column 1	Column 2	Totals
Row 1	A	B	R1
Row 2	C	D	R2
Totals	C1	C2	N

Example: Two gps A and B consist of 100 pt each, who have disease.
A serum was given to gpA and not for gpB (can called control).
It was found that in gp A and gp B 80 and 60 pt respectively were rcovered.
Test the hypothesis that serum help to cure disease?

Observed Frequency

	Recovered	Not recoverd	Total
A	80	**20**	100
B	60	**40**	100
	140	60	200

Expected Frequency

	Recovered	Not recoverd	Total
A	$\frac{C1xR1}{N} = \frac{140x100}{200} = 70$	$\frac{C2xR1}{N} = \frac{60x100}{200} = 30$	100
B	$\frac{C1xR2}{N} = \frac{140x100}{200} = 70$	$\frac{C2xR2}{N} = \frac{60x100}{200} = 30$	100
	140	60	200

- The calculation of Chi-square value is as follows:

  - Make the contingency tables

  -Note the frequencies observed (O) in each class of one event, row-wise and the number in each group of the other event, column-wise.

  -Determine the expected number (E) in each group of the sample or the cell of table on the assumption of null hypothesis.

- The hypothesis that there was no difference between the effect of the two frequencies, and then proceed to test the hypothesis in quantitative terms is called the Null hypothesis.

-Find the difference between the observed and the expected frequencies in each cell (O – E).

- Calculate the Chi-square values by the formula

-Sum up the Chi-square values of all the cells to get the total Chi-square value.

$$\chi^2 = \sum \frac{(Observed - Expected)^2}{Expected}$$ = 9.524

DF = (c-1)(r-1)= (2-1)(2-1)= 1

Critical values of the Chi-square distribution with *d* degrees of freedom

	Probability of exceeding the critical value						
d	0.05	0.01	0.001	*d*	0.05	0.01	0.001
1	$\boxed{3.841}$	$\boxed{6.635}$	$\boxed{10.828}$	11	19.675	24.725	31.264
2	5.991	9.210	13.816	12	21.026	26.217	32.910
3	7.815	11.345	16.266	13	22.362	27.688	34.528
4	9.488	13.277	18.467	14	23.685	29.141	36.123
5	11.070	15.086	20.515	15	24.996	30.578	37.697
6	12.592	16.812	22.458	16	26.296	32.000	39.252
7	14.067	18.475	24.322	17	27.587	33.409	40.790
8	15.507	20.090	26.125	18	28.869	34.805	42.312
9	16.919	21.666	27.877	19	30.144	36.191	43.820
10	18.307	23.209	29.588	20	31.410	37.566	45.315

***INTRODUCTION TO POPULATION GENETICS*, Table D.1**

So
reject hypothesis
Of no relation

This indicate
There is highly significant
dependance of recovery on
serum

	Much improve	Slightly improve	Not Improve	Total
Drug	60	**32**	**28**	120
Placebo	28	**17**	**45**	90
	88	49	73	210