

CHAPTER 4

RESULTS

4.1 Demographic data:

4.2 1. Age:

Mean age:

Group 1: 27.8 ± 23.3 years

Group 2: 25.1 ± 13.4 years

Group 3: 28.7 ± 26.5 years

4.2. Gender

Table 3: gender of patients

	Male	Female
Group 1	35	38
Group 2	12	10
Group 3	187	136

In group 1 the rate of male is 47.9% and female is 52.1%.

In group 3 the rate of male is 57.8% and female is 42.2%

4.3. Signs and clinical symptoms of patients in group 2:

- fever : 22 (100%)
- Diarrhea: 20 (90.9%)
- Hepatomegaly: 13 (59.1%)
- Splenomegaly: 12 (54.5%)
- Rose spots: 10 (45.4)
- Headache: 16 (72.7%)
- Abdominal ileus: 15 (68.2%)
- Abdominal pain: 9 (40.9%)
- Relative bradycardia: 1 (4.5%)
- Intestinal bleeding: 1 (4.5%)

4.4. Results of typhi dot test in group 1,3:

Table 4: Result of typhi dot (positive and negative).

	Typhoid	Non-typhoid	Total
Typhi dot (+)	57	61	118
Typhi dot (-)	16	262	278
Total	73	323	396

Table 5: Results of antibody that is classified by typhoid and non-typhoid

Results of EIA	Typhoid	Non-typhoid
IgM (+), IgG (-)	46	43
IgM (+), IgG (+)	11	18
IgM (-), IgG (-)	11	203
IgM (-), IgG (+)	5	59
Total	73	323

Typhi dot positive in typhoid fever group is 57 (sensitivity =78.1%)

Typhi dot negative in non-typhoid group is: 262 (specificity = 81.1%)

4.5. Result of typhi dot test in Group 2:

Table 6: Results of EIA in group 2.

Antibody	Result
IgM (+), IgG (-)	6 (27.3%)
IgM (+), IgG (+)	9 (40.9%)
IgM (-), IgG (-)	5 (22.7%)
IgM (-), IgG (+)	2 (9.1%)

Typhi dot test positive in group 2 is 15 (74.5%).

95% CI = 0.745 ± 0.093 → the positive rate can move from 64.6% to 83.8%

4.6. Widal test

Table 7: Result of Widal test in group 1,3.

	Typhoid	Non-typhoid	Total
Typhi dot (+)	57	61	118
Typhi dot (-)	16	262	278
Total	73	323	396

Table 8: Result of Widal test in group 2.

	Result	Percentage
Positive	13	0.59
Negative	9	0.41

Table 9: Results of Widal test are classified by titer.

	1:100	1:160	1:200
Group1	43	0	2
Group 2	66	0	2
Group 3	13	0	0

4.7. Analysis the validity of typhi dot test based on group 1 and 3

Table 10 : Two by two table for analysis of typhi dot test.

	Typhoid	Non-typhoid	Total
Typhi dot (+)	57	61	118
Typhi dot (-)	16	262	278
Total	73	323	396

$$\text{Sensitivity} = \frac{57}{73} = 78.1\%$$

95%CI of sensitivity = 78.1% \pm 9.5% \rightarrow Sensitivity can move from 68.6% to 87.6%

$$\text{Specificity} = \frac{262}{323} = 81.1\%$$

95% CI of specificity = 81.1% \pm 4.3% \rightarrow Specificity can move from 76.8% to 85.4%

$$\text{Positive predictive value} = \frac{57}{118} = 48.3\%$$

$$\text{False positive rate} = \frac{61}{323} = 18.9\%$$

$$\text{False negative rate} = \frac{16}{73} = 22\%$$

$$\text{Negative predictive value} = \frac{262}{278} = 94.2\%$$

$$\text{Accuracy} = \frac{319}{396} = 80.6\%$$

$$\text{Prevalence} = \frac{73}{418} = 17.4\%$$

4.8. Analysis of Widal test based on group 1 and 3.

Table 11: Two by Two table for analysis of Widal test

	Typhoid	Non-typhoid	Total
Widal positive	45	68	113
Widal Negative	28	255	283
total	73	323	396

$$\text{Sensitivity} = \frac{45}{73} = 61.6\%$$

95% CI of sensitivity = $61.6\% \pm 5.7\%$ → Sensitivity can move from 55.9% to 67.3%

$$\text{Specificity} = \frac{255}{323} = 79\%$$

95% CI of specificity = $79\% \pm 2.3\%$ → Specificity can move from 76.7% to 81.3%

$$\text{Positive predictive value} = \frac{45}{113} = 39.8\%$$

$$\text{False positive rate} = \frac{68}{323} = 21.1\%$$

$$\text{False negative rate} = \frac{28}{73} = 38.4\%$$

$$\text{Negative predictive value} = \frac{255}{283} = 90.1\%$$

300

Accuracy = $\frac{300}{396} = 75.8\%$

396

Table 12: results of analysis of typhi dot and Widal test

	Typhi dot (%)	Widal (%)
Sensitivity	78.1	61.6
False positive	18.9	21.1
(+) predic.value	48.3	39.8
Specificity	81.1	79.0
False negative	22	38.4
(-) predic.value	94.2	90.1
Accuracy	80.6	75.8

4.9. The comparison sensitivity and specificity between typhi dot and Widal test by**Mc Nemar chi square test:**

4.9.1. The comparison of sensitivity:

Table 13. The comparison of sensitivity between typhi dot and Widal test

	Typhi dot (+)	Typhi dot (-)	Total
Widal test (+)	41	4	45
Widal test (-)	16	12	28
	57	16	73

$$X^2 = \frac{(14 - 16)^2}{16 + 4} = 6.05$$

With $X^2 = 6.05 \rightarrow P < 0.02$

95% CI (P1 - P2) = (P1 - P2) \pm 1.96. SE(P1 - P2)

P1: sensitivity of typhi dot test

P2: sensitivity of Widal test.

SE (P1 - P2) = 0.0497

P1 - P2 = 0.16

CI with 95% = 0.16 - 1.96 x 0.0497 = 0.063 to 0.16 + 1.96 x 0.0497 = 0.257

So the sensitivity of typhi dot test is better than Widal test by between 6.3% and 25.7%

4.9.2. Comparison of specificity

Table 14: the comparison of specificity between Widal and typhi dot test.

	Typhi dot (-)	Typhi dot (+)	Total
Widal (-)	243	12	255
Widal (+)	19	49	68
Total	262	61	323

$$X^2 = \frac{(12 - 19)^2}{12 + 19} = 1.16$$

With $X^2 = 1.16 \rightarrow P > 0.2$.

So there is no significant different between the specificity of Widal and typhi dot test.

$$95\% \text{ CI } (P1 - P2) = (P1 - P2) \pm 1.96 \cdot SE(P1 - P2)$$

P1: specificity of typhi dot test

P2: specificity of Widal test.

$$P1 - P2 = 0.021$$

$$SE (P1 - P2) = 0.017$$

$$95\% \text{ CI} = 0.021 \pm 0.034 \rightarrow \text{from } -0.007 \text{ to } 0.055$$

4.10. Analysis of the validity of typhi dot test based on group 1 and 2, 3 (in this case any patient has blood culture negative is considered as non-typhoid fever)

Table 15: Two by two table for analysis of typhi dot test based on group 1 and 2,3.

	Typhoid	Non-typhoid	Total
Typhi dot (+)	57	76	133
Typhi dot (-)	16	269	285
Total	73	345	418

$$\text{Sensitivity} = \frac{57}{73} = 78.1\%$$

95%CI of sensitivity = 78.1% \pm 9.5% \rightarrow Sensitivity can move from 68.6% to 87.6%

$$\text{Specificity} = \frac{262}{323} = 77.9\%$$

95% CI of specificity = 77.9% \pm 4.4% \rightarrow Specificity can move from 73.5% to 82.3%

$$\text{Positive predictive value} = \frac{57}{133} = 42.8\%$$

$$\text{False positive rate} = \frac{76}{345} = 22.03 \%$$

$$\text{False negative rate} = \frac{16}{73} = 22 \%$$

$$\text{Negative predictive value} = \frac{269}{285} = 94.4 \%$$

$$\text{Accuracy} = \frac{326}{418} = 78 \%$$

$$\text{Prevalence} = \frac{73}{418} = 17.4 \%$$

4.11. Analysis of Widal test based on group 1 and 2,3.

Table 16: Two by Two table for analysis of widal test based on group 1 and 2,3

	Typhoid	Non-typhoid	Total
Widal positive	45	81	126
Widal Negative	28	264	292
total	73	345	418

45

$$\text{Sensitivity} = \frac{\quad}{73} = 61.6 \%$$

73

95% CI of sensitivity = 61.6% \pm 5.7% \rightarrow Sensitivity can move from 55.9% to 67.3%

264

$$\text{Specificity} = \frac{\quad}{345} = 76.5\%$$

345

95% CI of specificity = 76.5% \pm 4.5% \rightarrow Specificity can move from 72% to 81%

45

$$\text{Positive predictive value} = \frac{\quad}{126} = 35.7 \%$$

126

81

$$\text{False positive rate} = \frac{\quad}{345} = 23.5\%$$

345

$$\text{False negative rate} = \frac{28}{73} = 38.4\%$$

$$\text{Negative predictive value} = \frac{264}{292} = 90.4\%$$

$$\text{Accuracy} = \frac{309}{418} = 73.9\%$$

Table 17: Results of analysis of typhi dot and Widal test based on group1 and 2,3.

	Typhi dot (%)	Widal (%)
Sensitivity	78.1	61.6
False positive	22.03	23.5
(+) predic.value	42.8	35.7
Specificity	77.9	76.5
False negative	22	38.4
(-) predic.value	94.4	90.4
Accuracy	77.9	73.9

4.12. The comparison of sensitivity and specificity between typhi dot and Widal test by Mc Nemar chi square test with analysis based on group 1(typhoid) and 2,3 (non-typhoid)

4.12.1. The comparison of sensitivity:

Table 18. The comparison of sensitivity between typhi dot and widal test

	Typhi dot (+)	Typhi dot (-)	Total
Widal test (+)	41	4	45
Widal test (-)	16	12	28
	57	16	73

$$X^2 = \frac{(14 - 16)^2}{16 + 4} = 6.05$$

With $X^2 = 6.05 \rightarrow P < 0.02$

95% CI (P1 - P2) = (P1 - P2) ± 1.96. SE(P1 - P2)

P1: sensitivity of typhi dot test

P2: sensitivity of Widal test.

SE (P1 - P2) = 0.0497

P1 - P2 = 0.16

CI with 95% = 0.16 - 1.96 x 0.0497 = 0.063 to 0.16 + 1.96 x 0.0497 = 0.257

So the sensitivity of typhi dot test is better than Widal test by between 6.3% and 25.7%

4.12.2. Comparison of specificity

Table 19: the comparison of specificity between Widal and typhi dot test.

	Typhi dot (-)	Typhi dot (+)	
Widal (-)	249	15	264
Widal (+)	20	61	81
	269	76	345

$$X^2 = \frac{(15 - 20)^2}{15 + 20} = 0.45$$

With $X^2 = 0.45 \rightarrow P > 0.2$.

So there is no significant difference between the specificity of Widal and typhi dot test.

$$95\% \text{ CI } (P1 - P2) = (P1 - P2) \pm 1.96 \cdot SE(P1 - P2)$$

P1: specificity of typhi dot test

P2: specificity of Widal test.

$$P1 - P2 = 0.014$$

$$SE (P1 - P2) = 0.033$$

$$95\% \text{ CI} = 0.014 \pm 0.033 \rightarrow \text{from } -0.019 \text{ to } 0.047$$

4.13. Table 20: results of typhi dot test are analyzed by two situations (based on group1,3 and based on group1 and 2,3)

	Typhi dot (%) based on group 1 and 3	Typhi dot (%) based on group 1 and 2,3
Sensitivity	78.1	78.1
Specificity	81.1	77.9
False positive	18.9	22.03
False negative	22	22
Positive predictive value	48.3	42.8
Negative predictive value	94.2	94.1
Accuracy	80.6	78.0

The comparison of specificity between two situations of analysis.

Situation 1: analysis based on group 1 (typhoid fever) and 3 (non-typhoid fever).

Specificity is 81.1%

Situation 2: analysis based on group 1 (typhoid fever) and 2,3 (non-typhoid fever)

Specificity is 77.9%.

The difference is tested by chi square test:

$$X^2 = 0.1 \rightarrow p > 0.2.$$

There is no significant difference between two specificity.