

Results:

One hundred fifty-nine patients positive for H. pylori stool Ag who had never received eradication therapy for H. Pylori, were included in the study. One hundred fifty completed the treatment. 59 patients received triple therapy alone (Standard group) and 100 patients received triple therapy and probiotics (study group). The mean age of standard group was 42.15 ± 13.28 and the mean age in the study group was 41.23 ± 11.72 . Baseline features of subjects were similar (Table 2)

Table 1: Clinical information of subjects in the standard and study groups.

Items	Standard therapy group (N=59)	Study therapy group (N=100)	P-value
Age (year)	42.15 \pm 13.28	41.23 \pm 11.72	0.660
Weight (kg)	80.49 \pm 15.06	76.34 \pm 17.40	0.116
Height (cm)	163.59 \pm 7.58	162.02 \pm 9.87	0.262
BMI (kg/m ²)	30.20 \pm 6.17	29.27 \pm 7.03	0.390
Gender (males: females)	18 (30.50%): 41 (69.50%)	34 (34.00%): 66 (66.00%)	0.650
Diabetic (Yes: No)	8 (13.60%): 51 (86.40%)	21 (21.00%): 79 (79.00%)	0.241
Diarrhea after antibiotic (Yes: No)	14 (25.50%): 41 (74.50%)	9 (9.50%): 86 (90.50%)	0.009*

Quantitative data are expressed as mean \pm standard deviation and compared by t-independent test.

Qualitative data are expressed as numbers (percentages) and compared by chi-square test.

P-value: probability value P-value >0.05: non-significant

The study group was further divided into two subgroups. The first received probiotics after antibiotic therapy (58 from 100) whereas the other group received probiotics before antibiotic therapy (42 from 100). Among the 159 subjects, 9 were lost follow-up: 4 in standard group and 5 in the study group. Of the 5 in the study group, three received probiotics after therapy while two received probiotics before therapy. The study's design is shown in figure 1.

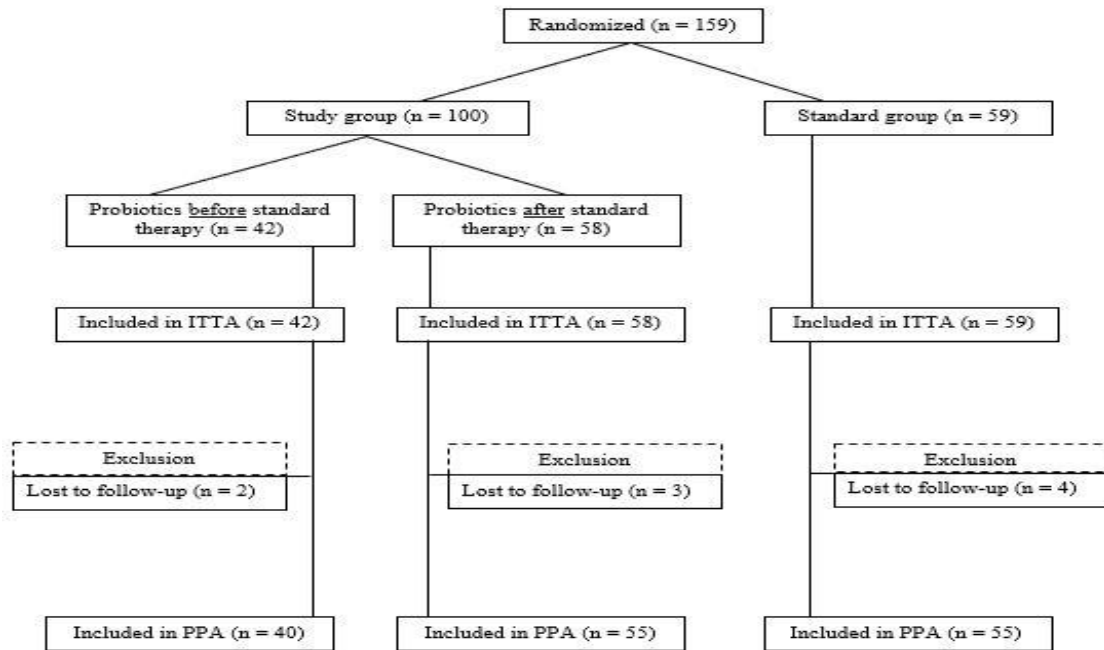


Figure 1. Study design

After therapy, of the 59 patients in the standard group, 38 (64.40%) patients responded to the eradication therapy, 17 (28.80%) patients resisted the treatment and 4 (6.80%) patients lost follow up. Of the 58 patients in the group that received probiotics after antibiotic therapy, 44 (75.90%) patients respond to the eradication therapy, 11 (19.00%) patients resisted the treatment and 3 (5.20%) lost follow up. In the group that received probiotics before antibiotic therapy (48 patients), 29 (69.00%) patients responded to eradication therapy, 11 (26.20%) patients resisted the treatment and 2 (4.80%) lost follow up. Patient distribution demonstrated in table 3.

Table 2: Patients distribution

Item	Negative	Positive	Lost follow up	Total
Standard therapy	38 (64.40%)	17 (28.80%)	4 (6.80%)	59 (100%)
Probiotic after standard therapy	44 (75.90%)	11 (19.00%)	3 (5.20%)	58 (100%)
Probiotic before standard therapy	29 (69.00%)	11 (26.20%)	2 (4.80%)	42 (100%)

Data are expressed as number (percentage) Negative = Eradicated H. Pylori Positive = Failed to eradicate H. Pylori

The eradication rate was higher in patients who received probiotics with standard therapy than those treated with standard therapy alone (78% Vs 71.19% by

intention to treat analysis and 76.84% Vs 69.09% by per protocol analysis). The improvement in the eradication rate became statistically significant when probiotics were received after standard therapy (81.04% Vs 71.19%, P-Value 0.021 by intention to treat analysis and 80.00% Vs 69.09%, P-Value 0.018 by per protocol analysis). Per protocol and Intention to treat analysis for treatment groups is shown in table 4.

Table 3: Per protocol and Intention to treat analysis for the treatment groups

Item	Standard therapy	Probiotic therapy	Odd ratio (95% CI)	P-value
Patients randomized	59	100		
Patients lost follow up	4	5		
Patients followed up	55	95		
Patients wit H Pylori eradication	42	78		
Patients resist H Pylori eradication	17	22		
Intention to treat analysis	71.19% (42/59)	78.00% (78/100)	0.69 (0.33 – 1.45)	0.335
Per-protocol analysis	69.09% (38/55)	76.84% (73/95)	0.79 (0.51 – 1.22)	0.297
	Standard therapy	Probiotic before standard therapy	Odd ratio (95% CI)	P-value
Patients randomized	59	42		
Patients lost follow up	4	2		
Patients followed up	55	40		
Patients wit H Pylori eradication	42	31		
Patients resist H Pylori eradication	17	11		
Intention to treat analysis	71.19% (42/59)	73.81% (31/42)	0.87 (0.36 – 2.13)	0.772
Per-protocol analysis	69.09% (38/55)	72.50% (29/40)	0.85 (0.34 – 2.08)	0.719
	Standard therapy	Probiotic after standard therapy	Odd ratio (95% CI)	P-value
Patients randomized	59	58		
Patients lost follow up	4	3		
Patients followed up	55	55		
Patients wit H Pylori eradication	42	47		
Patients resist H Pylori eradication	17	11		
Intention to treat analysis	71.19% (42/59)	81.04% (47/58)	0.58 (0.24 – 1.37)	0.021*
Per-protocol analysis	69.09% (38/55)	80.00% (44/55)	0.53 (0.27 – 1.30)	0.018*
	Probiotic before standard therapy	Probiotic after standard therapy	Odd ratio (95% CI)	P-value
Patients randomized	42	58		
Patients lost follow up	2	3		
Patients followed up	40	55		
Patients wit H Pylori eradication	31	47		
Patients resist H Pylori eradication	11	11		
Intention to treat analysis	73.81% (31/42)	81.04% (47/58)	0.66 (0.26 – 1.70)	0.389
Per-protocol analysis	72.50% (29/40)	80.00% (44/55)	1.52 (0.58 – 3.95)	0.392

P-value: probability value P-value >0.05: non-significant

No significant difference was detected between pretreatment mean lactobacillus strains concentration in different groups (P value, 0.998). Additionally, no significant difference was detected between the pretreatment mean Bifidobacterium strains concentration in different groups (P value, 0.999).

The mean Lactobacillus strains and Bifidobacterium strains concentration were significantly increased after treatment containing probiotics (P value 0.0001) which was not shown in the standard therapy alone (P value, 0.602 and 0.894). Comparing among 3 groups for probiotics concentrations at pre- and post-treatment is demonstrated in table 5 and figure 2.

Table 4: Comparing among 3 groups for bacteria concentrations at pre- and post-treatment

Item	<i>Lactobacillus</i> concentration			<i>Bifidobacterium</i> concentration		P-value
	Pre-treatment	Post-treatment	P-value	Pre-treatment	Post-treatment	
Standard therapy	2,417,746 ±2,012,295	1,601,763 ±1,361,622	0.602	8,111,017 ±5,497,298	7,287,636 ±4,946,382	0.894
Probiotic before	2,428,500 ±1,888,786	26,585,000 ±15,566,805	0.0001*	8,105,143 ±5,357,438	88,282,500 ±52,174,878	0.0001*
Probiotic after	2,443,569 ±2,230,328	32,065,455 ±14,206,417	0.0001*	8,062,586 ±5,685,795	113,201,818 ±63,369,652	0.0001*
P-value (Between)	0.998	0.0001*		0.999	0.0001*	

Data are expressed as mean ±standard deviation and compared by analysis of variance test (ANOVA-test) among groups and paired t-test within each group.

P-value: probability value *significant (P<0.05) P-value >0.05: non-significant

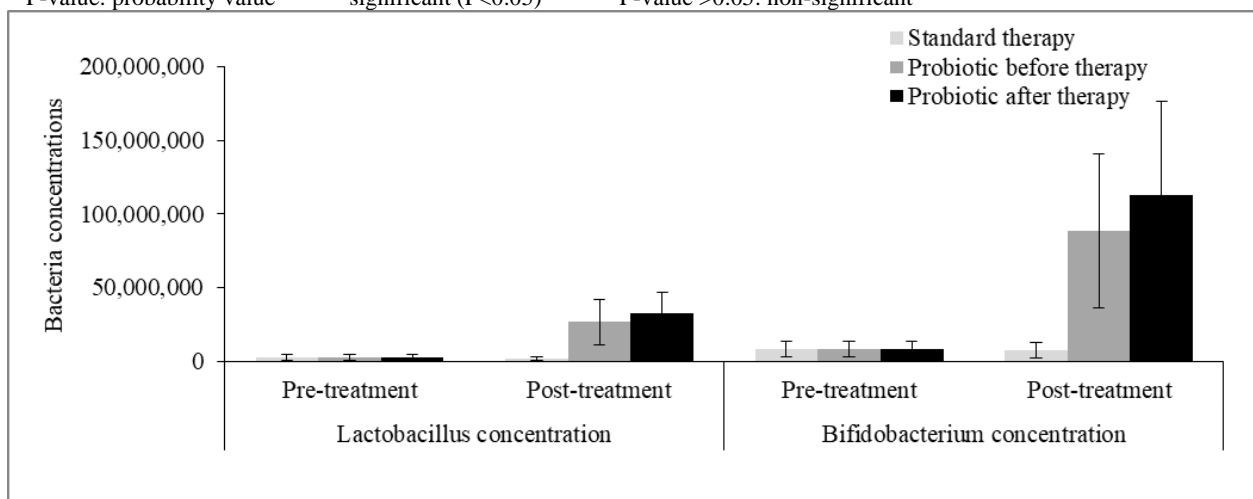


Figure 2: Bacteria concentrations at pre- and post-treatment in 3 groups.

Short term diarrhea was significantly lower in patients who received probiotics with standard therapy 9/95 (9.47%) compared to those patients who received standard therapy alone 14/55 (25.5%), particularly among those who received probiotics before standard therapy 3/40 (7.50%). Comparisons across the 3 groups regarding the incidence of short-term diarrhea after antibiotic therapy are demonstrated in table 6.

Table 5: Comparing among 3 groups regards incidence of short-term diarrhea after antibiotic therapy

Item	No of patients with diarrhea after antibiotic therapy	P value
Standard therapy	14/55 (25.5%)	0.009*
Patient received probiotics	9/95 (9.47%)	
Standard therapy	14/55 (25.50%)	0.0001*
Probiotic before standard therapy	3/40 (7.50%)	
Probiotic after standard therapy	6/55 (10.90%)	

Data are expressed as number (percentage) and compared by Chi-square test.
P-value: probability value *significant (P<0.05) P-value >0.05: non-significant

Patients with high BMI showed a significantly lower eradication rate in comparison to those with normal or low BMI, whether they were treated by standard therapy alone or standard therapy with probiotics. The eradication rate was 60% with standard therapy and 70% with probiotics containing therapy. These results are summarized in table 7.

Patients with diabetes mellitus showed significant lower eradication rates in comparison to non-diabetic patient either treated by standard therapy alone or standard therapy with probiotics. The eradication rate was 13% with standard therapy and 15% with probiotics containing therapy. These was demonstrated in table 7.

Table 7: Association between BMI and Diabetes and H. Pylori Ag in stool after 4 weeks of therapy in standard and probiotic therapy groups.

Categories		Standard therapy (N=55)					Probiotic therapy (N=95)				
		Total	Positive (n=17)	Negative (n=38)	Eradication rate (%)	P- value	Total	Positive (n=22)	Negative (n=73)	Eradication rate	P-value
BMI	< 25	12	0	12	100%	0.009*	26	1	25	96%	0.006*
	≥ 25	43	17	26	60%		69	21	48	70%	
	Total	55	17	38	69%		95	22	73	77%	

Diabetes Mellitus	No	47	10	37	79%	0.0001*	75	5	70	93%	0.0001*
	Yes	8	7	1	13%		20	17	3	15%	
	Total	55	17	38	69%		95	22	73	77	

Data are expressed as number (percentage) and compared by Chi-square test.

P-value: probability value P-value >0.05: non-significant * Significant (P<0.05)

Negative = Eradicated H. Pylori

Positive = Failed to eradicate H. Pylori