



Availability of Mean Platelet Volume and Neutrophil/Lymphocyte Ratio in Control of Helicobacter Pylori Eradication

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Abstract

Aim: The most common chronic bacterial infection in humans is Helicobacter pylori (HP) and has been proven to cause gastritis, recurrent peptic ulcers, duodenal ulcers, and gastric cancer. We investigated the neutrophil-lymphocyte ratio (NLR) and the mean platelet volume (MPV) in the control of HP infection eradication success.

Material and Method: Patients with HP infection in endoscopic biopsy performed due to dyspeptic complaints were included in this retrospective analysis. Quadruple antibiotic eradication therapy was given to the patients for 14 days. Pre- and post-treatment complete blood count parameters of 217 patients whose eradication treatment was successful were evaluated.

Results: There was a statistically significant decrease in the neutrophil count after treatment compared to before treatment ($p < 0.001$). NLR after treatment was significantly lower than before treatment ($p = 0.002$). MPV value after treatment showed a statistically significant increase compared to before treatment ($p < 0.001$).

Conclusion: In our study, a significant difference was observed between pre-/post-treatment neutrophil value, neutrophil/lymphocyte ratio, and MPV value.

Keywords: Helicobacter pylori, mean platelet volume, gastritis, neutrophil/lymphocyte ratio

INTRODUCTION

Marshall and Warren have identified the stomach bacterium in 1982 and cultured Campylobacter pyloridis, which was later reclassified as Helicobacter pylori (HP) (1). In developing countries, it is more common than in developed ones. The prevalence of HP in our country was found to be 71-80% (2,3). Low socioeconomic level, poor nutrition, poor hygiene conditions and living in crowded environments pose a risk for the disease (4,5). The prevalence of HP was found to be 82.5% with the urea breath test. Most of the cases have asymptomatic chronic inflammation (6).

During inflammation, neutrophils and lymphocytes interact with the microenvironment and tumor cells. The release of neutrophil chemotactic factors from inflammatory and malignant tissues causes the number of neutrophils to increase in peripheral blood (7-10).

The tissue damage caused by HP is originated from immune response and increased inflammatory mediators due to platelet activation. The bacterium facilitates T cell activation through antigenic molecules such as urease,

lipopolysaccharide, and HP heat shock protein. The increase in T cells induces the secretion of cytokines. It causes the accumulation of platelets in the gastric mucosa (11). The HP infection alleviates the concentration of eicosanoids such as prostaglandin F and derives concomitant increase in thromboxane A2 (TXA2) with lipid peroxidation. This details the high platelet count and is also supported by increased mean platelet volume (MPV), platelet distribution width (PDW), thrombocyte (PCT) in routine laboratory examinations (12).

Vascular endothelial growth factors, tumor necrosis factor, and other cytokines that contribute to cancer progression are secreted by neutrophils. Increased neutrophils lead to lymphocytopenia or decreased lymphocyte function (13). Increased levels of cytokines and inflammatory markers were observed in gastric biopsies and serum samples of HP-positive patients (10). An increase in neutrophils and a decrease in lymphocytes occurs. Therefore, the Neutrophil/lymphocyte ratio (NLR) is a sensitive marker for inflammation (11). While the MPV provides information about platelet activity, systemic inflammation can also vary (12).

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Study Hypothesis

An increase in the number of neutrophils and a decrease in the number of lymphocytes are observed in physiological stress. The ratio of these two subgroups to each other is used as a sensitive indicator of inflammation. MPV levels have been associated with chronic inflammation and higher MPV values indicate that platelets participate in proinflammatory and prothrombotic events (12,13).

Non-invasive, easily accessible and cost-effective tests are needed for the eradication control of HP due to the emerging prevalence of infection. We aimed to investigate the NLR and MPV in post-treatment eradication control of HP.

MATERIAL AND METHOD

Patients with HP infection detected in the endoscopic biopsy performed due to dyspepsia at the Gastroenterology clinic of Adiyaman Training and Research Hospital between January 2020 and June 2021 were included. The ethics committee approval has been granted on 18/05/2021 and protocol number: 2021/05-18. The study complied with the Declaration of Helsinki and informed consent has been obtained from all participants.

Database were collected from patients' medical and laboratory records. Hemogramme, coagulometric and biochemical tests were performed in all patients before endoscopy. Endoscopies were performed under general anesthesia (Propofol 1% 10 g/20 ml, Midazolam 50 mg/10 ml) after an 8-hour fast under the supervision of an anesthesiologist.

Patients who used proton pump inhibitors within one month, patients with infection, malignancy, hematological, chronic kidney disease, and patients receiving immunosuppressive therapy were excluded from the study. Patients with gastrointestinal bleeding, gastric ulcer, portal hypertensive gastropathy, on endoscopy also were excluded from the study. To detect the presence of HP, two biopsies were taken from the gastric antrum region with biopsy forceps. Mucosal samples were stained with hematoxylin and eosin. Mucosal samples were evaluated with the Sydney classification for HP positivity or negativity (13). Cases with atrophy, intestinal metaplasia, dysplasia or malignancy were not included in the study.

HP antigen in the stool was evaluated eight weeks after the end of treatment. Negative detection was considered successful eradication (7). The NLR was calculated by dividing the number of neutrophils by the number of lymphocytes. Patients who did not complete the course of

antibiotics were excluded from the analysis.

Statistical Analysis

Descriptive statistics were presented by calculating frequency, percentage, mean, standard deviation, median, 25%-75% percentile (Q1-Q3) values. The assumption of normality was checked using the Shapiro-Wilk test by examining the histogram, q-q plot, skewness and kurtosis values. Wilcoxon Signed Rank Test was used to distribute the groups that did not fit the normal distribution in the comparison of two dependent measures. Results with a P value of less than 0.05 were considered statistically significant. Analyzes were made with the SPSS 23.0 package program.

RESULTS

Descriptive statistics of the patients were presented in Table 1. Almost half the (44.2%) of the subjects were male (n=96), 55.8% were female (n=121). The average age of the patients was 40.7±14.35 years. The endoscopy finding of 63.6% of the patients was antral gastritis (AG) (n=138), and 36.4% of them were pangastritis (PG) (n=79).

The pre-and post-treatment measurements of the patients were compared in Table 2. According to the Wilcoxon Peer Test results, the neutrophil value after treatment showed a statistically significant decrease compared to before treatment (p<0.001).

After treatment, there was a statistically significant decrease in the NLR compared to before treatment (p=0.002). MPV value showed a statistically significant increase after treatment compared to before (p<0.001).

The parameters of AG and PG groups before and after treatment were compared. While a decrease in neutrophil values was observed in the AG group after treatment (p=0.001), the decrease was not statistically significant in the PG group (p=0.052). Although the lymphocyte value did not change in the AG group (p=0.811), there was a decrease in the PG group (p=0.001). The NLR decreased in the AG group (p=0.003) but it did not change in the PG group. MPV value increased in both AG (p=0.006) and PG groups (p<0.001) (Table 3).

The difference values (delta) of the pre-treatment and post-treatment measurements of the groups were compared. According to the Mann Whitney U test, it was found that there was a difference between the groups only in MPV measurement, and a higher increase was observed in the PG group (p=0.03). In other measurements, the difference values did not change according to the groups (p>0.05).

Table 1. Demographic characteristics of the patients

| Variable | Category | n | % | Median (SD) | Median (Q1-Q3) |
|--------------------|----------|-----|------|-------------|----------------|
| Gender | Male | 96 | 44.2 | | |
| | Female | 121 | 55.8 | | |
| Endoscopy findings | AG | 138 | 63.6 | | |
| | PG | 79 | 36.4 | | |
| Age | | 217 | | 40.7±14.35 | 41 (28-50) |

Table 2. Time-bound changes

| Variables | n | Median (SD) | Median (Q1-Q3) | z | p |
|---------------------------------|-----|-------------|-----------------|-------|--------|
| Pre-treatment Neutrophil value | 217 | 4.63±1.85 | 4.3 (3.3-5.4) | -3.80 | <0.001 |
| Post-treatment Neutrophil value | 217 | 4.2±1.7 | 3.9 (3.2-4.9) | | |
| Pre-treatment Lymphocyte value | 217 | 2.32±0.68 | 2.2 (1.8-2.7) | -0.34 | 0.731 |
| Post-treatment Lymphocyte value | 217 | 2.31±0.64 | 2.2 (1.8-2.7) | | |
| Pre-treatment NLR | 217 | 2.14±1.17 | 1.85 (1.5-2.58) | -3.04 | 0.002 |
| Post-treatment NLR | 217 | 1.95±1.15 | 1.75 (1.38-2.2) | | |
| Pre-treatment MPV | 217 | 8.26±1.47 | 8.1 (7.3-8.9) | -4.73 | <0.001 |
| Post-treatment MPV | 217 | 8.58±1.33 | 8.5 (7.8-9.2) | | |

Table 3. Antral gastritis and pangastritis parameters of groups before and after treatment were compared

| | Antral gastritis | | | | Pangastritis | | | |
|---------------------------------|------------------|-----------|------------------|--------------------|--------------|-----------|-----------------|---------------------|
| | n | Mean (SD) | Median (Q1-Q3) | Test | n | Mean (SD) | Median (Q1-Q3) | Test |
| Pre-treatment Neutrophil value | 138 | 4.74±1.83 | 4.55 (3.4-5.7) | z=-3.23 p=0.001 | 79 | 4.45±1.88 | 4 (3.3-5) | z=-1.94 p=0.052 |
| Post-treatment Neutrophil value | 138 | 4.27±1.55 | 3.9 (3.2-5.1) | | 79 | 4.08±1.94 | 3.7 (2.9-4.5) | |
| Pre-treatment Lymphocyte value | 138 | 2.35±0.64 | 2.2 (1.9-2.7) | z=-2.39 p=0.811 | 79 | 2.27±0.75 | 2.1 (1.7-2.8) | z=-0.942 p=0.001 |
| Post-treatment Lymphocyte value | 138 | 2.37±0.61 | 2.3 (1.9-2.8) | | 79 | 2.2±0.69 | 2.1 (1.7-2.6) | |
| Pre-treatment NLR | 138 | 2.15±1.23 | 1.91 (1.5-2.63) | z=-2.96 p=0.003 | 79 | 2.12±1.06 | 1.74 (1.5-2.5) | z=-1.03 p=0.303 |
| Post-treatment NLR | 138 | 1.91±0.89 | 1.75 (1.35-2.23) | | 79 | 2.03±1.51 | 1.7 (1.39-2.18) | |
| Pre-treatment MPV | 138 | 8.41±1.54 | 8.15 (7.5-9.1) | z=-2.75 p=0.006 | 79 | 8±1.31 | 7.9 (7.1-8.7) | z=-4.0 p<0.001 |
| Post-treatment MPV | 138 | 8.65±1.45 | 8.4 (7.7-9.4) | | 79 | 8.46±1.07 | 8.5 (7.8-9.1) | |

DISCUSSION

NLR and platelet-lymphocyte ratio (PLR) are parameters that are cost-effective, easily obtainable, and correlate with the prognosis of systemic inflammatory diseases. MPV is an indicator of platelet functions, which play an important role in immunological and inflammatory processes (13,14).

NLR was significantly higher in the HP positive group compared to the HP negative group. In addition, post-treatment NLR in the HP positive group after successful eradication was significantly lower than pre-treatment (15). We detected a significantly higher NLR after treatment than before treatment.

NLR was found to be significantly higher in the HP-positive group than in the negative group (16). According to a research from Iran, NLR was found to be higher in HP-positive patients with peptic ulcers than in asymptomatic HP-positive patients. In the same study, NLR was found to be higher in asymptomatic HP-positive patients compared to the HP-negative control group (11). Kondo et al. reported that after a successful HP eradication therapy, a significant decrease was observed in peripheral blood leukocyte, neutrophil and monocyte values compared to pre-treatment (17). Farah et al. stated a significant increase in NLR in the HP (+) group compared to the HP (-) group. An increase in NLR was observed in proportion to HP severity (18). In addition, it was observed that NLR

improved after HP eradication treatment (13).

Ümit et al. found a significantly higher MPV rate in the HP (+) group than in the HP (-) group (19). We found that the pre-treatment MPV rate was significantly higher than the post-treatment MPV rate. Sahin et al. conducted a study in a pediatric patient group of 153 HP (+) and 211 individuals. No statistically significant difference was observed between groups in terms of NLR and MPV. No significant difference was observed in terms of NLR and MPV after treatment compared to before treatment (20).

Kaplan et al. examined the relationship between PLR, NLR, PDW, PCT and have found increased values in all these parameters. They also published that alleviated platelet count due to HP infection and reduced platelets with ongoing eradication therapy especially in women (21). On the other hand Sahwa et al. reported higher MPV, lower PDW and platelet count (22).

In this study, we have observed a significant difference between NLR and MPV before and after treatment. It is assumed that NLR reflects the balance between activation of the inflammatory pathway and anti-tumor immune function. However, there are certain downsides of NLR calculation. Any surgical operation causes certain stress thus elevating NLR and changing the course of inflammation (23). Additionally, cardiovascular diseases and infection, or medication have an important effect on NLR.

Detection of HP positivity by biopsy in the entire study population was one of the strengths of our analysis. The comparison of NLR and MPV before and after treatment was also favorable compared to previous literature. Further trials with many patients as multicenter prospective studies are needed for comprehensive data.

CONCLUSION

Regarding the results of this study one can conclude that post-treatment neutrophil lymphocyte ratio significantly decreased compared to pre-treatment period. On the contrary post-treatment MPV value showed a statistically significant increase compared to pre-treatment. Regarding the results of this study one can conclude that NLR and MPV can be utilized in the eradication success of HP infection as easy to obtain markers that are routinely obtained in daily practice.

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Conflict of interest: The authors have no conflicts of interest to declare.

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REFERENCES

- Cave DR. Transmission and epidemiology of *Helicobacter pylori*. *Am J Med*. 1996;100:12-7.
- Malfertheiner P, Megraud F, O'morain C, et al. Management of *Helicobacter pylori* infection—the Maastricht V/Florence consensus report. *Gut*. 2017;66:6-30.
- Goodwin CS, Worsley BW. Microbiology of *Helicobacter pylori*. *Gastroenterol Clin North Am*. 1993;22:5-19.
- Marshall BJ, Warren JR. Unidentified curved bacilli in the stomach of patients with gastritis and peptic ulceration. *Lancet*. 1984;1:1311-5.
- Hunt R, Sumanac K, Huang JQ. Review article: should we kill or should we save *Helicobacter pylori*?. *Aliment Pharmacol Ther*. 2001;15:51-9.
- Ozaydin N, Turkyilmaz SA, Cali S. Prevalence and risk factors of *Helicobacter pylori* in Turkey: a nationally-representative, cross-sectional, screening with the 13 C-Urea breath test. *BMC Public Health*. 2013;13:1215.
- Chey WD, Wong BC; Practice Parameters Committee of the American College of Gastroenterology. American College of Gastroenterology guideline on the management of *Helicobacter pylori* infection. *Am J Gastroenterol*. 2007;102:1808-25.
- Fagoonee S, Pellicano R. *Helicobacter pylori*: molecular basis for colonization and survival in gastric environment and resistance to antibiotics. A short review. *Infect Dis (Lond)*. 2019;51:399-408.
- Ernst P, Jin Y, Reyes V, Crowe S. The role of the local immune response in the pathogenesis of peptic ulcer formation. *Scand J Gastroenterol Suppl*. 1994;205:22-8.
- Han S, Liu Y, Li Q, et al. Pre-treatment neutrophil-to-lymphocyte ratio is associated with neutrophil and T-cell infiltration and predicts clinical outcome in patients with glioblastoma. *BMC Cancer*. 2015;15:617.
- Jafarzadeh A, Akbarpoor V, Nabizadeh M, et al. Total leukocyte counts and neutrophil-lymphocyte count ratios among *Helicobacter pylori*-infected patients with peptic ulcers: independent of bacterial CagA status. *Southeast Asian J Trop Med Public Health*. 2013;44:82-8.
- Kim TJ, Pyo JH, Lee H, et al. Lack of association between *Helicobacter pylori* infection and various markers of systemic inflammation in asymptomatic adults. *Korean J Gastroenterol*. 2018;72:21-7.
- Farah R, Khamisy-Farah R. Association of neutrophil to lymphocyte ratio with presence and severity of gastritis due to *Helicobacter pylori* infection. *J Clin Lab Anal*. 2014;28:219-23.
- McColl KE. Clinical practice. *Helicobacter pylori* infection. *N Engl J Med*. 2010;362:1597-604.
- Asil M, Dertli R. Neutrophil to lymphocyte ratio is increased in chronic *Helicobacter pylori* infection and returns to normal after successful eradication. *J Turgut Ozal Med Cent*. 2016;23:409-13.
- Ferhatoğlu MF, Şenol K, Kartal A, et al. Importance of neutrophil/ lymphocyte ratio is important in *Helicobacter pylori* eradication treatment follow-up. *Med J Ankara Tr Res Hosp*. 2019;52:38-42.
- Kondo Y, Joh T, Sasaki M, et al. *Helicobacter pylori* eradication decreases blood neutrophil and monocyte counts. *Aliment Pharmacol Ther*. 2004;20:74-9.
- Davì G, Neri M, Falco A, et al. *Helicobacter pylori* infection causes persistent platelet activation in vivo through enhanced lipid peroxidation. *Arterioscler Thromb Vasc Biol*. 2005;25:246-51.
- Umit H, Umit EG. *Helicobacter pylori* and mean platelet volume: a relation way before immune thrombocytopenia. *Eur Rev Med Pharmacol Sci*. 2015;19:2818-23.
- Sahin Y, Gubur O, Tekingunduz E. Relationship between the severity of *Helicobacter pylori* infection and neutrophil and lymphocyte ratio and mean platelet volume in children. *Arch Argent Pediatr*. 2020;118:e241-5.
- Kaplan M, Ates I, Yuksel M, et al. The role of the PLR–NLR combination in the prediction of the presence of *Helicobacter pylori* and its associated complications. *Saudi J Gastroenterol*. 2018;24:294-300.
- Ali SA, Gaufri NEAM. Platelet characterization in *Helicobacter pylori* patients. *Open Access Library Journal*. 2017;4:e3637.
- Dolan RD, McSorley ST, Horgan PG, et al. The role of the systemic inflammatory response in predicting outcomes in patients with advanced inoperable cancer: systematic review and meta-analysis. *Crit Rev Oncol Hematol*. 2017;116:134-46.