Predictive Factors of Bell's Palsy: Neutrophil to Lymphocyte Ratio and Platelet to Lymphocyte Ratio

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Research note

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Abstract

Objectives: Inflammation plays an important role in the pathogenesis of Bell's palsy. Neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) are indicators of inflammation. The aim of this study was to find the prevalence of Bell's palsy and the mean of neutrophil to lymphocyte ratio and platelet to lymphocyte ratio among them.

Result: Out of all patients who visited ENT outpatient department during the study period, the overall prevalence of Bell's palsy was 0.6% (117) at a 95% confidence interval (0.5-0.72%). Among them, the mean neutrophil to lymphocyte ratio was 5.014 ± 1.63 , and the mean platelet to lymphocyte ratio was 207.38 ± 54.59 . Both NLR and PLR values were raised in Bell's palsy. Therefore, NLR and PLR can be used as auxiliary parameters in the management of Bell's palsy.

Introduction

Bell's palsy (BP) accounts for 60–75% of lower motor neuron facial paralysis.¹ The exact etiopathogenesis of BP is unclear. Autoimmune causes, vascular factors and nerve sheath inflammation are thought to be the etiological factors of the disease.² Both Neutrophil to Lymphocyte ratio (NLR) and Platelet to Lymphocyte Ratio (PLR) are regarded as inflammatory markers. NLR is used to monitor the risk and prognosis patients with cardiovascular disease and cancer.^{3–6} PLR is high in vascular diseases like peripheral and coronary artery diseases and malignancies like gynecological and hepatobiliary cancer.⁷

Bell's palsy can lead to significant facial asymmetry. As this is an inflammatory condition, rapid response is seen with increase in the activity of leukocytes and plasma proteins. Therefore, NLR and PLR values are used as prognostic markers in Bell's palsy.⁷

The aim of this study is to find out the prevalence of Bell's palsy and the mean values of NLR and PLR among them.

Methods

This descriptive cross-sectional study was conducted in the Department of Otorhinolaryngology and Head and Neck Surgery in the College of Medical Sciences, Chitwan, Nepal from 1st March, 2018 to 1st March, 2020. Ethical approval was taken from Institutional Review Board (Ref. No: 2020-046). Patients visiting the ENT out-patient department (OPD) were included in the study.

All participants gave a written informed consent. House-Brackmann (HB) grading system was used to subdivide BP patients as per the severity of facial palsy. The demographic features like age and sex of the patients were also recorded. Complete blood count was determined. Total leukocytes, neutrophils, lymphocytes and platelets counts were used to calculate PLR and NLR values. Convenience sampling was done.

One hundred and seventeen Bell's palsy (BP) patients were included in the study. In Bell's palsy patients, NLR and PLR values were calculated. An observation between the NLR and PLR values of patients with Bell's palsy and the people with intact facial nerve function was then made. The latter group had neither active ear disease nor facial nerve pathology and they came for preoperative evaluation in ENT OPD for septoplasty or myringoplasty surgery. Other conditions of facial paralysis like trauma, Ramsey-Hunt syndrome and tumoral masses were excluded. Diseases conditions which could affect NLR and PLR, such as active ear infection, renal failure, liver disease, heart disease, chronic obstructive pulmonary disease, neurological diseases, or neoplasm were also excluded. House-Brackmann (HB) grading system was used to subdivide BP patients as per the severity of facial palsy All BP patients were treated with steroids, antiviral medication and physical therapy.

Statistical analyses

Data entry and analysis was done in the Statistical Package for the Social Sciences (SPSS) for Windows, version 20.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were represented by mean $\pm$ standard deviation, and the categorical variables were presented as the number of the cases and percentage. Normality was checked using Shapiro-Wilk test. Chi-square test was used to analyze categorical variables and student t-test was used to analyze continuous variables. The relationship between the severity of Bell's palsy and NLR and PLR values was assessed using Coefficient of Variation test. $p < 0.05$ value was considered significant.

Results

Out of all patients who visited ENT outpatient department during the study period, the overall prevalence of Bell's palsy was 0.6% (117 patients) at a 95% confidence interval (0.5–0.72%). The BP group contained 64 males (54.7%) and 53 (45.3%) females. The mean age in the BP group was 36.96 ± 10.33 years. (Table 1)

Table 1
Patient demographic and complete blood count parameters

	BP Group	Control Group
Age	36.96 ± 10.33	38.78 ± 5.61
Gender-Male	54.7%	53%
NLR	5.014 ± 1.63	3.05 ± 0.92
PLR	207.38 ± 54.59	155.62 ± 96.61
WBC	9.11 ± 1.83	9.3 ± 6
Neutrophil	7.22 ± 1.45	6.4 ± .8
Lymphocyte	1.44 ± 0.37	2.1 ± 1.3
Platelet	326.8 ± 13	298.63 ± 15

The mean NLR was 5.014 ± 1.63 in the BP group. In the control group, the mean NLR was 3.05 ± 0.92 . The mean NLR was significantly high in BP group ($p < 0.001$) (Fig. 1).

The mean PLR was 207.38 ± 54.59 in the BP group. In the control group, the mean PLR was 155.62 ± 96.62 . The mean PLR was significantly high in BP group ($p < 0.001$) (Fig. 2).

On comparing whether severity of facial paralysis (as per House Brackmann grading) correlated with high NLR and PLR ratio, it was found that a very weak positive relationship was seen between severity of facial palsy and NLR ratio, $r(115) = .03$, $p = 0.69$. This result was not significant at $p < 0.05$. Similarly, a very weak positive relationship was seen between severity of facial palsy and PLR ratio, $r(115) = .01$, $p = 0.89$. This result was not significant at $p < 0.05$. The scatter plot also showed increased NLR and PLR values didn't necessarily increase the chance of severity of facial nerve palsy. (Figure S1 and S2)

Discussion

This study evaluated the prevalence of Bell's palsy among patients who visited ENT OPD during the study period. The prevalence was found to be 117 (0.6%) at a 95% confidence interval (0.5–0.72%). 54.7% of the cases were male. The mean age in the BP group was 36.96 ± 10.33 years. The study done by Chang et al in South Korea found the prevalence to be 0.12% at 95% confidence interval (0.07–0.17%). The disease was seen more in females and the most common age group was 70–79 years. ⁸

This study evaluated whether blood parameters NLR and PLR could be used as prognostic marker of Bell's palsy. Both NLR and PLR are markers of systemic inflammation.^{9,10} As the pathophysiology of BP is due to inflammatory mechanism, both Neutrophil to Lymphocyte ratio (NLR) and Platelet to

Lymphocyte Ratio (PLR) are high in Bell's palsy patients.³ Atan et al reported mean NLR and PLR values to be 4.3 and 137.5 respectively in Bell's palsy group which was statistically significant when compared to control group.¹¹ Eryilimaz et al reported mean NLR to be 1.78 (0.93–4.8) among pediatric patients with Bell's palsy which was significantly higher when compared to normal pediatric population.¹² Our study also showed similar findings.

Some studies shows positive correlation between high NLR and poor prognosis in Bell's palsy patients, whereas some show no significant correlation between the degree of facial palsy and NLR and PLR.^{13,14} This study showed increased NLR and PLR values didn't necessarily increase the chance of severity of facial nerve palsy.

Viral infection, ischemic neuropathy, and autoimmune responses are held responsible for Bell's palsy.¹⁵ This can lead to inflammatory changes resulting in facial nerve swelling, nerve compression and ultimately facial nerve palsy. Due to increase pressure on the facial nerve, vein reflux is further prevented on the nerve. This causes congestion of the blood vessels resulting in vicious cycle of oedema, compression and ischemia of facial nerve.¹³

There are some difficulties in using NLR and PLR values as an indicator of any inflammation. It is reported in literature that NLR and PLR values changes in room temperature due to storage before automated hematology analysis. In addition, the reference values of NLR and PLR also changes depending upon the type of hematology analyser.^{16,17}

High NLR and PLR values in Bell's palsy patients highlight the inflammatory nature of this disease. NLR and PLR are recommended auxillary parameter in the management of Bell's palsy.

Limitations

This study had certain limitations. First, this was a cross-sectional study. A prospective study with regular monitoring of patient with NLR and PLR would have been better. Second, NLR and PLR before and after treatment of Bell's palsy were not assessed. Third, other inflammatory markers like erythrocyte sedimentation rate (ESR) and C-reactive protein concentration were not measured in this study.

Abbreviations

BP: Bell's palsy; NLR: Neutrophil to Lymphocyte ratio; PLR:Platelet to Lymphocyte Ratio; ESR: Erythrocyte Sedimentation Rate; HB: House-Brackmann; ENT OPD: Ear, Nose, Throat out-patient department.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Institute of College of Medical Sciences, Chitwan, Nepal. The purpose and objective of the study were described to the participants and consent was obtained from the study participants. All participant information obtained in the course of the study was kept confidential.

Availability of data and materials

The dataset supporting the conclusions of this article is available in the Mendeley Data repository titled, "Bell's palsy dataset." <https://data.mendeley.com/datasets/4xb57rrpbq/1>

Consent for publication

Not applicable

Competing interests

The authors declare that there is no competing interest.

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Nil

Authors' contributions

AP conceived the study, developed the proposal, carried out the data collection, and conducted the analysis and reviewed the manuscript. JPM participated in conceiving the study, reviewing the proposal, reviewing the analysis and participated in final study document development

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Figures

Figure 1

Box and whisker plot showing NLR patients with Bell's palsy and control population

Figure 2

Box and whisker plot showing PLR patients with Bell's palsy and Normal population

Supplementary Files

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