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Research Article

**MULTIPLE SCLEROSIS PLAQUES REGIONAL
DISTRIBUTION VARIATION IN CANADA AND PAKISTAN
WITH REFERENCE TO GREY & WHITE MATTER: A
RETROSPECTIVE ANALYSIS CARRIED OUT AT SERVICES
HOSPITAL, LAHORE**¹Sehrish Abbas, ²Muhammad Kamran Khan, ³Inam ur Rehman¹Bahawal Victoria Hospital Bahawalpur²PIMS, Islamabad.³UHS Lahore**ABSTRACT:**

Background and Purpose: The retrospective determination of the involvement of the regional variation in the establishment of the MS cases of in Canada and Pakistan in term their population. Our research also analysis the para hippocampal gyrus lesions in its detailed characterization as per the distribution of the grey white matter.

Methods: Sixty cases were presented through clinical assessments having multiple sclerosis, they were made a part of this research. Total sample was divided in to two groups having thirty patients in each group from the population of Pakistan and Canada. The process of imaging was carried out on the (1.5 T MR system) with T1 – W, T2 – W, FLAIR, Proton density and TIW sequence of post-gadolinium. The count of the lesions was made and they were categorized in the light of anatomic regions para ventricular, juxta cortical and temporal lobe. The involvements of the juxta cortical of para hippocampal area in the consideration of the involvement of the brain parenchymal were also categorized. This retrospective research was carried out at Services Hospital, Lahore from 21 April, 2016 to 30 June, 2017.

Results: More incidence of disease was observed in the Canadian population when compared to the population of Pakistan with a mean younger than the Canadian population; however, the the distribution of the anatomical lesions in temporal lobe, Para hippocampal and paraventricular region almost the same in both the nations.

Conclusion: In the Canadian population it was observed that most common was the multiple sclerosis; however, its distribution of the anatomical lesions including the para-hippocampal area was not significantly involved in the variation.

Keywords: Periventricular (PVC), Multiple sclerosis (MS), Juxta cortical (JC), Temporal lobe and Para-hippocampal.

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INTRODUCTION:

Most common is MS in the central nervous system which is found in the young adults as a chronic inflammatory disease, it affects the gray and white matter. The results of this disease cause irreversible and severe disability of clinical nature. Disease diagnostic, monitoring and progression can be observed through magnetic resonance imaging even when the MS syndrome is clinically isolated and it can also predict the brain atrophy and disability. To diagnose the MS, MR imaging is carried out through multisequence protocol which includes T2 – weighted, FLAIR (Fluid–attenuation inversion recovery), pre-contrast, post-contrast T1 – weighted sequences and Proton density. Varying levels of sensitivity in the MR sequences have been used for the supratentorial differentiation & infratentorial lesions. FLAIR and Dual–echo (DIR) imaging detect MS lesions through higher level of sensitivity, this also appear hyperintensity focal areas on various kinds of the images.

However, it is also evinced that specificity lack in FLAIR and DIR sequences various lesions differentiation specifically edema, remyelination, demyelination, gliosis and inflammation. The relationship of the cognitive impairment and grey matter atrophy have been shown by the numerous cross-sectional and longitudinal research studies; whereas, para-hippocampal gyrus involvement and diagnosis with particular reference to the sequence of MR need further investigation and due consideration. The retrospective determination of the involvement of the regional variation in the establishment of the MS cases of in Canada and Pakistan in term their population. Our research also analysis the para hippocampal gyrus lesions in its detailed characterization as per the distribution of the grey white matter.

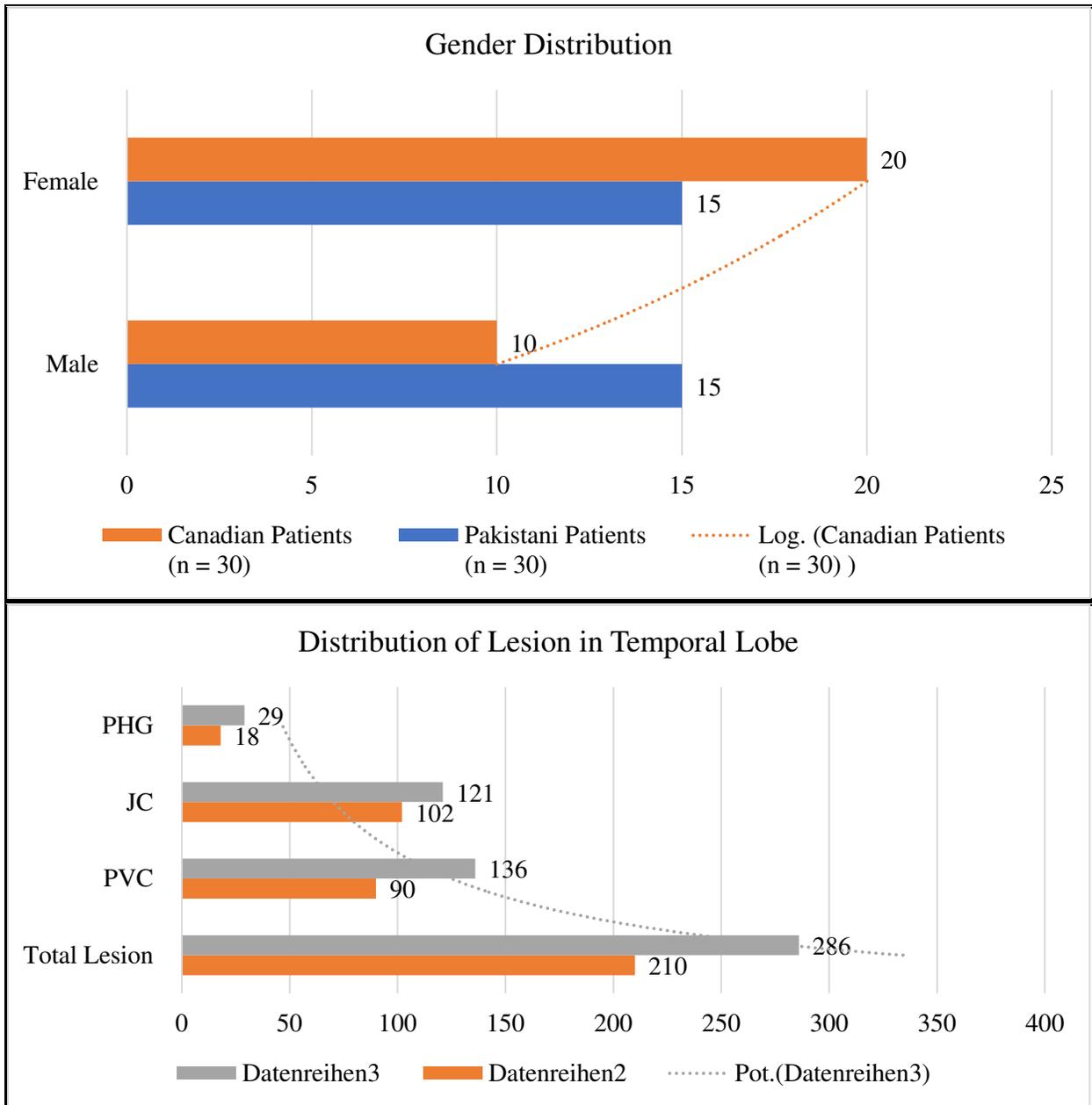
PATIENTS AND METHODS:

Table – I: Ethnic variation in the population of Pakistan and Canada with regional involvement of brain in MS established cases

| Patients | | Pakistani Patients (n = 30) | Canadian Patients (n = 30) |
|---|--------|--------------------------------|-------------------------------|
| Age (Years) | | 32 (16 to 65) | 29 (15 to 16) |
| Gender | Male | 15 | 10 |
| | Female | 15 | 20 |
| Distribution of Lesion in Temporal Lobe | | | |
| Total Lesion | | 210 | 286 |
| PVC | | 90 | 136 |
| JC | | 102 | 121 |
| PHG | | 18 | 29 |

Sixty cases were presented through clinical assessments having multiple sclerosis, they were made a part of this research. Total sample was divided in to two groups having thirty patients in each group from the population of Pakistan and Canada. The process of imaging was carried out on the (1.5 T MR system) with T1 – W, T2 – W, FLAIR, Proton density and T1W sequence of post-gadolinium. The count of the lesions was made and they were categorized in the light of anatomic regions para ventricular, juxta cortical and temporal lobe. The involvements of the juxta cortical of para hippocampal area in the consideration of the involvement of the brain parenchymal were also categorized. This retrospective research was carried out at Services Hospital, Lahore from 21st April, 2016 to 30th June, 2017. In the Canadian population there were ten females and twenty males in the mean age of twenty-nine years in the age limit of 15 – 60 years. The duration of the disease as median was observed as seven years in the range of 3 – 12 years), RRMS was observed in seventeen cases, SPMS was observed in seventeen cases and PPMS was observed in seven cases only. Whereas, in the population of Pakistan in the total of thirty patient's men and women were fifteen each in the mean age factor of thirty-two years in the age limit of 16 – 65 years. In terms of the median duration of the illness the duration was observed as five years in the range of 2 – 12 years), RRMS, SPMS and PPMS was observed respectively in 14, 10 and 6 patients.

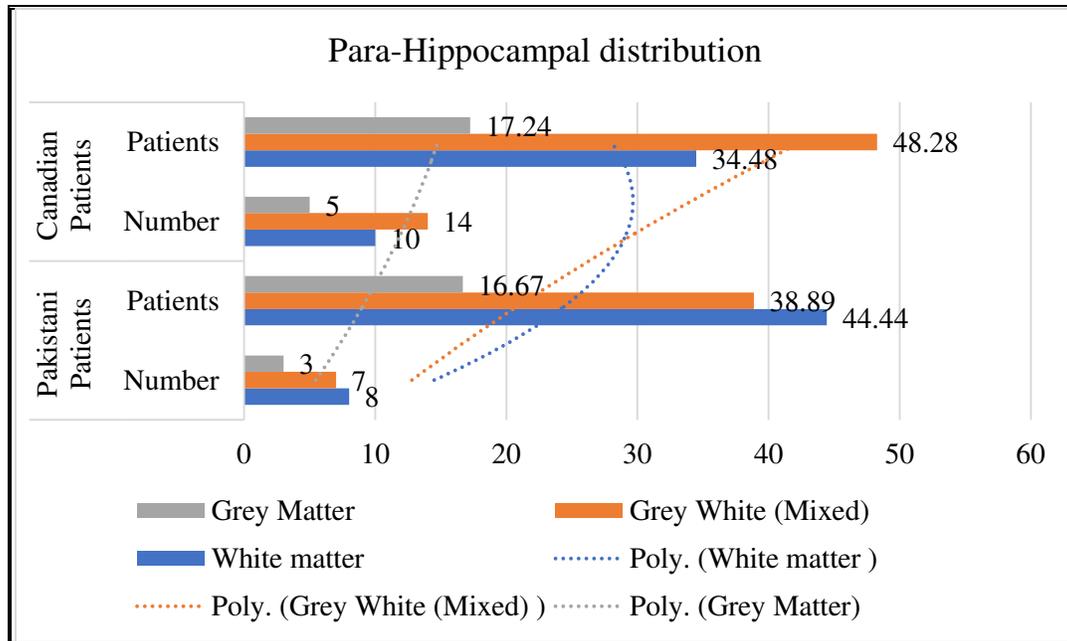
Every patient was subjected to MR brain images by using (1.5 – T MR) units. Five sequences were carried out in every patient which includes turbo spin–echo imaging (TR / TE, 3300 / 16) 98 echo train length, dual–echo and T1–weighted conventional imaging spin–echo (768 / 15), T2–weighted, proton density and FLAIR imaging. Twenty-four contiguous axial sections were taken having five-mm thickness, matrix 256×256 and field view as 250×250 mm.



Chi-Square Test, P-value respectively as 1.957 and 0.375 with an insignificant $p > 0.05$

Table – II: Para-hippocampal distribution in MS established cases among Pakistani and Canadian population.

| Matter | PHG | | | |
|--------------------|--------------------|----------|-------------------|----------|
| | Pakistani Patients | | Canadian Patients | |
| | Number | Patients | Number | Patients |
| White matter | 8 | 44.44 | 10 | 34.48 |
| Grey White (Mixed) | 7 | 38.89 | 14 | 48.28 |
| Grey Matter | 3 | 16.67 | 5 | 17.24 |



Chi-Square, p-value and insignificant p-value respectively as 0.509, 0.775 and > 0.05

Every image of MR sequence was analyzed & total lesions count was made, detailed characterizing of the lesions of temporal lobe distribution in to the peri-ventricular, para-hippocampal and juxta-cortical regions. We also analyzed in the para-hippocampal lesions the distribution of the mixed or white matter.

RESULTS

More incidence of disease was observed in the Canadian population when compared to the population of Pakistan with a mean younger than the Canadian population; however, the the distribution of the anatomical lesions in temporal lobe, Para hippocampal and paraventricular region almost the same in both the nations. Our research summarizes MR imaging outcomes and MS studies Pakistani and Canadian patients thirty each. The total number of the lesions in the Canadian population was 286, 136 temporal lobes (47.55%), 121 Peri-ventricular (42.30%), 29 Juxta-cortical (10.13%) in the temporal lobe Para-Hippocampal gyrus (PHG). In the total of 29, 14 PHG lesions (48.27%) were from PHG mixed lesions (white and grey matter), 10 PHG white matter (34.48%) lesions and 5 PHG grey matter (17.24%) lesions.

In all the lesions of PHG, four cases of LS (13.79%) were acute in the characteristics of the lesions. Whereas, in the population of Pakistan (30 cases), 210 cases were of MS including 102 temporal lobes lesions (48.57%), 90 PVC cases (42.85%), 18 Juxta-

cortical cases (8.57%) in PHG of Temporal Lobe. PHG lesions cases were 18, seven cases of PHG mixed lesion (38.88%) (white and grey matter), 8 cases of PHG white matter (44.44%) and 3 PHG grey matter cases. Five acute cases were also observed in all PHG lesions (27.78%).

DISCUSSION

There is wider use of the Conventional MR sequences for MC diagnosis through diffusion tensor imaging and MR spectroscopy [1 – 4]. In previous decade FLAIR is a part of the imaging protocols and guidelines for inflammatory lesions of the brain as MS due to its better peri-ventricular white matter brain lesions and supratentorial juxta-cortical detection [5, 6]. The newly introduced techniques like imaging through double inversion recovery which is recently introduced due to its CSF and white matter lesion better attenuation [7]. DIR sequence diagnostic accuracy is targeted on the neuroimaging clinical applications which includes infectious, vascular lesions, inflammatory and neoplastic lesions. There is a drawback of the DIR sequence as it has lengthy acquisition time with promising outcomes about the infratentorial brain pathologies [5, 8]. In para-hippocampal lesions added with the conventional T1-W, T2-W and FLAIR sequence, proton density sequences and DIR have appreciating outcomes. The detection of the MS lesions in para-hippocampal gyrus can be made through the strength of the magnetic field (1.5 T) in comparison to the higher MR sensitive imaging with the help of (3T. 9 – 11) field strength.

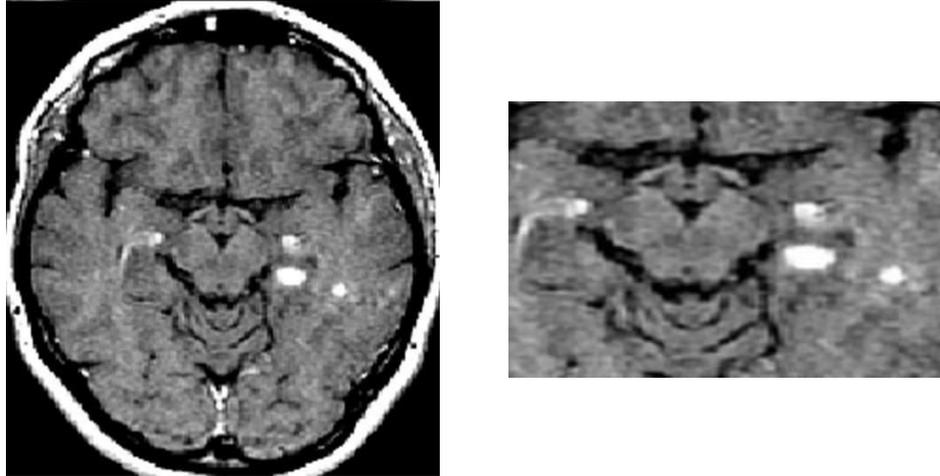


Figure: Acute left hippocampal lesion

DIR & FLAIR sequences have detection rates difference between juxta-cortical white matter & mixed white – gray matter which is a distribution of the MS lesions. A higher number of the mixed white – gray lesions can be detected [5]. In the light of currently performed histopathologic research studies it is revealed that intracortical lesions were observed frequently in the patients of MS, those intracortical lesions detection has become very important for the prognostic and diagnostic interest [12]. Racial variation was approved by two various studies of MS which includes Caucasians and American research carried out on the white and black. Lower risk factor in the blacks about the MS was not proved in these research studies as there is a possibility of the low levels of the vitamin D. It never explains the Asians and Hispanics face low risk factor of the MS against whites, on the other hand that why risk was higher in the black women about the MS [13, 14]. Same outcomes have been produced in our research when we compared Pakistani population with the Canadian population, we also observed women dominance in the incidence of MS.

CONCLUSION:

In the Canadian population it was observed that most common was the multiple sclerosis; however, its distribution of the anatomical lesions including the para-hippocampal area was not significantly involved in the variation.

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