

Distribution of M Band in Serum Protein Electrophoresis, Urinary Bence Jones Protein and Beta-2 Microglobulin Level in Multiple Myeloma Patients: A Hospital Based Study at a Tertiary Referral Hospital, Guwahati, Assam

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ABSTRACT

Multiple myeloma (MM) is a clonal plasma cell neoplasm with appearance of serum M band & beta-2 microglobulin and urinary bence jones protein. A Hospital based cross-sectional descriptive study was undertaken in the OPD of the Clinical Haematology Department of Gauhati Medical College & Hospital, Guwahati, Assam with 100 numbers of newly diagnosed MM patients during November, 2010 to October, 2013 using International Myeloma Working Group (IMWG) criteria for diagnosis of monoclonal gammopathy. Results showed (1) Distribution of M band in serum protein electrophoresis (SPEP): No M band in 19% cases, Serum M-protein > 5gm/dl in 22 (22%), 2.1-5 gm/dl in 38 (38%) and 0.1-2 gm/dl was found in 21 (21%) patients, maximum value was 8.8 gm/dl and minimum 0 gm/dl. Thus in 19 (19%) patients had non-secretory pattern electrophoresis. Statistically, there exists significant difference ($p=0.0267$) in the number of patients with reference to M-band in serum protein electrophoresis. (2) Distribution of urinary Bence Jones Protein (BJP) level of the patients: Urinary Bence Jones Protein (BJP) was present in 44 (44%) patients and absent in 56 (56%) patients. Statistically, there does not exist significant

difference ($p=0.775$) in the number of patients with reference to presence and absence of BJP. (3) Distribution of β_2 microglobulin level of the patients: 23 (23%) patients had normal range (< 3.5 mg/L), 45% had 3.5-5.4 mg/L, 32 (32%) had ≥ 5 mg/L. The minimum level was 1.8 mg/L and maximum was 45.5 mg/L with mean value of 48.86 mg/L. Statistically, there exists significant difference ($p=0.0259$) in the number of patients with reference to their β_2 microglobulin level.

Key words: Myeloma, Protein, Level.

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INTRODUCTION

Multiple myeloma is a clonal plasma cell neoplasm characterized by the proliferation of plasma cells in the bone marrow, monoclonal protein, Osteolytic bone lesions, renal disease, and immunodeficiency. It accounts for 15% of lymphohematopoietic cancers (LHC) and 2% of all cancers in the US. MM is the most important class which is included under plasma cell dyscrasias. More importantly, delineation of the mechanisms mediating plasma cell proliferation, survival and migration in the bone marrow microenvironment may enhance the understanding of pathogenesis, and a better understanding of the molecular pathogenesis is fundamental for developing more effective

prognostic, therapeutic and preventive approaches. Various studies shows different observations in connection to distribution of M band in serum protein electrophoresis, urinary bence jones protein and beta-2 microglobulin level in MM patients. But to our knowledge, such studies in the North – East India has not been carried on.

MATERIALS AND METHODS

This study is based on studies conducted on Distribution of M Band in Serum Protein Electrophoresis, Urinary Bence Jones Protein and Beta-2 microglobulin Level in Multiple Myeloma

Patients - a Hospital Based Study at a Tertiary Referral Hospital, Guwahati, Assam. A total of 100 cases were studied in the Out Patient Department (OPD) of the Clinical Haematology Department, Gauhati Medical College & Hospital, and Guwahati, Assam. Being a descriptive study, the data were procured from the OPD of the same department.

Research Type: Hospital based cross-sectional descriptive study.

Study Setting: the present study has been undertaken in the Out Patient Department of the Clinical Haematology Department of Gauhati Medical College & Hospital, Guwahati, Assam.

Study Period: the study period was three years commencing from November, 2010 to October, 2013.

Study Population: the study population comprise of 100 numbers of newly diagnosed cases of multiple myeloma attending the OPD of the Clinical Haematology Department of Gauhati Medical College & Hospital, Guwahati, Assam during the period of November, 2010 to October, 2013. Before undergoing the study clearance from institutional ethical committee was obtained. Analysis of data was done in the year 2014-15.

The Sample: Sample size of 100 number of newly diagnosed multiple myeloma patients were taken into the study during the period of November, 2010 to October, 2013.

Selection of Cases: We have taken all the newly diagnosed cases of multiple myeloma into the study attending at OPD of the Clinical Haematology Department of Gauhati Medical College & Hospital, Guwahati, Assam during the period of November, 2010 to October, 2013. Initially patients were selected purely on clinical ground and then negative cases were excluded after diagnosis based on International Myeloma Working Group (IMWG) criteria for diagnosis of monoclonal gammopathy. Inclusion criteria - One

hundred newly diagnosed cases of multiple myeloma of all age group from November, 2010 to October, 2013. Exclusion criteria – (1) Old diagnosed cases of multiple myeloma that are under treatment. (2) Monoclonal gammopathy of undetermined significance (MGUS) (3) Asymptomatic (smouldering) multiple myeloma.

Protocol: The proforma was prepared based on universal standard protocols for evaluation of multiple myeloma which contains separate history, examination and investigation parts. The International Myeloma Working Group (IMWG) criteria for classification of monoclonal gammopathys, multiple myeloma and related disorders were used for diagnosis of the disease. During the study period Immunofixation electrophoresis test (for serum/urine) was not available in the institute. So this test was not included into the study. Then staging was made according to International Staging System (ISS). Performance status of patients was made according to Eastern Co-operative Oncology Group (ECOG) standard performance protocol (Appendix-1).

Methods: Details of the patient - Details of the patients were recorded in the manner in order of age, sex, religion, caste, occupation, address, hospital number and registration number for identification and documentation. When patients were first examined a detailed history was taken and thorough clinical examination was done. Then they underwent a battery of investigations to confirm diagnosis. All the patient's history, clinical examination, investigation findings, and diagnosis data were recorded in a pre-designed and pre-tested proforma.

Statistical Analysis: data were analysed using statistical package and results and observations were presented in tabular form. Statistical tests were applied wherever required.

Table 1: Distribution of M band in serum protein electrophoresis (SPEP) (N=100)

M-band in SPEP (gm/dl)	Male		Female		Total		N	Mean	SD	Min	Max
	No.s	%	No.s	%	No.s	%					
0	12	17.91	7	21.21	19	19	100	2.992	2.344	0	8.8
0.1 – 2	14	20.90	7	21.21	21	21					
2.1 - 5	26	38.80	12	36.37	38	38					
>5	15	22.39	7	21.21	22	22					
Total	67	100	33	100	100	100					

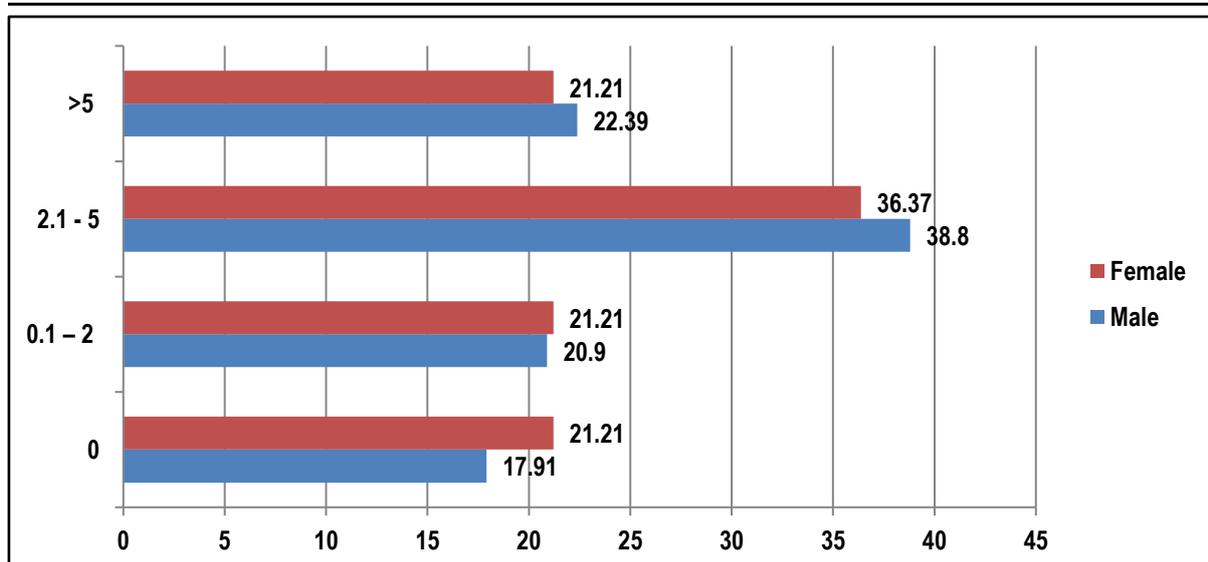


Figure 1: Bar diagram showing distribution of M band in serum protein electrophoresis

Table 2: Distribution of urinary Bence Jones Protein (BJP) level of the patients (N=100)

Urinary BJP at Base line	Males		Females		Total	
	No.s	%	No.s	%	No.s	%
Present	30	44.78	14	42.42	44	44
Absent	37	55.22	19	57.58	56	56
Total	67	100	33	100	100	100

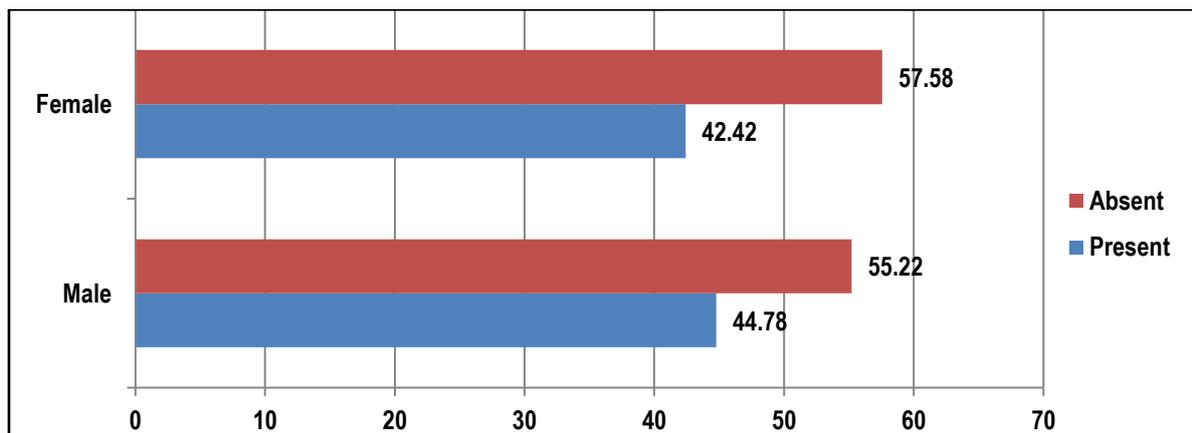


Figure 2: Bar diagram showing distribution of urinary Bence Jones Protein level of the patients

Table 3: Distribution of $\beta 2$ microglobulin level of the patients (N=100)

$\beta 2$ -M (mg/L)	Male		Female		Total		N	Mean	SD	Min	Max
	No.s	%	No.s	%	No.s	%					
<3.5	16	23.88	7	21.21	23	23	100	48.86	15.11	1.8	45.5
3.5-5.4	31	46.27	14	42.42	45	45					
≥ 5.5	20	29.85	12	36.37	32	32					
Total	67	100	33	100	100	100					

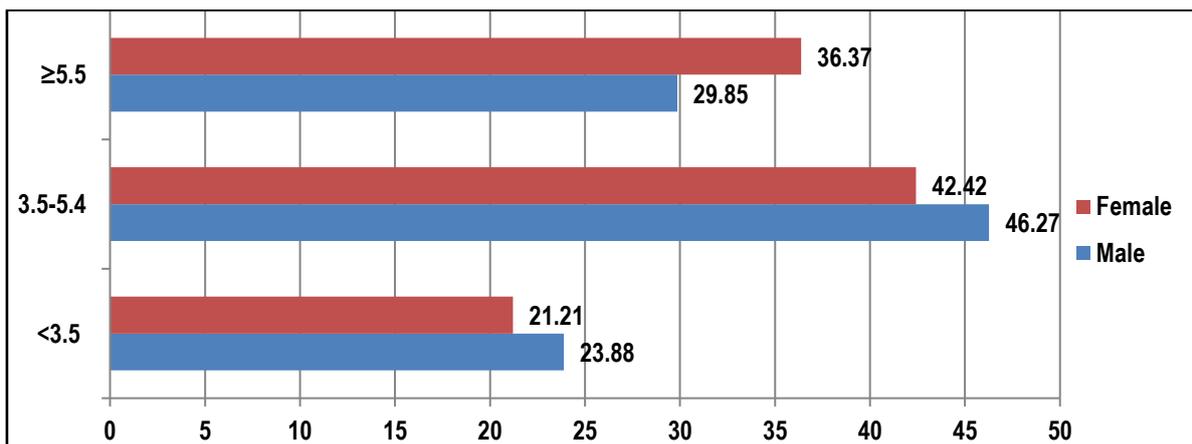


Figure-3: Bar diagram showing distribution of $\beta 2$ microglobulin level of the patients

RESULTS AND OBSERVATIONS

Table-1 shows that there were 19 (19%) patients who did not show an M band in electrophoresis. Serum M-protein more than 5gm/dl was found in 22 (22%) patients, 2.1-5 gm/dl was found in 38 (38%) patients and 0.1-2 gm/dl was found in 21 (21%) patients. The maximum value was 8.8 gm/dl and minimum 0 gm/dl. Thus in 19 (19 %) patients had non-secretory pattern electrophoresis. Statistical analysis from the table-1 reveals that there exists significant difference ($p = 0.0267$) in the number of patients with reference to M-band in serum protein electrophoresis and the most significant group of patients is found to be having M-band in serum protein electrophoresis in the interval of (2.1- 5) gm/dl. The table-2 shows that Urinary Bence Jones Protein was present in 44 (44%) patients and absent in 56

(56%) patients. The statistical analysis from the table-2 reveals that there does not exist significant difference ($p=0.775$) in the number of patients with reference to presence and absence of BJP. The table-3 shows a normal range value of less than 3.5 mg/L was found in 23 (23%) patients. Forty five (45%) patients had 3.5-5.4 mg/L. In the rest 32 (32%) patients it was more than equal to 5 mg/L. The minimum level was 1.8 mg/L and maximum was 45.5 mg/L with mean value of 48.86 mg/L. Thus $\beta 2$ -microglobulin level was significantly elevated in most of our patients. Statistical analysis from the table-3 reveals that there exists significant difference ($p=0.0259$) in the number of patients with reference to their $\beta 2$ microglobulin level. Also it is found that a significantly more number of patients had $\beta 2$ microglobulin in the range of 3.5-5.4mg/L.

DISCUSSION

M-Band in Serum Protein Electrophoresis (SPEP)

In the present study there were 19 (19%) patients who did not show an M band in electrophoresis. Serum M-protein more than 5gm/dl was found in 22 (22%) patients, 2.1-5 gm/dl was found in 38 (38%) patients and 0.1-2 gm/dl was found in 21 (21%) patients. The maximum value was 8.8 gm/dl and minimum 0 gm/dl. Thus in 19 (19%) patients had non-secretory pattern electrophoresis. Statistical analysis reveals that there exists significant difference ($p=0.0267$) in the number of patients with reference to M-band in serum protein electrophoresis and the most significant group of patients is found to be having M-band in serum protein electrophoresis in the interval of (2.1- 5) gm/dl.

Kyle RA. (2003)¹ observed M band in 82 percent of the MM patients. Gupta P et al. (1995)² described M protein in serum in 74 percent of the myeloma patients. G.D. Miralles et al. (1992)³ described M-band in 87 percent of the myeloma patients. Kyle RA. et al. (2003)¹ in his study of 1027 cases of multiple myeloma, nonsecretory myeloma was recognized in 3 percent of the patients. Thus our study results nearly correlated with the studies of Kyle RA,¹ Gupta P et al.,² and G.D. Miralles et al.³

Urinary Bence Jones Protein (BJP)

In the present study Urinary Bence Jones Protein was present in 44 (44%) patients and absent in 56 (56%) patients. Statistical analysis reveals that there does not exist significant difference ($p=0.775$) in the number of patients with reference to presence and absence of BJP. Gupta P et al.², Riccardi A et al.(1991)⁴ and Thakur Y S et al. (1997)⁵ demonstrated urine BJP in 47 percent, 47 percent and 44.45 percent of the MM patients respectively. Thus most of the studies have near similar values to ours.

$\beta 2$ -Microglobulin ($\beta 2$ -M)

In the present study a normal range value of $\beta 2$ -Microglobulin ($\beta 2$ -M) i.e. less than 3.5 mg/L was found in 23 (23%) patients. Forty five (45%) patients had 3.5-5.4 mg/L. In the rest 32 (32%) patients it was more than equal to 5 mg/L. The minimum level was 1.8 mg/L and maximum was 45.5 mg/L with mean value of 48.86 mg/L. Thus $\beta 2$ -microglobulin level was significantly elevated in most of our patients. Statistical analysis reveals that there exists significant difference ($p=0.0259$) in the number of patients with reference to their $\beta 2$ -microglobulin level. Also it is found that a significantly more number of patients had $\beta 2$ -microglobulin in the range of 3.5-5.4mg/L. In Kyle RA's (2003)¹, 75 percent of the myeloma patients had a value >2.8 mg/L and the median were 3.9. Blade J (1995),⁶ found $\beta 2$ -M value >2.8 mg/L in 58 percent of the MM patients. Thus our observations are almost similar to the above studies and so can be comparable with these studies.

CONCLUSION

- Most frequently detected Serum M band level was 2.1-5 gm/dl (detected in 38% patients).
- Urine BJP was present in 64.28% patients and absent in 35.71% patients.

RECOMMENDATIONS

- 1) The common nonspecific symptoms of multiple myeloma like fatigue, bone pain, easy bruising and bleeding and recurrent infections are similar to symptoms of some common diseases. So it become necessary for physicians to keep high level of suspicion for the possibility of these being for

multiple myeloma and thorough evaluation to be undertaken to detect all multiple myeloma cases.

- 2) Moreover, some screening tests like detection of serum M-band, Beta2microglobulin and urinary BJP should be held periodically by the health agencies to detect the disease early specially in elderly people who are at risk of having environmental, occupational and life style factors for development of multiple myeloma. For this hospital should be well equipped with uninterrupted supply of materials necessity for early detection of multiple myeloma. Health agencies should be encouraged to organize periodic camps, health mela for screening of the disease.
- 3) Environmental, occupational and life style factors which are risk for development of multiple myeloma should be included into the health education programmers so that the disease can be prevented. Information, Education and Communication (IEC) activities should be strengthened to disseminate these informations to the people. Moreover, periodical orientation course to medical and paramedical staff should be undertaken.
- 4) The study was a descriptive study. So any conclusions drawn will have to be guarded and will have to confirm with further trials in India.

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