

## Multiple Myeloma in Relation to Different Geographical Distribution, Socioeconomic Status and Level of Education: A Hospital Based Study at a Tertiary Level Hospital, Guwahati, Assam

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### ABSTRACT

**Background:** The risk factors for multiple myeloma (MM) are not conclusive, because the cause of MM is not clearly known. Researchers believe that MM is most likely the result of many risk factors acting together. Despite recent advances in clarifying the biological mechanisms of MM, there are no established risk factors so far other than factors like male gender, increasing age, African American ethnicity, positive family history of lymphohematopoietic cancer (LHC) and monoclonal gammopathy of undetermined significance (MGUS). Several studies have shown different level of prevalence of MM in different geographical areas, socioeconomic status and education. This study aimed to investigate the relationship of MM with these variations.

**Methods:** 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.

**Results:** In the present study 72 (72%) patients hail from rural areas and 28 (28%) from urban areas showing that of MM is significantly high ( $p=0.000011$ ) in patients belonging to the rural areas; 97 (97%) patients' hails from plain areas while only 3 (3%) patients from hill areas having prevalence of MM is very low ( $p<0.00001$ ) among the people living in hill areas than those living in plain areas; 57 (57%) patients belonged to lower class, 13 (13%) patients to upper class and 30 (30%) patients to middle class depicting that number of patient is significantly

high ( $p<0.00001$ ) among the lower class (as per socioeconomic status suggested by Kupuswamy) of the society and lastly 82 (82%) patients were literate while 18 (18%) were illiterate showing that there exists significant difference ( $p=0.0039$ ) of prevalence of MM among people with different education levels. Also prevalence seems to be low among the educated people.

**Conclusion:** Prevalence of MM is significantly high in patients belonging to the rural areas, living in hill areas than those living in plain areas, among the lower class (as per socioeconomic status suggested by Kupuswamy) of the society and low among the educated people.

**Keywords:** Myeloma, Patients, Significantly.


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### INTRODUCTION

Multiple Myeloma (MM) is a malignant proliferation of plasma cell and plasmacytoid cells characterised nearly always by the presence, in the serum and/or urine, of a monoclonal immunoglobulin (Ig) or Ig fragment. Myeloma cells can induce alterations in the marrow microenvironment, which in turn, provides survival factors that contribute to the resistance of myeloma cells to many anticancer drugs. 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. Several studies have shown different level of prevalence of MM in different geographical areas, socioeconomic status and education. This study aimed to investigate the relationship of MM with these variations.

**MATERIALS AND METHODS**

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 OPD 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.

**Study Sample:** 100 number of newly diagnosed MM 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 MM 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 gammopathys.

**Inclusion Criteria:** One hundred newly diagnosed cases of MM of all age group from November, 2010 to October, 2103.

**Exclusion Criteria:** (1) Old diagnosed cases of MM that are under treatment. (2) Monoclonal gammopathys of undetermined significance (MGUS) (3) Asymptomatic (smoldering) MM.

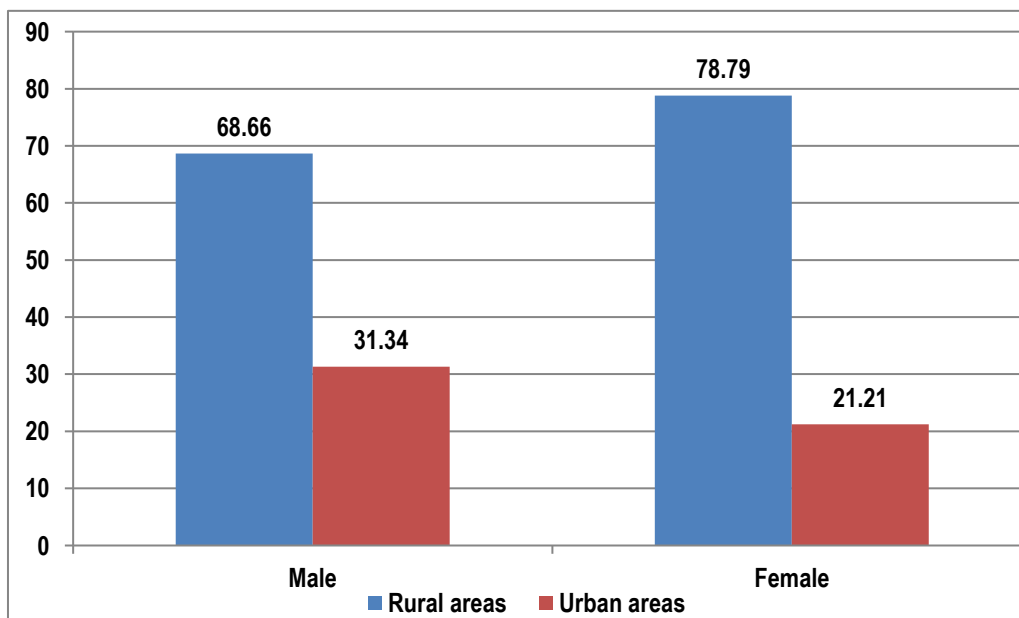
**Protocol:** The proforma was prepared based on universal standard protocols for evaluation of MM which contains separate history, examination and investigation parts. The International Myeloma Working Group (IMWK) criteria for classification of monoclonal gammopathys, multiple myeloma and related disorders 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.

**Methods:** 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: Geographical areas wise distribution of the patients (rural/urban)**

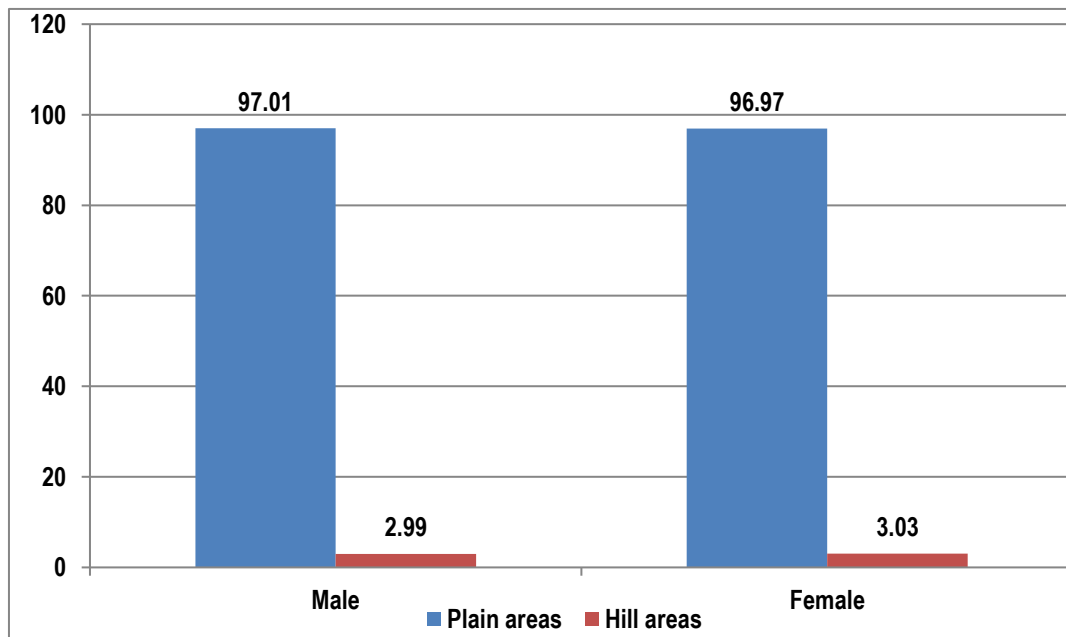
Geographical areas	Male		Female		Total	
	No.s	%	No.s	%	No.s	%
Rural areas	46	68.66	26	78.79	72	72
Urban areas	21	31.34	7	21.21	28	28
<b>Total</b>	<b>67</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>100</b>	<b>100</b>



**Figure 1: Bar diagram showing geographical area wise distribution of the patients (rural/urban)**

**Table 2: Geographical areas wise distribution of the patients (plain/hill areas)**

Geographical areas	Male		Female		Total	
	No.s	%	No.s	%	No.s	%
Plain areas	65	97.01	32	96.97	97	97
Hill areas	2	2.99	1	3.03	3	3
<b>Total</b>	<b>67</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>100</b>	<b>100</b>



**Figure 2: Bar diagram showing geographical area wise distribution of the patients (plain/hill areas)**

**RESULT AND OBSERVATIONS**

**1. Geographical distribution of the patients (rural/urban) N=100**

Table-1 shows that 72 (72%) patients hail from rural areas and 28 (28%) from urban areas. The statistical analysis from the table-1 suggest that prevalence of MM is significantly high ( $p= 0.000011$ ) in patients belonging to the rural areas. (Test statistics: 'Z' test for difference of two proportions, calculated value of 'Z'= 4.4)

**2. Geographical distribution of the patients (plain/hill areas) N=100**

It appears from the above table-2 that 97 (97%) patients' hails from plain areas while only 3 (3%) patients from hill areas. The statistical analysis from the table-2 suggest that prevalence of MM is very low ( $p<0.00001$ ) among the people living in hill areas than those living in plain areas. (Test statistics: 'Z' test for difference of two proportions, calculated value of 'Z'= 9.4)

**3. Distribution of socioeconomic status of the patients (as per Kupuswamy modified criteria) N = 100**

Table-3 shows that 57 (57%) patients belonged to lower class, 13

(13%) patients to upper class and 30 (30%) patients to middle class. The statistical analysis from the table-3 suggest that number of patient is significantly high ( $p<0.00001$ ) among the lower class (as per socioeconomic status suggested by Kupuswamy) of the society. (Test statistics: 'X<sup>2</sup>' test for independences of attributes)

**4. Level of education of the patients**

Among the patients who informed that they are able to read and write, but could not confirm up which level they read, they are categorized as such. Others were categorized as per their level of school education.

Table-4 shows that 82 (82%) patients were literate while 18 (18%) were illiterate. The statistical analysis from the table-4 suggest that there exists significant difference ( $p=0.0039$ ) of prevalence of MM among people with different education levels. Also prevalence seems to be low among the educated people. (Test statistics: 'X<sup>2</sup>' test for independences of attributes, calculated value of 'X<sup>2</sup>'=1 9.14)

**Table 3: Distribution of socioeconomic status of the patients (as per Kupuswamy modified criteria)**

Socioeconomic status	Males		Females		Total	
	No.s	%	No.s	%	No.s	%
Upper class	8	11.94	5	15.15	13	13
Middle class	24	35.82	11	33.33	30	30
Lower class	35	52.24	17	51.52	57	57
<b>Total</b>	<b>67</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>100</b>	<b>100</b>

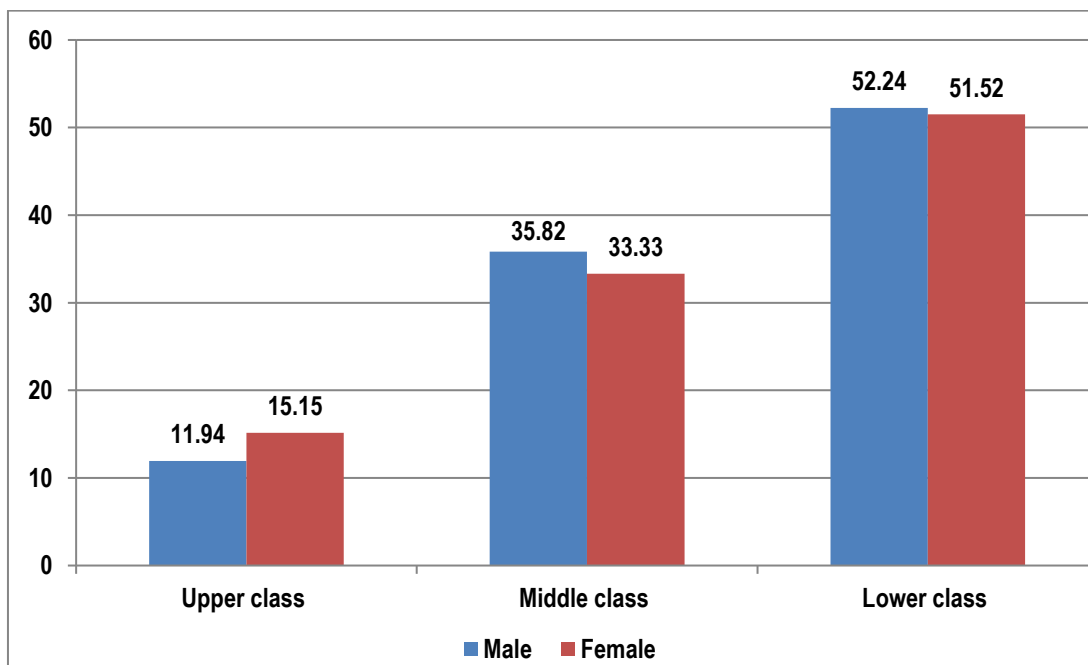


Figure 3: Bar diagram showing distribution of socioeconomic status of the patients (as per Kupuswamy modified criteria)

Table 4: Distribution of patients with different levels of education. N=100

Education level	Males		Females		Total	
	No.s	%	No.s	%	No.s	%
Illiterate	11	16.42	7	21.21	18	18
Can read only	3	4.48	5	15.15	8	8
Can read and write	11	16.42	5	15.15	16	16
Primary school	21	31.34	5	15.15	26	26
Middle school	9	13.43	6	18.18	15	15
High school	8	11.94	3	9.09	11	11
Graduate	4	5.97	2	6.07	6	6
<b>Total</b>	<b>67</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>100</b>	<b>100</b>

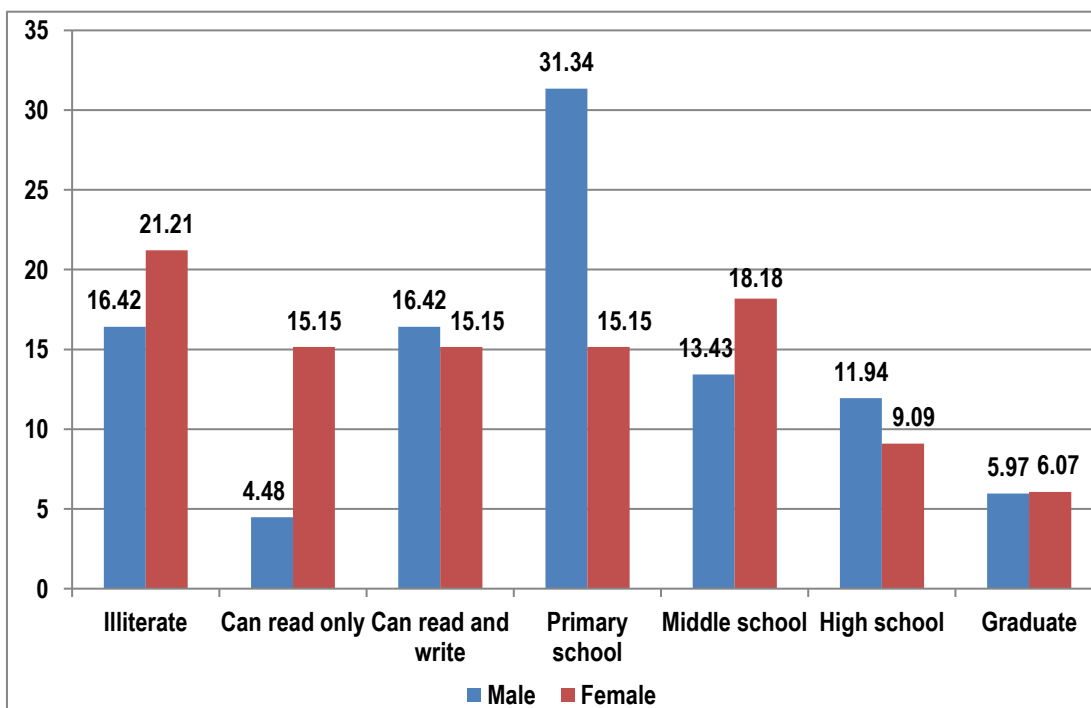


Figure 4: Bar diagram showing distribution of patients with different levels of education

## DISCUSSION

### (1) Geographical distribution of patients (Urban/Rural areas)

In the present study 72 (72%) patients hail from rural areas and 28 (28%) from urban areas. Statistical analysis suggest that prevalence of MM is significantly high ( $p=0.000011$ ) in patients belonging to the rural areas.

### (2) Geographical distribution of patients (plain/hill areas)

In the current study 97 (97%) patients' hails from plain areas while only 3 (3%) patients from hill areas. Statistical analysis suggest that prevalence of MM is very low ( $p<0.00001$ ) among the people living in hill areas than those living in plain areas.

A total of 68,400 whites and 10,533 nonwhites were reported to have died from multiple myeloma (MM) in the continental United States between 1950 and 1975 (excluding 1972 because of incomplete case ascertainment). Age-adjusted mortality rates for nonwhites were approximately twice as high as for whites. Urban areas had the highest rates and rural areas had the lowest, and positive associations were seen with indices of socioeconomic level and the percentage of residents with Scandinavian ancestry.<sup>1</sup> Thus, our study findings does not correlate with this study.

In India, MM was diagnosed in 84 residents of Jammu & Kashmir between 1984-1988. The data were analyzed to find out variations of demographic factors, ethnicity and location of residence (urban/rural). The observed average annual incidence per 100,000 residents was 1.28. The rates for males and females were 2.02 and 0.71 per 10(5) persons/year respectively. The observed average incidence rate for Muslims was significantly higher than that for Hindus. Urban residents had significantly higher rates than rural population. Highest incidence rate (14.39) was in the age group of 65 years and above.<sup>2</sup> Thus, our study findings have similar observations with this study.

### (3) Distribution of socioeconomic status of patients

In our study 57 (57%) patients belonged to lower class, 13 (13%) patients to upper class and 30 (30%) patients to middle class. Statistical analysis suggest that number of patient is significantly high ( $p<0.00001$ ) among the lower class (as per socioeconomic status suggested by Kupuswamy) of the society.

Koessell S.L et al (1996)<sup>3</sup> studied regarding socioeconomic status and the incidence of multiple myeloma were suggestive of a positive association of MM as being higher in individuals of lower socioeconomic status.

Lenhard R.E et al. (1987)<sup>4</sup> observed that higher incidence of myeloma in individuals of lower socioeconomic status possibly have been the result of better access to sensitive diagnostic methods and adequate medical treatment by individuals of higher socioeconomic status rather than a true positive relationship between an increased risk of myeloma and lower socioeconomic status. Thus the above observations of our study can be correlated with these International studies.

### (4) Distribution of patients with different levels of education

In the present study 82 (82%) patients were literate while 18 (18%) were illiterate. The statistical analysis suggest that there exists significant difference ( $p=0.0039$ ) of prevalence of MM among people with different education levels. Also prevalence seems to be low among the educated people. The EPILYMPH study applied a detailed occupational exposure assessment approach to a large multi-centre case-control study conducted in six European countries. This paper analysed MM risk associated

with level of education, and lifetime occupational history and occupational exposures, based on the EPILYMPH data set. A low level of education was associated with MM OR=1.68 (95% CI 1.02-2.76). An increased risk was observed for general farmers (OR=1.77; 95% CI 1.05-2.99) and cleaning workers (OR=1.69; 95% CI 1.04-2.72) adjusting for level of education. Risk was also elevated, although not significant, for printers (OR=2.06; 95% CI 0.97-4.34). Pesticide exposure over a period of ten years or more increased MM risk (OR=1.62; 95% CI 1.01-2.58). Thereby, MM was more commonly observed in professionals with low education level.<sup>5</sup> Thus our study findings are nor similar to this study. It may be explained that level of health consciousness is more in literate groups than the illiterate group. Hence, they get better access to sensitive diagnostic methods early for diagnosis of MM. So, rate of case detection of the disease is more among the literate group resulting more prevalence. Moreover, further community based research is needed to examine whether levels of education of patients contributes as an important attributes to the causation of multiple myeloma.

## CONCLUSION

Prevalence of multiple myeloma is significantly high in patients belonging to the rural areas, living in hill areas than those living in plain areas, among the lower class (as per socioeconomic status suggested by Kupuswamy) of the society and low among the educated people.

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