

## Original Research Article

# Distribution of different occupations in multiple myeloma patients- a hospital based study at a tertiary care hospital, Guwahati, Assam, India

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## ABSTRACT

**Background:** Several studies have shown that people who have been exposed to radiation or to asbestos, benzene, pesticides, and other chemicals used in rubber manufacturing may be at higher risk for developing multiple myeloma (MM). Those exposed to wood products, such as carpenters, furniture makers, and paper makers, are also at higher risk of developing this disease. Most occupational cohort studies lack statistical power for rare outcomes such as MM and many case-control studies suffer from small numbers of exposed subjects in specific occupation, job title or chemical exposure categories. This study aimed to investigate the distribution of MM among different occupational groups.

**Methods:** A total of 100 cases were studied in the out patient department (OPD) of the Clinical Haematology Department, Gauhati Medical College and Hospital, and Guwahati, Assam, India. It was a hospital based cross-sectional descriptive study. 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 (IMWG) criteria for classification of monoclonal gammopathy, multiple myeloma and related disorders were used for diagnosis of the disease. Data were analyzed using statistical package and results and observations were presented in tabular form. Statistical tests were applied wherever required.

**Results:** Statistical analysis suggested that farmers and housewives were more vulnerable to MM and the prevalence was significantly high ( $p > 0.00001$ ) among farmers followed by housewives; prevalence of MM was significantly high ( $p > 0.00001$ ) among the farmers working in agriculture as compared to those in farms; there was some difference ( $p < 0.00001$ ) in relation to risk of pesticide exposure between cultivation of crops and vegetable. Pesticide exposure was relatively high with cultivation of crops than vegetable; among the farmers working in farms, those who work in farm with furred animals are more vulnerable ( $p < 0.00001$ ) to the prevalence of MM than the others; frequency of pesticide exposure had no effect ( $p = 0.354$ ) on the prevalence of MM; prevalence of MM was significantly high ( $p = 0.0005$ ) among farmers who expose to pesticides for more than 5 years as compared to those exposing for less time and prevalence of multiple myeloma is very insignificant ( $p < 0.00001$ ) among the fruit and pesticide sellers.

**Conclusions:** Prevalence of MM was significantly high ( $p = 0.0005$ ) among farmers who expose to pesticides for more than 5 years and carpenters who worked for more than 4 years.

**Keywords:** Myeloma, Occupation, Vulnerable

## INTRODUCTION

Multiple myeloma is a clonal plasma cell malignancy characterized by the proliferation of neoplastic plasma cells.<sup>1</sup> Its Incidence rates increase with age, particularly after age 40, and are higher in men. 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.<sup>2</sup>

Recent studies have shown that there is a high incidence of MM among professional fire fighters and those exposed to herbicides, including Agent Orange. On the other hand, other studies have depicted that agricultural workers and/or persons exposed to pesticides have generated variable results of developing MM. Likewise, results among pesticide production workers, applicators, handlers and licensed users have been inconsistent; and collectively, do not provide strong support for an underlying causal association of developing MM. Similarly, occupational studies of cosmetology, chemical, petroleum, or radiation industry workers have not provided consistent evidence in support of causal associations with MM while other studies show association.

## METHODS

This study was based on studies conducted on “Distribution of Different Occupations in Multiple Myeloma Patients- a Hospital Based Study at Gauhati Medical College and Hospital, Guwahati, Assam- A Hospital Based Study at Gauhati Medical College and Hospital, Guwahati, Assam, India”. A total of 100 cases were studied in the out patient department (OPD) of the Clinical Haematology Department, Gauhati Medical College and Hospital, and Guwahati, Assam, India. Being a descriptive study, the data were procured from the OPD of the same department. It was a hospital based cross-sectional descriptive study.

### *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 and Hospital, Guwahati, Assam, India 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.

### *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 and 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 gammopathies.

### *Inclusion criteria*

One hundred newly diagnosed cases of multiple myeloma of all age group from November 2010 to October 2013.

### *Exclusion criteria*

- Old diagnosed cases of multiple myeloma that are under treatment.
- Monoclonal gammopathys of undetermined significance (MGUS).
- Asymptomatic (smoldering) 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 (IMWK) criteria for classification of monoclonal gammopathies, 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 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 analyzed using statistical package and results and observations were presented in tabular form. Statistical tests were applied wherever required.

## RESULTS

A total of 100 cases were taken into the study. Table 1 shows that patients were engaged with various types of occupations. Among male patients farmers were the most common sufferers of MM comprising of 25 numbers (25%) while among female patients housewife were most

common sufferers comprising of 23 numbers (23%). The statistical analysis shown in the Table 1 suggest that farmers and housewives are more vulnerable to multiple myeloma and the prevalence is significantly high ( $p > 0.00001$ ) among farmers followed by housewives. (Test statistics: 'Z' test for differences of two proportions).

**Table 1: Distribution of different present occupation of the patients.**

Present occupation	Male		Female		Total		Mean duration (years)
	No.	%	No.	%	No.	%	
Farmer	25	37.31	0	0	25	25	18
Housewife	0	0	23	69.70	23	23	32
Government service	2	2.99	3	9.09	5	5	22
Retired Government servant	2	2.99	3	9.09	5	5	5
Unemployed	1	1.5	1	3.30	2	2	24
Businessman	2	2.99	0	0	2	2	15
Fisherman	2	2.99	0	0	2	2	15
Employees of NGO	2	2.99	0	0	2	2	20
Labour	2	2.99	0	0	2	2	20
Carpenter	2	2.99	0	0	2	2	20
Police	1	1.5	1	3.30	2	2	10
Tailor	1	1.5	1	3.30	2	2	20
Photographer	1	1.5	0	0	1	1	20
Workers of carbon industry	1	1.5	0	0	1	1	15
Hair dresser	1	1.5	0	0	1	1	15
Laboratory technician	1	1.5	0	0	1	1	20
Veterinary professional	1	1.5	0	0	1	1	25
Cobbler	1	1.5	0	0	1	1	20
Chemist	1	1.5	0	0	1	1	20
Book binder	1	1.5	0	0	1	1	25
Painter	1	1.5	0	0	1	1	20
Jewellery workers	1	1.5	0	0	1	1	30
Metalworkers	1	1.5	0	0	1	1	20
Workers of petrol pump	1	1.5	0	0	1	1	30
Driver	1	1.5	0	0	1	1	15
Rick show puller	1	1.5	0	0	1	1	30
Priest	1	1.5	0	0	1	1	25
Typesetter	1	1.5	0	0	1	1	25
Sweeper	0	0	1	3.30	1	1	25
Hooker	1	1.5	0	0	1	1	25
Worker of wood and leather factory	1	1.5	0	0	1	1	20
Worker of rubber and plastic factory	1	1.5	0	0	1	1	20
Worker of bamboo factory	1	1.5	0	0	1	1	20
Workers of asbestos industry	1	1.5	0	0	1	1	20
Industry workers where pesticides are used	1	1.5	0	0	1	1	20
Worker of textile industry	1	1.5	0	0	1	1	20
Worker of road	1	1.5	0	0	1	1	20
Total	67	100	33	100	100	100	

## DISCUSSION

### *Distribution of different present occupations of the patients*

In the present study patients were engaged with various types of occupations. Among male patients farmers were the most common sufferers of MM comprising of 25 numbers (25%) while among female patients housewife were most common sufferers comprising of 23 numbers (23%). Statistical analysis suggest that farmers and housewives are more vulnerable to MM and the prevalence is significantly high ( $p > 0.00001$ ) among farmers followed by housewives. Khuder SA et al observed maximum incidences of multiple myeloma in farmers.<sup>3</sup> Thus our study results can be correlated with this international study.

### *Distribution of different forms of pesticides used by the farmers*

In present study 20 (20%) patients were exposed to pesticides in agriculture sector and 5 (5%) patients in farm sector. Seventy five (75%) patients were not exposed to pesticides. Statistical analysis suggest that prevalence of MM is significantly high ( $p > 0.00001$ ) among the farmers working in agriculture as compared to those in farms. Mannelje A et al and Baris D et al have demonstrated the risk of the occurrence of myeloma in agricultural workers with use of fuels and pesticides in general.<sup>4,5</sup> Burmeister LF reported association of MM in farmers working in chicken farm, Pukkala E and Notkola V reported in pig or poultry farm and Baris D et al reported in sheep farm.<sup>5-7</sup> Thus, present study findings are consistent with various other studies of Mannelje A et al and Baris D et al, Burmeister LF, Pukkala E et al.<sup>7</sup>

It can be explained that farmers are more exposed to pesticides in agriculture than farming. So, incidences of MM are high among agricultural farmers in relation to farmers working in farms. Moreover, as most of the farmers are male, prevalence of MM is more in male than female. Thus present study results correlated with these international studies.

### *Distribution of exposure of farmers to pesticides in different agriculture works*

In the study it has observed that during cultivation crops 15 (15%) patients were exposed to pesticides while 5 (5%) patients were exposed to pesticides with cultivation of vegetables. Statistical analysis suggested that there is some difference ( $p < 0.00001$ ) in relation to risk of pesticide exposure between cultivation of crops and vegetable. Pesticide exposure is relatively high with cultivation of crops than vegetable. It can be explained that farmers are more exposed to pesticides in cultivation of crops than cultivation of vegetables. So, incidences of MM are high among agricultural farmers with cultivation of crops than vegetables.

### *Distribution of different modes of exposure of farmers to pesticides in different farming*

It was observed in the present study that pesticides exposure occurred in 3 (3%) patients in farm industry having cattle, poultry, sheep and other furred farm animals; 1 (1%) patient in chicken farm and 1 (1%) patient in farms of grain dust. Statistical analysis suggested that among the farmers working in farms, those who work in farm with furred animals are more vulnerable ( $p < 0.00001$ ) to the prevalence of MM than the others. Fritschi L et al and Baris D et al reported nonsignificant relative risk estimates for MM for poultry, cattle, sheep, horse and pig farmers.<sup>5,8</sup> Heinemann EF and Pottem LM reported association of MM in farmers who lived with furred animals and firm animals and Burmeister LF reported with chicken farm.<sup>6,9,10</sup> Present study findings can be correlated with these studies.

### *Distribution of frequency of pesticides exposure to the patients*

In present study 8 (8%) patients were exposed to pesticides 16-20 times in 6 months, 7 (7%) patients exposed 11-15 times in 6 months, 5 (5%) patients exposed 5-10 times in 6 months and 4 (4%) patients exposed 21-25 times in 6 months. Statistical analysis shows that frequency of pesticide exposure has no effect ( $p = 0.354$ ) on the prevalence of MM.

### *Distribution of duration of pesticides exposure to the patients*

In the study 14 (14%) patients were exposed to pesticides for more than 5 years, 7 (7%) patients for 4-5 years, 2 (2%) patients for 2-4 years and 1 (1%) patient for 1-2 years. Statistical analysis suggest that prevalence of MM is significantly high ( $p = 0.0005$ ) among farmers who expose to pesticides for more than 5 years as compared to those exposing for less time. Patients did not give history regarding individual type of pesticides used. So individual type of pesticides could not be studied.

### *Distribution of different types of business of the businessman*

In the study 1 (1%) patient was fruit seller and 1 (1%) pesticides seller. Statistical analysis suggest that prevalence of MM is very insignificant ( $p < 0.00001$ ) among the fruit and pesticide sellers. Fruit sellers frequently use pesticides as preservatives while pesticide sellers have direct contact with pesticides. Pearce NE demonstrated the risk of the occurrence of myeloma in patients who used pesticides.<sup>11</sup> Thus, although present study results are statistically insignificant, yet it is comparable with the study. Moreover, it appeared that both fruit seller and pesticide sellers had given the history of selling these for more than 10 years. The statistical analysis suggest that among the fruit and pesticide sellers, those who are with their business for more than 10 years

are more vulnerable ( $p < 0.00001$ ) to MM. Perrotta C et al reported that chances of developing MM was more following exposure to pesticides in farms those who exposed for more than 10 years.<sup>12</sup> Present study findings are consistent with this study.

#### ***Distribution of Fishermen***

In present study we observed 2 (2%) patients developed MM who worked as fisherman where one patient worked for 4-5 years and another for 15 years. Statistical analysis reveals that fisherman who are in their work for more than 4 years have significantly high ( $p = 0.00001$ ) possibility of having MM. Higher incidence of MM in fisherman has been explained by Lee WJ et al.<sup>13</sup> Schwartz GG observed a significant increased risk of MM patients with high consumption of dioxin-contaminated fish, e.g. Baltic Sea fisherman.<sup>14</sup> Thus the present study is also having similar observation with the study. Present study findings correlate with these international studies.

#### ***Distribution of carpenters***

In present study, we found 2 (2%) patients developed multiple myeloma who worked as carpenter of which 1 (1%) patient exposed to wood particles in wood industry for about 10 years and 1 (1%) patient for 4-5 years. Statistical analysis suggested that carpenters who are in their work for more than 4 years have significantly high ( $p = 0.00001$ ) possibility of having MM.

In a follow-up study by Lee WJ et al described a relative risk of MM 0.8 (95% CI: 0.49-1.23) for wood dust exposure (ever vs. never) among Swedish construction workers while Demers PA et al described a nonsignificant increased risk of MM for dentine wood dust exposure among wood workers (SMR 5 1.6, 95% CI: 0.8-2.8).<sup>13,15</sup> So present study has similar observation with these studies

#### ***Distribution of Photographers***

In present study, we observed one (1%) patients developed MM who worked as photographer for about 20 years which is statistically insignificant. Rafnsson V reported insignificant association of MM with photographer who worked for long duration.<sup>16</sup> So, present study has similar observation with the study.

#### ***Distribution of workers of carbon industry***

In present study we found one (1%) patient developed MM who worked as carbon black worker for about 30 years which is statistically insignificant ( $p > 0.00001$ ). Sorahan T et al had observed risk of MM with carbon black workers who worked for about 15 years.<sup>17</sup> Thus, although present study finding is statistically insignificant, it can be correlated with this international study.

#### ***Distribution of hair dresser***

In present study one (1%) patient developed myeloma who worked as hair dresser for 15 years which is statistically insignificant ( $p > 0.00001$ ). Altekruze SF et al observed significantly increased risk of MM among women hair dresser while Takkouche B et al and Rollison DE et al observed insignificant risk.<sup>18</sup> Thus, although our study finding is statistically insignificant, it can be correlated these international studies.

#### ***Distribution of laboratory technician***

In present study, we observed one (1%) patient developed MM who worked as laboratory technicians for 25 years which is statistically insignificant ( $p > 0.00001$ ). Laboratory technicians are commonly exposed to organic solvents like methylene chloride, benzene etc. Liu T et al demonstrated that myeloma risk is doubled in people with occupational exposure to methylene chloride, compared with unexposed people.<sup>19</sup> Onoda T et al after meta-analysis of MM and benzene exposure, has proposed a summary relative risk estimate of 0.74 (95% CI: 0.60-0.90) for myeloma following benzene and/or organic solvent exposure.<sup>20</sup> Thus, although our study finding is statistically insignificant, it can be correlated these international studies.

#### ***Distribution of veterinary professional***

In present study, we observed one (1%) patient developed MM who worked as veterinary professional for about 25 years which is statistically insignificant ( $p > 0.00001$ ). Travier N et al proposed insignificant associations MM among veterinary professional.<sup>21</sup> Thus the present study was also having similar observation with this study.

#### ***Distribution of cobbler***

Cobblers commonly use chemical like ethylene chloride, benzene to polish shoes. In present study, we observed one (1%) patient developed MM who worked as cobbler for about 20 years which is statistically insignificant ( $p > 0.00001$ ). Risk of MM following exposure to methylene chloride and benzene has been described by Liu T et al and Sonoda T et al respectively.<sup>19,20</sup> Thus, although present study finding is statistically insignificant, it can be correlated these international studies.

#### ***Distribution of chemist***

In present study, we observed one (1%) patient developed MM who worked as chemist for about 20 years which is statistically insignificant ( $p > 0.00001$ ). Hoar SK et al proposed insignificant associations of MM among chemist.<sup>22</sup> Thus, although present study finding is statistically insignificant, it can be correlated this international study.

### **Distribution of book binder**

In present study, we observed one (1%) patient developed MM who worked as book binders for about 25 years which is statistically insignificant ( $p > 0.00001$ ). Rafnsson V proposed insignificant associations MM among book binders.<sup>16</sup> Thus, although our study finding is statistically insignificant, it can be correlated this international study.

### **Distribution of painter**

Painters are exposed to dyes and pigments, dusts, aromatic and aliphatic hydrocarbons and low-molecular-weight solvents such as trichloroethylene and methylethylketone and variety of toxins. In present study, we observed one (1%) patient developed MM who worked as painters for about 20 years which is statistically insignificant ( $p > 0.00001$ ). Bethwaite PB have proposed increased risks of MM following exposure to paints and solvents.<sup>23</sup> However, the large Danish studies conducted by Heinemann EF et al and Pottem LM et al did not confirm such a relationship.<sup>9,10</sup> Thus, although present study finding is statistically insignificant, it can be consistent with the study conducted by Bethwaite PB.<sup>23</sup>

### **Distribution of jewellery workers**

In present study, we observed one (1%) patient developed MM who worked as painters for about 30 years which is statistically insignificant ( $p > 0.00001$ ). Dubrow R proposed insignificant associations MM among various occupational cohorts like jewellery workers.<sup>24</sup> Thus the present study was also having similar observation with this study

### **Distribution of metalworkers**

In present study, we observed one (1%) patient developed MM who worked as metalworker for about 20 years which is statistically insignificant. Positive association of myeloma has been demonstrated with metalworkers with exposure to different metals like nickel in Canadian refinery; arsenic, cadmium, copper powder and fumes, and lead vapours and liquid; cadmium and nickel; chimney industry- arsenic, nickel and chromium and lead and cadmium.<sup>25-29</sup> However, like other studies one large Danish study reported insignificant risk of myeloma with metalworkers.<sup>9,10</sup> Thus, although present study findings are statistically insignificant it is consistent with various other studies like those by Egedahl RD et al, Morris PD et al, Svensson EG et al, Gustavsson P et al and Berg JW et al.<sup>25-29</sup>

### **Distribution of workers of petrol pump**

Workers in the petroleum industry are exposed to a variety of known carcinogens, including polycyclic aromatic hydrocarbons. In present study, we observed one (1%) patient developed MM who worked as petrol

pump worker for about 30 years which is statistically insignificant ( $p > 0.00001$ ). Flodin U et al and Morris PD et al showed exposures to carbon monoxide as a consequence of exposure to petrol, diesel, jet fuel, or automobile exhausts, coal fumes and smoke have all been linked with myeloma risk.<sup>26,30</sup> Thus, although present study findings are statistically insignificant it is comparable with these international studies.

### **Distribution of type setter**

In present study, we observed one (1%) patient developed MM who worked as type setter for about 25 years which is statistically insignificant ( $p > 0.00001$ ). Rafnsson V proposed insignificant associations MM in type setter.<sup>16</sup> Thus the present study was also having similar observation with this study.

### **Distribution of worker of wood and leather factory**

In present study, we observed one (1%) patient developed MM each who worked as worker of wood and leather factory for about 25 years which is statistically insignificant ( $p > 0.00001$ ). In a follow-up study among Swedish construction workers, Lee WJ, Baris D et al described a relative risk of 0.8 (95% CI: 0.49-1.23) for wood dust exposure (ever vs. never), whereas Demers PA et al described a insignificant increased risk of MM for dentine wood dust exposure among wood workers (SMR 5 1.6, 95% CI: 0.8-2.8).<sup>13,15</sup> In contrast a large Danish study, Heinemann EF, et al reported risk deficit.<sup>8</sup> Cuzick J and De Stavola B and Walrath J et al described nearly two-fold increase risk of MM among workers in the leather tanning industry.<sup>31,32</sup> Fu H et al and Mikoczy Z et al observed insignificant risk of MM were for leather dust and glue solvent exposure.<sup>33,34</sup> Thus present study findings are comparable with the above studies conducted those by Demers PA et al, Fu H et al and Mikoczy Z et al.<sup>15,33,34</sup>

### **Distribution of worker of rubber and plastic factory**

Rubber workers can be exposed to organic solvents, plastic monomers, rubber additives and asbestos among other agents. In present study, we observed one (1%) patient developed MM who worked as worker of rubber and plastic manufactory factory for about 20 years which is statistically insignificant ( $p > 0.00001$ ).

Several studies have proposed increased mortality of MM among workers in the styrene-butadiene rubber industry and rubber products and plastic footwear industry.<sup>35,36</sup> However, Heinemann EF et al and Pottem LM et al observed no association between a history of work in the nibbler or plastic manufacturing industries and myeloma.<sup>9,10</sup> Thus, although present study findings are statistically insignificant it is consistent with various other studies like those by Sathiakumar N et al and Figs LW et al.<sup>35</sup>



### ***Distribution of workers of bamboo factory***

Workers in the bamboo factory frequently exposes to carbon monoxide as a consequence to smoke. Moreover, they frequently expose to fuel. In present study, we observed one (1%) patient developed MM who worked as worker of bamboo industry having exposed to smoke and fuel for about 20 years which is statistically insignificant ( $p=0.00001$ ). Morris PD et al showed exposure to carbon monoxide as a consequence to smoke have myeloma risk.<sup>26</sup> Thus, although present study findings are statistically insignificant it is comparable with this study.

### ***Distribution of workers of asbestos factory***

In present study we observed one (1%) patients developed multiple myeloma who worked at asbestos factory for about 20 years which is statistically insignificant ( $p>0.00001$ ). Cuzick J and De Stavola B reported an observed rate of 3.5 times the expected rate of multiple myeloma following exposure to asbestos who exposed for at least 10 years or more.<sup>31</sup> Heinemann EF, Pottm LM found no association of multiple myeloma and exposure to asbestos.<sup>9,10</sup> Thus, although present study findings are statistically insignificant it is consistent with the study of Cusack J and De Stavola B.

### ***Distribution of industry workers where pesticides are used***

In present study, we observed one (1%) patients developed MM who worked in industry for 20 years where pesticides are used which is statistically insignificant ( $p>0.00001$ ). Mannetje A et al and Baris D et al had demonstrated the risk of the occurrence of myeloma in agricultural workers with use of fuels and pesticides in general.<sup>4,5</sup> However, Perrotta C et al and Jones DR. Et al have not confirmed a relationship between a history of exposure to pesticides and myeloma.<sup>37,38</sup> Thus, present study findings can be comparable with these studies.

### ***Distribution of worker of textile industry***

In present study, we observed one (1%) patients developed MM who worked at textile industry for about 20 years which is statistically insignificant ( $p>0.00001$ ). Delzell E et al proposed insignificant associations of MM among workers of textile industry.<sup>39</sup> Thus the present study was also having almost similar observation with this study.

### ***Distribution of worker of road***

Road workers are frequently exposed to carbon monoxide as a consequence of exposure to Petrol, diesel, or automobile exhausts, coal fumes and smoke. In our study, we observed one (1%) patients developed MM who worked as worker of road for about 20 years which is statistically insignificant ( $p>0.00001$ ). Flodin U et al and

Morris PD et al showed exposures to carbon monoxide as a consequence of exposure to petrol, diesel, jet fuel, or automobile exhausts, coal fumes and smoke have all been linked with myeloma risk.<sup>26,30</sup> Thus, although present study findings are statistically insignificant it is comparable with these studies.

### ***Distribution of other occupations***

Other occupations we observed in our study were 23 (23%) house wife, 5 (5%) Government servant, 5 (5%) retired Government servant, 2 (2%) percent unemployed, 2 (2%) employees of non-government organization, 2 (2%) labour, 2 (2%) police, 2 (2%) tailor, one (1%) driver, one (1%) rick show puller, one (1%) priest and one (1%) sweeper and one (1%) hooker. To our search, no obvious literature has been observed so far regarding their any relationship with multiple myeloma. Moreover, further community based research is needed to examine whether family type contributes as an important attribute to the causation of MM.

## **CONCLUSION**

Prevalence of MM is significantly high ( $p=0.0005$ ) among farmers who expose to pesticides for more than 5 years and carpenters who worked for more than 4 years.

### ***Recommendations***

- Some screening tests like detection of occupational exposure 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.
- 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.
- 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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