BACKGROUND AND OBJECTIVES

- Does demographics impact the cytogenetic features of multiple myeloma (MM) in Eastern North Carolina (ENC)?
- In 2017, the age-adjusted incidence rate for multiple myeloma in North Carolina, was 5.7 and 15.1 per 100 000 person per year, respectively for whites and blacks, with a disproportionately higher mortality rate of 7 per 100 000 person per year, among blacks.\(^1\)
- MM is a cytogenetically heterogenous plasma cell malignancy. Cytogenetic signatures are predictive of therapy response and improved understanding of cytogenetics impacts treatment strategies and survival.
- However not much is known about the influences of age, gender, race and location on the cytogenetic abnormalities identified in MM. Eastern North Carolina (ENC) is a region at the eastern tier of North Carolina, which spans 41 counties; located on and east of the Interstate-95 and west of the Atlantic Ocean. The objective was to evaluate the impact of age, gender, ethnicity and location within NC on high-risk cytogenetics (t (4:14), t(14:16), del(17p) and gain(1q21) features of MM cases in ENC.

METHODS

- The electronic medical charts of 100 patients diagnosed and treated with multiple myeloma at the Vidant Health System hospitals in ENC between January 2014 and January 2016, were retrospectively analyzed.
- Fluorescent In Situ Hybridization (FISH) and cytogenetic testing was routinely performed on confirmed cases of multiple myeloma.
- The data obtained was the age at diagnosis, sex, ethnicity, Body Mass Index, county, zip code and FISH/cytogenetic information relevant to the study.
- Myeloma risk stratification was done per the Mayo Stratification for Myeloma and Risk Adapted Strategy (mSMART) risk classification.\(^2\)
- The data is part of a larger collection effort of the Multiple Myeloma Research Foundation (MMRF) relating clinical outcomes in MM to personal assessment of genetic profile (CoMMPass) study in Eastern North Carolina.
- Statistical analysis was performed with SPSS Version 26.0 statistic software package. Data was expressed as means ± standard deviation (SD). We applied the logistic regression model to the pooled population to identify risk associations with adverse cytogenetic risk. A value of P < 0.05 was considered statistically significant.

RESULTS/OUTCOMES

- The median age in ENC was 69 years old and there was a male predominance among patients with multiple myeloma at 56%.
- African American patients were almost twice as likely affected, compared to Caucasian patients (64% vs 34%).
- 90% of the study participants were evenly distributed between normal weight and obesity with BMI between 18 to 40.
- Gain of 1q was the most prevalent adverse risk cytogenetic abnormality at 38% and it co-occurred with all combinations of double and triple hit myeloma in 18% of study participants.
- t(14;20) did not occur in any of the study participants.
- Pitt and Herford counties overall had the highest multiple myeloma cases at 27% and 10% respectively, while 18.5% and 40% of these cases were of double and triple hit myelomas. Craven and Johnston counties had the least cases of multiple myeloma at 1%.
- We did not identify any statistically significant association between age, sex, BMI and ethnicity for +1q, 17p deletion and t(14:16) translocation.
- However, after adjusting for sex, BMI and ethnicity, there was a statistically significant trend towards younger patients (<65 years) developing t(4:14) translocation, P=0.01 and lower BMI(<25.9) was associated with t(4:14) translocation, P=0.02 after adjusting for age, sex and ethnicity. This has not been previously reported.

CONCLUSIONS

- Myeloma is initiated by a complex interplay of the environment and genetic factors, driven by rogue physiologic functions required to generate antibody diversity and leads to molecular events that inhibit apoptosis and propagate immortal cells.
- Chromosomal translocations and hyperploidy are major genetic anomalies.
- We did not find any statistically significant evidence to suggest an influence of sex and ethnicity on high risk cytogenetic abnormalities in multiple myeloma.
- Our study particularly showed a statistically significant inverse link between age and t(4:14), P=0.004, not previously reported.
- In addition, our study noted a newly reported statistically significant inverse relationship between BMI and t(4:14), P=0.02 after adjusting for age, sex and ethnicity.
- Our study showed Pitt and Herford counties predominantly with the more aggressive myelomas as well having most cases of myeloma as noted in the figure.
- Further studies are required to identify prevailing patient related and/or environmental factors that are associated with recurrent adverse cytogenetic alterations in these counties.
- When explored in larger studies, it may portend therapeutic implications, which would assist improved risk stratification and overall survival after risk adapted treatments.

REFERENCES

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