Jews and Inflammatory Bowel Diseases

Ahmed M. El-Tawil

Department of Surgery, University Hospital of Birmingham, Birmingham, United Kingdom

Ulcerative colitis is three to five times more common in Jews than in non-Jews living in Western countries [1-7]. Jews living in South Africa have an incidence of 17/ 100,000 compared with 5/100,000 in white populations [8]. In Israel, Ashkenazi Jews have a higher incidence than Sephardi Jews, but a lower incidence than Ashkenazi Jews in the United States or Northern Europe [9]. The prevalence rate rose from 121.0/100,000 in 1987 to 167.2/100,000 in 1997. These rates were higher in women than in men. Prevalence was highest in Israeli-born members in 1987 but in European/American-born members in 1997. The average annual incidence rate for the 10 year period was 5.04/100,000/yr [9].

Jews have higher incidence of Crohn's disease than gentile populations [1, 4].

Within Israel, the prevalence rate has risen from 25.53/100,000 in 1987 to 65.11/100,000 in 1997, and then to 112.99 in 2007 [10]. The prevalence rate was higher in women than in men, and in Israeli- or European/American-born than in Asian/African-born individuals. The rise in prevalence was steady from 1987 to 1997 and then to 2007 in all subgroups, except for Asian/African-born kibbutz members. In the last group, a decrease in prevalence was evidenced between 1987 and 1997, and then a sharp increase between 1997 and 2007 [10].

The higher incidences and prevalence of inflammatory bowel diseases in Jews compared with other local populations have presented an unclear situation, which have led some people to consider Jewish ethnicity as a risk factor [11].

Earlier, I identified a lack of the provision of vegetables and fruits as a common phenomenon in English history since the Tudor times. This raises a hypothesis that a lack of antioxidants in the provided diets and the resultant overproduction of Reactive Oxygen Species (ROS) and the consequent development of genetic polymorphisms in previous generations and consequently their inheritance to current generations may have contributed to a higher incidence of degenerative diseases in Western countries compared with the East [12].

The explanation for this hypothesis is that free radicals are very reactive, combining with and altering almost any molecule with which they collide. If enough free radicals are formed, some are bound to collide with nucleic acid molecules and alter them. The result is a mutation [13]. The single electron reduction of molecular oxygen to superoxide initiates the formation of a family of ROS that create a constant and insidious threat to aerobic organisms. Homeostatic mechanisms have developed to minimize the steady-state levels of ROS and to repair oxidative damage. Of all the cellular targets that reactive oxygen can damage, DNA may be the most significant because of the potential mutagenic and genotoxic consequences.

The reactivity of ROS with DNA is well documented [14] and damage can occur in both the nitrogenous base and deoxyribose moieties [15]. Superoxide radicals and hydrogen peroxide do not react with DNA at physiological concentrations. However, the hydroxyl radical, produced from superoxide and hydrogen peroxide through transition-metal catalyzed Fenton chemistry and by ionizing radiation is indiscriminately reactive, breeding numerous radical adducts and their datives. Furthermore, the negative charge of DNA smoothes the progress of the local generation of hydroxyl radical through the binding of transition metals.

The overall consequence is that ROS can generate oxidatively modified bases as well single and double strand breaks in DNA. If un-repaired, such oxidative damage can lead to mutations that can range from single nucleotide substitutions to gross chromosomal rearrangements, which in metazoans can have somatic as well as germ-line consequences. In the oxygen-rich aerobic environment, the genomic integrity is maintained by minimizing the access of ROS to DNA and by biochemical mechanisms that recognize and repair oxidatively damaged DNA [14, 16].

In principle, increased mutation rates can arise through increased oxidative stress, by failure of ROS defence

Received: 04.01.2009 Accepted: 23.01.2009
J Gastrointestin Liver Dis
June 2009 Vol.18 No 2, 137-138
Address for correspondence: AM El-Tawil
Department of Surgery,
Queen Elizabeth Hospital,
Edgbaston, United Kingdom
E-mail: atawil20052003@yahoo.co.uk

metabolism, or by failure of DNA repair. The interaction of modern dietary constituents' intake and ancient genetic mutations may be contributing to the variation in the individual and regional predisposition to degenerative diseases. It is likely that ROS create a similar condition of genetic instability to the effects of irradiation which cross across the generations and have lead to the expression of the disease when appropriate cultures have been available [17]. The concept of inheritance of genetic aberrations has been verified in different studies [18, 19].

Zinc deficiency and overproduction of ROS in subjects with inflammatory bowel diseases are well known [20, 21]. Yet it is uncertain whether this lack of zinc is a cause or consequence of the activity of the disease. However, deficiency of zinc may facilitate the proposed interaction between modern dietary intakes and the inherited genetic polymorphisms. In addition, lack of the produced superoxide dismutases would result in genetic instability and consequently to more damage [22].

In a study aimed at analyzing the maternally inherited mitochondrial DNA in each of nine geographically separated Jewish groups, eight non-Jewish host populations, and an Israeli Arab/Palestinian population, and then comparing the differences found in Jews and non-Jews with data collected from the same populations in an earlier study using Y-chromosome samples [23], it was found that most Jewish communities were founded by relatively few women, that the founding process was independent of the geographical area, and that subsequent genetic input from surrounding populations was limited on the female side. In a significant distinction to this, the paternally inherited Y chromosome showed diversity similar to that of neighbouring populations and showed no evidence of founder effects. It was also reported that the immigrants Jews had adopted their lives to those of the locals [24].

This life style of the Middle Eastern Jews who moved to Europe and to the States may give a clue to the possible reason of the high incidences and prevalence of inflammatory bowel diseases compared with whites and other Jewish subgroups.

We propose that environmental factors and the specific life style of the Ashkenazi may be a contributory factor to the occurrence of inflammatory bowel diseases, in contrast to their neighbours in Israel and West Bank.

Conflicts of interest

None to declare.

References

1. Acheson ED. The distribution of ulcerative colitis and regional enteritis in United States veterans with particular reference to the Jewish religion. Gut 1960; 1: 291- 293.
2. Weiner HA, Lewis CM. Some notes on the epidemiology of nonspecific ulcerative colitis. An apparent increase in incidence in Jews. Am J Dig Dis 1960; 5: 406-418.
3. Evans JG, Acheson ED. An epidemiological study of ulcerative colitis and regional enteritis in the Oxford area. Gut 1965; 6: 311-324.
4. Monk M, Mendeloff AI, Siegel CI, Lilienfeld A. An epidemiological study of ulcerative colitis and regional enteritis among adults in Baltimore. I. Hospital incidence and prevalence 1960-1963. Gastroenterology 1967; 53: 198-210.
5. Gilat T, Ribak J, Benaroya Y, Zenushlany Z, Weissman I. Ulcerative colitis in the Jewish population of Tel Aviv Jafo. I. Epidemiology. Gastroenterology 1974; 66: 335-342.
6. Gelpi AP. Inflammatory bowel disease among college students. West J Med 1978; 129: 369-373.
7. Birnbaum D, Groen JJ, Kaunder G. Ulcerative colitis among the ethnic groups in Israel. Arch Intern Med 1960; 105: 843-848.
8. Wright JP, Froggatt J, O'Keefe EA, et al. The epidemiology of inflammatory bowel disease in Cape Town 1980-1984. S Afr Med J 1986; 70: 10-15.
9. Niv Y, Abuksis G, Fraser GM. Epidemiology of ulcerative colitis in Israel: a survey of Israeli kibbutz settlements. Am J Gastroenterol 2000; 95: 693-698.
10. Zvidi I, Hazazi R, Birkenfeld S, Niv Y. The prevalence of Crohn's disease in Israel: a 20-year survey. Dig Dis Sci 2009; 54: 848-852.
11. Brant SR, Panhuysen CI, Nicolae D, et al. MDR1 Ala893 polymorphism is associated with inflammatory bowel disease. Am J Hum Genet 2003; 73: 1282-1292.
12. El-Tawil, AM. Eastern and Western nations: different prevalence of chronic-non-infectious diseases, why? Iran J Publ Hlth 2009 (in press)
13. Asimov I. The Genetic Code. Viking Pr 1963.
14. Beckman KB, Ames BN. Oxidative decay of DNA. J Biol Chem 1997; 272: 19633-19636.
15. Halliwell B. Oxygen and nitrogen are pro-carcinogens. Damage to DNA by reactive oxygen, chlorine and nitrogen species: measurement, mechanism and the effects of nutrition. Mutat Res 1999; 443: 37-52.
16. Fridovich I. Superoxide radical and superoxide dismutases. Annu Rev Biochem 1995; 64: 97-112.
17. Sevan'kaev AV, Shkavrova TG, Potetnia OI, et al. Comparative investigation of structural and gene somatic mutations in workers of nuclear chemical plants. I. A study of stable and unstable chromosome aberrations. Radiats Biol Radioecol 2005; 45: 149-161.
18. Morak M, Schackert HK, Rahner N, et al. Further evidence for heritability of an epimutation in one of 12 cases with MLH1 promoter methylation in blood cells clinically displaying HNPCC. Eur J Hum Genet 2008; 16: 804-811.
19. Zschocke J. Dominant versus recessive: molecular mechanisms in metabolic disease. J Inherit Metab Dis 2008; 31: 599-618.
20. El-Tawil AM. High incidence of Crohn's disease in pre-menopausal women: Escherichia coli may be contributing. Int J Colorectal Dis 2004; 19: 498.
21. El-Tawil AM. Zinc deficiency in men with Crohn's disease may contribute to poor sperm function and male infertility. Andrologia 2003; 35: 337-341.
22. Woodruff RC, Phillips JP, Hilliker AJ. Increased spontaneous DNA damage in Cu/Zn superoxide dismutase (SOD1) deficient Drosophila. Genome 2004; 47: 1029-1035.
23. Thomas MG, Weale ME, Jones AL, et al. Founding mothers of Jewish communities: geographically separated Jewish groups were independently founded by very few female ancestors. Am J Hum Genet 2002; 70: 1411-1420.
24. Bernstein CN, Rawsthorne P, Cheang M, Blanchard JF. A population-based case control study of potential risk factors for IBD. Am J Gastroenterol 2006; 101: 993-1002.