fortune Journals

Research Article

ARCHIVES OF
CLINICAL AND
BIOMEDICAL RESEARCH

ISSN: 2572-5017

Ethnicity Matters in Healthcare

Gurmukh Singh MD, PhD, MBA*

Abstract

There is increasing emphasis on excluding race in consideration of healthcare matters. This is mostly due to the history of discrimination based on race/ethnicity/social status etc. However, ethnicity has implications for the prevalence of disorders and responses to treatment. While excluding race/ethnicity from consideration is a noble effort, it runs counter the philosophy of precision medicine demanding individualized care for each person. The opinion expressed in this article makes a case for including consideration of ethnicity as it may be relevant to the care of an individual, without using it to adversely discriminate a person from receiving optimal healthcare.

Keywords: Healthcare; Treatment; Ethnicity; Race; Geographic area; Laboratory medicine; Precision medicine

Consideration of Ethnicity in Laboratory Medicine and Healthcare

The delivery of optimal healthcare requires judicious use of diagnostic laboratory services. Clinical laboratory data drive about 70% of clinical decisions [1]. The classical way to establish normal values/reference ranges for laboratory assays is to test at least 120 healthy individuals of a given age, sex, ethnicity, geographic area and use the central 95% as the reference range [1,2]. There are multiple variations on this schema. There is increasing emphasis on using "race" neutral reference ranges, due in part to past practices of discrimination in healthcare based on race/ethnicity.

Review of common laboratory test results from NHANE survey did not reveal meaningful differences among races in the USA [3].

One recent example of the race neutral philosophy is the revision to the equation for calculating estimated glomerular filtration rate, by removing race as a factor [4]. The common refrain being that race is a social construct and is not based on biology. It is often cited that there are more differences in the genome in a given population/ethnic group than are seen between populations/racial and ethnic groups. Be that as it may, try telling that to someone with sickle cell disease. This disorder is driven by a difference in one nucleotide base-pair out of three billion! This genetic variation is not race driven but is common in areas with high incidence of falciparum malaria. However, it applies predominantly to Africa and a part of Eastern India. There is a similar geographic and ethnic variation in other hemoglobinopathies as well. Hemoglobin E disorder is commoner in East Asia. Beta Thalassemia being more prevalent in Mediterranean and middle eastern countries and alpha thalassemia being a prevalent disorder in East Asia [5]. Thus, despite a similar genome in the human population, small differences among different ethnic groups cause variations in disease spectrum.

As in the case of hemoglobin structural variations/disorders, many other differences among various peoples are genetically/DNA driven while

Affiliation:

Professor Emeritus, Pathology, Medical College of Georgia at Augusta University, Augusta, GA, USA

***Corresponding author:**
Gurmukh Singh, Professor Emeritus, Pathology, Medical College of Georgia at Augusta University, Augusta, GA, USA.

Citation: Gurmukh Singh. Ethnicity Matters in Healthcare. Archives of Clinical and Biomedical Research. 9 (2025): 338-341.

Received: August 16, 2025
Accepted: August 22, 2025
Published: August 27, 2025

Singh G., Arch Clin Biomed Res 2025
DOI:10.26502/acbr.50170471

others may be related to cultural practices. In multigenic disorders, it may not be feasible to disentangle genetic and cultural matters. A few examples of each of these factors are presented below:

Low leukocyte count in Blacks: In a proportion of people of African descent the baseline neutrophil count is low enough to be called neutropenia when compared to the white population [6]. This anomaly/variation is not pathological/racial but an indication of the Duffy null status of the individual. It is important to recognize this to avoid invasive investigations in a black child or adult with apparent neutropenia. As in the case of Hb S gene, lack of Duffy blood group is protective against malaria and provided a survival advantage to the individuals with this variation and is a result of the influence of evolution [7]. However, Duffy null status is also associated with other changes in blood parameters, the most prominent being a low neutrophil count.

Hb A1c levels are higher in people of African descent, despite being normoglycemic [8]. However, people with sickle cell trait have lower A1c levels for plasma glucose levels similar to those in other populations [9]. Recognizing this peculiarity is not racial discrimination but an aid in providing precision medicine-based healthcare.

Bombay phenotype: ABO null genetic state results in lack of H substance, on red cells, that is the precursor material for blood groups O, A, B and AB antigens. A person with ABO null genotype would type as blood group O, but will also have antibodies to red cells from all other blood group O, A, B and AB individuals, thus making is almost impossible to find compatible blood for the individual. Only another person with Bombay phenotype could be a donor for a person with ABO null status, i.e., Bombay phenotype [10,11]. Bombay phenotype is almost exclusively seen in Gujrat province in India. (One of the female attendants of Mahatma Gandhi had Bombay phenotype, both Gandhi and the lady being from Gujrat province) (Figure 1).

Vitamin D reference range: People of African descent have better bone mineral density while having lower serum levels of 25(OH) vitamin D. This is explained by the genetically determined lower levels of vitamin D binding protein resulting in lower total vitamin D levels while the bioavailable vitamin D is normal. Thus, the reference range for vitamin D levels, derived from white population is not application to black individuals [12]. The low levels of vitamin D in African Muslim women are, also in part, due to extensive covering by clothes and limited opportunities outdoors and sun exposure. Knowing the ethnicity and cultural practices to ensure optimal healthcare is not discrimination based on race.

The higher incidence of hypertension, heart disease, multiple myeloma, and lower life span among people of African descent in the USA probably reflect multiple genetic,

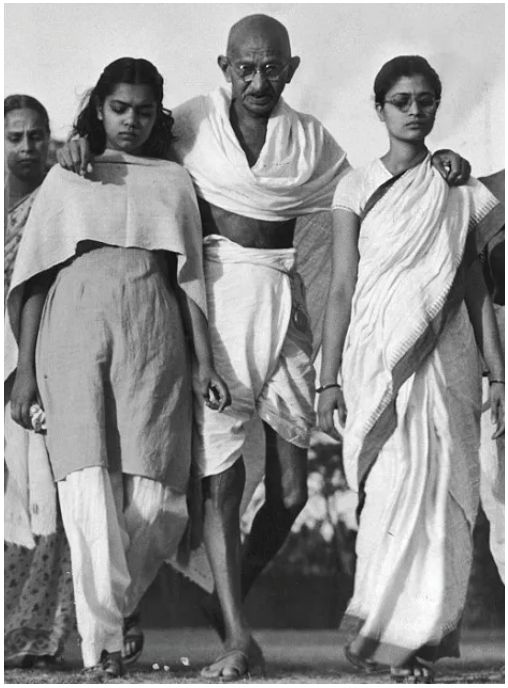

Figure 1: Mahatma Gandhi, center, with his two caregivers, one of whom was later discovered to have Bombay phenotype that made it difficult to procure compatible blood for her.

and cultural issues, but nevertheless warrant consideration in healthcare [13-17]. Knowledge of these factors is important in addressing appropriate health screening, promoting healthy habits, implementing preventive measures and choosing effective interventions.

Allergic reactions on blood transfusion: IgA deficiency and deficiency of haptoglobin are related to allergic reactions on blood transfusion. The reactions are similar in nature due to the recipient making antibodies to the protein in which the patient is deficient. There is marked ethnic variability in the prevalence of these deficiencies. Haptoglobin deficiency being commoner in Japanese and IgA deficiency being more common among whites [18,19]. As noted earlier, knowing this ethnic variation and taking it into consideration for diagnostic testing is essential for good healthcare and does not constitute discrimination.

Alcohol metabolism: Nearly a quarter of the people of East Asian descent lack acetyl aldehyde dehydrogenase. Mutation in the ALDH2 gene, resulting in reduced enzyme activity and the inability to efficiently metabolize alcohol, specifically acetaldehyde, a toxic byproduct of alcohol breakdown causes greater blood and tissue levels of acetaldehyde. This buildup of acetaldehyde in the body, causes unpleasant reactions like facial flushing, nausea, and rapid heartbeat after consuming alcohol [20]. This may be nature's way of preventing alcohol abuse! However, knowledge of this genetic variation is important in making a correct diagnosis of these symptoms. Observant Mormons, who routinely abstain from alcohol have

the longest life spans among Americans, though this may also be due to other life style factors in addition to sobriety [21].

Different pathogenicities of Epstein Barr Virus (EBV) in China and Africa: EBV causes oropharyngeal cancers in China and Burkitt's tumors in Africa [22,23]. This difference may or may not be genetic based as there are marked differences in culture, nutrition and prevalence of other pathogens in the two geographic regions. However, taking into consideration the ethnicity and geographic origin of a person are important in constructing a proper list of differential diagnoses. Racial differences in response to other infections, e.g., tuberculosis have been noted as well [24]. Gastric and Breast cancers: The incidence of gastric cancer is higher and the incidence of breast cancer is lower in Japanese as compared to Americans [25,26]. This difference is likely to be due to a combination of genes and culture as it tends to disappear over a few generations after immigration of Japanese to the USA. Consideration of ethnicity in addressing these malignancies is promoting precision medicine, not committing racial discrimination.

Disease spectrum in Native Americans: The prevalences of obesity and diabetes are much higher in the Native American population than in white population. Once again, the differences are likely to be a combination of differences in genetic makeup and culture. However, a logical explanation could be that the Native American population endured periods of famine/starvation that favored the survival of people with more efficient metabolism, who could sustain themselves on meager supply of food [27]. Now that food is plentiful that efficient metabolism may be working to their disadvantage by leading to obesity and diabetes [28]. Knowing this propensity of the Native Americans to these disorders is not discrimination but is essential to the promotion of optimal healthcare.

Cultural and geographic factors: Differences in a few disorders among various ethnic groups are almost entirely driven by cultural issues. The Kangri cancer in Kashmiri people, in India, is almost certainly related to the practice of placing earthenware pots, containing live charcoal, under their clothing, on the abdomen, to ward against cold surroundings. The high incidence of oral cancer in Southern India is likely to be related to the practice of reverse smoking, i.e., putting the lit end of the cigarette in the mouth. Beetle nut (Paan) chewing that contain tobacco is likely a contributing factor [29-32].

A peculiar occurrence of hypoglycemia, occasionally fatal, in children, in India and Bangladesh, on eating litchi/ lychee fruit on empty stomach may be related to genetics and the background of undernutrition in affected children [33].

Some religious practices may be beneficial, e.g., Abstinence from alcohol among the observant Mormons and Muslims, avoidance of tobacco among the Sikhs, celibacy among observant catholic clergy and nuns. Consanguinity among some religious groups has negative effects on health [33].

The current fascination with being "vegan" could produce nutritional deficiencies of vitamin B12, vitamin D, and other trace nutrients [34].

While it is noble to neutralize differences among different peoples, and avoid discrimination based on ethnicity or any other factors, this is in contrast to the principle of providing individualized, customized, precise care. The two competing philosophies need to coexist and ought to be balanced in healthcare including Laboratory Medicine.

Disclosures

I serve as a consultant to Helena Laboratories, Sebia Inc, Diazyme Laboratories and Warm Springs Medical Center, GA.

There was no external funding for this article.

References

1. Sikaris KA. Enhancing the Clinical Value of Medical Laboratory Testing. Clin Biochem Rev 38 (2017): 107-114.
2. Doles N, Ye Mon M, Shaikh A, et al. Interpreting Normal Values and Reference Ranges for Laboratory Tests. J Am Board Fam Med 38 (2025): 174-179.
3. Lim E, Miyamura J, Chen JJ. Racial/Ethnic-Specific Reference Intervals for Common Laboratory Tests: A Comparison among Asians, Blacks, Hispanics, and White. Hawaii J Med Public Health 74 (2015): 302-10.
4. Khaim R, Todd R, Rosowicz A, et al. Impact of race-neutral eGFR calculations on African American kidney transplant candidate wait time: A single center retrospective analysis. Clin Transplant 38 (2024): e15267.
5. Williams TN, Weatherall DJ. World distribution, population genetics, and health burden of the hemoglobinopathies. Cold Spring Harb Perspect Med 2 2012: a011692.
6. Thobakgale CF, Ndung'u T. Neutrophil counts in persons of African origin. Curr Opin Hematol 21 (2014): 50-7.
7. Daniels G. Blood group polymorphisms: molecular approach and biological significance. Transfus Clin Biol 4 (1997): 383-90.
8. Chapp-Jumbo E, Edeoga C, Wan J, et al. Pathobiology of Prediabetes in a Biracial Cohort (POP-ABC) Research Group. Ethnic disparity in hemoglobin A1c levels among

normoglycemic offspring of parents with type 2 diabetes mellitus. Endocr Pract 18 (2012): 356-362.

9. Lacy ME, Wellenius GA, Sumner AE, et al. Association of Sickle Cell Trait With Hemoglobin A1c in African Americans. JAMA 317 (2017): 507-515.

10. Scharberg EA, Olsen C, Bugert P. The H blood group system. Immunohematology 32 (2016): 112-118.

11. Qadir H, Larik MO, Iftekhar MA. Bombay Blood Group Phenotype Misdiagnosed As O Phenotype: A Case Report. Cureus 15 (2023): e45555.

12. Powe CE, Evans MK, Wenger J, et al. Vitamin D-binding protein and vitamin D status of black Americans and white Americans. N Engl J Med 369 (2013): 1991-2000.

13. Abrahamowicz AA, Ebinger J, Whelton SP, et al. Racial and Ethnic Disparities in Hypertension: Barriers and Opportunities to Improve Blood Pressure Control. Curr Cardiol Rep 25 (2023): 17-27.

14. Kanapuru B, Fernandes LL, Fashoyin-Aje LA, et al. Analysis of racial and ethnic disparities in multiple myeloma US FDA drug approval trials. Blood Adv 6 (2022): 1684-1691.

15. Waxman AJ, Mink PJ, Devesa SS, et al. Racial disparities in incidence and outcome in multiple myeloma: a population-based study. Blood 116 (2010): 5501-6.

16. Landgren O, Kazandjian D. Diagnosed with myeloma before age 40. Blood 138 (2021): 2601-2602.

17. De Ramos IP, Auchincloss AH, Bilal U. Exploring inequalities in life expectancy and lifespan variation by race/ethnicity and urbanicity in the United States: 1990 to 2019. SSM Popul Health 19 (2022): 101230.

18. Ko DH, Chang HE, Kim TS, et al. A review of haptoglobin typing methods for disease association study and preventing anaphylactic transfusion reaction. Biomed Res Int 2013 (2013): 390630.

19. Killeen RB, Joseph NI. Selective IgA Deficiency. 2023 Jun 26. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing (2025).

20. Wall TL, Ehlers CL. Genetic Influences Affecting Alcohol Use Among Asians. Alcohol Health Res World 19 (1995): 184-189.

21. Enstrom JE, Breslow L. Lifestyle and reduced mortality among active California Mormons, 1980-2004. Prev Med 46 (2008): 133-6.

22. Wang CQ, He J. Ubiquitous Distribution of Epstein-Barr Virus and the Highly Uneven Distribution of Nasopharyngeal Carcinoma. Chin Med J (Engl) 129 (2016): 2506-2507.

23. Liao HM, Liu H, Chin PJ, et al. Epstein-Barr Virus in Burkitt Lymphoma in Africa Reveals a Limited Set of Whole Genome and LMP-1 Sequence Patterns: Analysis of Archival Datasets and Field Samples From Uganda, Tanzania, and Kenya. Front Oncol 12 (2022): 812224.

24. Nahid P, Horne DJ, Jarlsberg LG, et al. Racial differences in tuberculosis infection in United States communities: the coronary artery risk development in young adults study. Clin Infect Dis 53 (2011): 291-4.

25. Naylor GM, Gotoda T, Dixon M, et al. Why does Japan have a high incidence of gastric cancer? Comparison of gastritis between UK and Japanese patients. Gut 55 (2006): 1545-52.

26. Nagahashi M, Kumamaru H, Kinukawa N, et al. Breast cancer statistics for Japan in 2022: annual report of the national clinical database-breast cancer registry-clinical implications including chemosensitivity of breast cancer with low estrogen receptor expression. Breast Cancer 32 (2025): 217-226.

27. O'Fallon BD, Fehren-Schmitz L. Native Americans experienced a strong population bottleneck coincident with European contact. Proc Natl Acad Sci U S A 108 (2011): 20444-8.

28. Lucero JE, Roubideaux Y. Advancing Diabetes Prevention and Control in American Indians and Alaska Natives. Annu Rev Public Health 43 (2022): 461-475.

29. Nayak NC, Chitale AR. Indian childhood cirrhosis (ICC) & ICC-like diseases: the changing scenario of facts versus notions. Indian J Med Res 137 (2013): 1029-42.

30. Hassan I, Sajad P. Kangri. A boon or bane for Kashmiris. Indian Dermatol Online J 7 (2016): 551-553.

31. Harini G, Krishnam Raju KV, Raju DV, et al. Psychosocial factors associated with reverse smoking: A qualitative research. J Int Soc Prev Community Dent 6 (2016): 529-534.

32. Choksi D, Kolhe KM, Ingle M, et al. Esophageal carcinoma: An epidemiological analysis and study of the time trends over the last 20 years from a single center in India. J Family Med Prim Care 9 (2020): 1695-1699.

33. Dutta D, Khandelwal D, Kalra S. Litchi-related Hypoglycemia: A Public Health Challenge, an Endocrine Opportunity. Indian J Endocrinol Metab 23 (2019): 380-381.

34. Bakaloudi DR, Halloran A, Rippin HL, et al. Intake and adequacy of the vegan diet. A systematic review of the evidence. Clin Nutr 40 (2021): 3503-3521.