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Short Communication Open Access

Creating Awareness of Sickle Cell Trait in School Students

Pushkar Aggarwal*

2nd Lieutenant, Civil Air Patrol, 13305 Darnestown Rd, Gaithersburg, MD

Abstract

Sickle Cell Trait (SCT) -the awareness of this problem is non-existent in middle and high school students, especially the African-Americans and those having malaria impacted regions as their descent. Sickle Cell trait is found in 8% of African-Americans. There is no comprehensive program across the country to make school students aware of SCT. The students are not aware that the sickle cell trait can lead to health complications if they are doing strenuous exercise or swimming to build stamina or to compete. The students volunteering in Civil Air Patrol, an United States Air Force Auxili ary, who do air sorties in unpressurised planes are unaware of sudden death risk due to hypoexemia. Incorporating the education material in biology, science and physical education text books and lectures has been proposed as a viable solution. As the student progresses through various grades so does the chapter advances each year with enhanced education material. It ties up with evolution, natural selection, vector diseases, geographical distribution, blood composition, advanced biology and environmental science. Chapters in mathematics, probability and computer science adopt simulations for natural selection based upon recessive and dominant genes as in Sickle Cell. Geographical Information Systems depict the geographical distribution and immigration of people. Social science students learn about historical perspectives and social implications of marriage between two persons having similar genetic traits. Before any pain management techniques or medications are adopted, the students should be made aware of the problem and the clinical symptoms. A comprehensive education strategy to create awareness and enhance knowledge especially in context with SCT amongst school students is proposed.

Introduction

Sickle Cell Trait (SCT) -the awareness of this problem is non-existent in middle and high school students, especially the African-Americans and those having malaria impacted regions as their descent. Sickle Cell trait is found in 8% of African-Americans. There is no comprehensive program across the country to make school students aware of SCT. The students are not aware that the sickle cell trait can lead to health complications if they are doing strenuous exercise or swimming to build stamina or to compete.

Objectives

This is a concept paper and the objective is to invigorate the medical community for Sickle Cell Trait and school education boards to manage the problem by education. Specifically

a) To invigorate medical community to think for classifying Sickle Cell Trait as an illness in disguise; manage it as an illness so that it does not devour innocent lives.
b) Educate school students:

Is Sickle Cell Trait an ordinary genetic trait or an illness?

Common Cold is an illness as per NIH, even though it is rarely fatal. (http://www.niaid.nih.gov/topics/commonCold/Pages/overview.aspx) Sickle Cell Trait (SCT), as per NIH is not classified as illness or disease. NIH states that "People who have sickle cell trait usually have few, if any, symptoms and lead normal lives. However, some people may have medical complications." (http://www.nhlbi.nih.gov/health/health-topics/topics/sca/causes.html). Many a learned clinicians are of the view that" Sickle cell trait is the genetic carrier state and not an illness or just a risk factor for certain adverse outcomes [1].

More than 3 million Americans, including one in 12 blacks, have sickle-cell trait. What precautions should they take to prevent a risk that most experts say is extremely rare and a few say doesn't exist? Still a few die! As per records of American judicial system- there have been many episodes of people of African American heritage dying due to unexplained reasons in cells and the cause was wetted by judicial system to be Sickle Cell Trait. Was the verdict a true representation or a racial issue is a topic of separate investigation? Recently, the issue of deaths of Sickle Cell trait afflicted athletes has come to the forefront. The literature suggests that Sickle cell trait is a risk factor for stroke [2]. Roach [3] stated that "Without specific evidence of interactions or more compelling data showing a stroke risk from sickle hemoglobin heterozygosity, one should be cautious about attributing a stroke to Sickle Cell Trait.

Sickle cell trait continues to be the leading cause of sudden death for young African Americans in military basic training and civilian organized sports. The syndrome may have caused the death of up to 10 college football players since 1974 and was suspected as the cause of death of U.S. Army recruits. The penal military-style boot camps in the United States and the recent death of two teenagers with sickle cell trait merits renewed vigor in the education of athletic instructors, the military and the public about conditions associated with sudden death in individuals with sickle cell trait [4].

Still the medical community calls Sickle cell trait persons as having a normal life. An episode of infection or episode of seasonal influenza is an illness; but a medical complication –Sickle Cell Trait which during hypoexemia can turn fatal is not an illness? So should Sickle Cell Trait be re-categorized as Illness?

The medical community should debate this and based upon recent

***Corresponding author:** Pushkar Aggarwal, 2nd Lieutenant, Civil Air Patrol, 13305 Darnestown Rd, Gaithersburg, MD, E-mail: Aggarwal.pushkar@gmail.com

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clinical evidences take an informed decision. However, before a decision is taken to classify SCT as a disease, the following social concerns should be kept in mind. a) Increased discrimination of SCT carriers in employment. b) Higher premiums or denial of health insurance by corporate insurance companies. c) Decreased employment opportunities in intensive labor jobs or airline pilots. The advantages are basically medical and are a) Decrease in risk of mortality as less employment in areas. b) Increased awareness of individuals as well as the society for risks of SCT and proper resources for research and treatment of SCT.

In absence of clear delineation by medical society, it is imperative that the disease be managed by education. There is no comprehensive program across the country to make school students aware of SCT and related genetic blood disorders. The students are not aware that the sickle cell trait can lead to health complications if they are doing strenuous exercise or swimming to build stamina or to compete. The students volunteering in Civil Air Patrol, United States Air Force Auxiliary, who do air sorties in unpressurised planes are unaware of sudden death risk due to hypoexemia. So neither do they do anything to prevent the adverse events but even when the adverse event happens they are unaware of its cause. They have no idea as when to stop exerting to prevent the adverse outcome. An example is hereby provided for three school systems of three distinct states in United States of America-Spalding County, Griffin, Georgia; Jefferson County, Birmingham, Alabama and Montgomery County, Rockville, Maryland. The African American along with Asian student enrollment in the Spalding and the Montgomery counties is about 47%, and 38% respectively. (http://www.doe.k12.ga.us/ReportingFW.aspx?PageReq=102&CountyId=726&T=1&FY=2010). About 8 to 10% of this population is supposed to be carrier of various hemoglobinopathies. Concrete SCT awareness program is nonexistent in these school systems and the same stands true for most of the public and private school systems in this country.

The most cost-effective strategy for reducing the burden of haemoglobin disorders is to provide awareness, teach disease management and guide the afflicted to use their energy to compatible careers and areas. The knowledge of Sickle cell disorders/defects and other hemoglobinopathies should be incorporated in subject books from middle school level. Incorporating the education material in text books and lectures has been proposed as a viable solution to make the students aware of SCT and its consequences. The following material can be added as a part of primary, middle and secondary school level curriculum, starting from basics and progressing in complexity as the class level increases.

Biology and genetics

a) Vector diseases, Mosquitoes transmitted diseases as malaria, West Nile and Dengue
b) Life cycle of Malaria parasite
c) Theory of natural selection- Recessive and dominant genes
d) Mendel's theory
e) Structure of blood, Red Blood Corpuscles, White Blood Corpuscles
f) Function of Bone marrow
g) Lab experiments to see shape of RBC
h) Description of hemoglobinopathies

Geography

a) Latitudes, tropical and subtropical region ecosystems
b) Geographical Information systems
c) Distribution of malaria and distribution of hemoglobinopathies across continents

Chemistry

Chemical and natural control of mosquitoes

Mathematics

a) Concepts of probability
b) Probability as applied to Mendel's theory

Computer science

a) Programming and simulations
b) Simulations of increase in vector population and modeling of relationship between malaria and Sickle cell trait.

Environmental science

Effect of global warming on incidence of vector diseases.

History: Historical perspectives of migration and effect on spread of genetic diseases

Political science

a) Slavery and effect on population demographics and cultures
b) Migration of people from Asia/Africa and relation to spread of hemoglobinopathies.

Sociology

a) bSocial implications of marriage between two persons having similar genetic traits.
b) Identify couples at risk for having affected children.
c) Importance of screening before marriage or pregnancy.

Health sciences

a) Inexpensive and reliable blood tests that can identify children at risk.
b) Genetic counseling informing trait carriers of risks that the condition may have on them and how it may be passed along to their children,
c) The treatment needed if affected by a haemoglobin disorder, and the possible options.

Physical education

a) The dos and don'ts for athletes and others with SCT.
b) Educate the children about the symptoms that should be treated as Red Flags during strenuous exercise, physical work or exhaustion during athletic or sports activities.
c) Sickle cell trait can trigger exertional red blood sickling during training and practice. Blood cells became sickle shaped and clustered in circulatory system.
d) That's the danger of exertional sickling: Catch it early and an athlete is likely to be just fine. But there's a tipping point from which there is no return

Testing: Mandatory SCT and other hemoglobinopathies testing before recruitment or before initiation of exhaustive training for sports activities in schools.

Research: Literature survey using PUBMED with examples from Sickle Cell search. Education about latest management principles and treatments

As the student progresses through various grades so does the chapter advances each year with enhanced education material. When the students relate the study material being applicable to themselves

or to their fellow students, they are more apt to generate interest in understanding the issue and thus understanding the study material.

Career planning: This is one of the most important areas of hemoglobinopathies education to school students. The risks associated with various careers for the afflicted (like with SCT) should be made clear to the students. If one wants to be a pilot in Commercial Airline Industry or in Air Force one should be aware that training in unpressurized planes could be fatal.

Further the students know at an early age that if they are afflicted by one of these hemoglobopathies, they might not be able to participate in some of the careers in their future life. So they can divert their energies and interests to other sports as Golf and Chess. The interest in medical and health field can be inculcated in the students by such an education.

Recommendations and Conclusion

To medical community

How many more students, athletes and prisoners have to become a statistic before the medical community awakens and recognizes an ailment affecting the persons of South Asian and African origin? Regard Sickle Cell Trait as an illness- just do not shrug your shoulders by saying what NIH says: "People who have sickle cell trait usually have few, if any, symptoms and lead normal lives. However, some people may have medical complications" Modify the statement to: "People who have sickle cell trait usually have few to none symptoms. They can lead normal lives if adequate precautions are taken. The people who are carriers of this trait should not resort to heavy physical work and exertional exercise and should rest and hydrate adequately if feeling exhausted. They should avoid low oxygen environments as high altitude areas without proper pressurized oxygen. However, still, some people may encounter medical complications which can be fatal."

To school authorities and school curriculum developers

Incorporate learning of various aspects of biology, genetics, chemistry, mathematics, history, geography, sociology and other fields using real life problems faced by students; grow their interest in these areas by making them feel a part of the curriculum so that they can funnel their interests in these areas. Before any pain management techniques or medications are adopted, the students should be made aware of the problem and the clinical symptoms of various hemoglobopathies. A comprehensive education strategy to create awareness and enhance knowledge especially in context with SCT amongst school students is the need of the day. This management technique would also be able to inculcate education interests in the students in various study fields especially medical and health field.

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