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Analyzing How the Risk of CHD (congenital heart disease) Varies in Different Ancestry Groups and Ethnicities

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ABSTRACT

Congenital heart disease (CHD) is one of the most common birth defects worldwide and is a significant contributor to global mortality. The research paper has focused on the reasons for and how outcomes of CHD vary across different ethnic groups, and correlate and investigate the different socioeconomic and genetic factors that influence the likelihood of CHD. By analysing and combining the data from these research papers, the results have pinpointed that non-white populations experience higher rates of CHD incidence and mortality compared to white populations. This is most commonly linked to non white people having socioeconomic disadvantages in countries, such as America, and genetic factors where certain chromosomal abnormalities that cause CHD are found more in some ethnic groups compared to others. Overall, the results have pinpointed that disparities in CHD are influenced by a combination and interaction of both biological and social factors, and understanding these factors are crucial in finding ways to improve access to health care.

THE SIGNIFICANCE OF THE STUDY

The research is important to help determine whether certain ethnic groups have a higher risk of CHD in order to improve the understanding of how genetic and environmental factors contribute to influencing the risk of CHD. Thus, the results of this study are significant for several stakeholders. For healthcare professionals, the paper provides insights about how genetic factors and socioeconomic factors can influence the incidence of CHD. This can allow them to make more personalised diagnoses. Thereby, providing better care to patients who are diagnosed with CHD. On another level, for health care systems, the study stresses the importance of providing better access to healthcare and aims to reduce inequalities which are faced by certain groups when receiving medical services. For researchers, the paper can encourage further investigation and exploring the genetic causes for CHD. Therefore, allowing them to identify the gaps in the current understanding of CHD. For patients and their families, specifically those from disadvantaged backgrounds, the study can raise more awareness about the different challenges and

financial burdens that these people can face when accessing proper healthcare. This can encourage advocacy for better support systems and better and equitable access to treatment.

Keywords: Congenital heart disease; CHD varying by ethnicity and ancestry; Family history; Minorities; Genes; Health care; Birth defects; Infant mortality; Childcare; Financial strains; Lifestyle; Machine learning; Structural anomalies; Heart transplant; iPCS; Genome editing technologies; ethnic groups; Disease modelling; Data analysis; Incidence; Mortality rate; Disease burden; Global health; Population health; Epigenetics; Racial disparities; Ethnic Disparities; Health inequalities; Socioeconomic Status; Healthcare access

INTRODUCTION

THE BURDEN OF CONGENITAL HEART DISEASES (CHD): HOW RATES VARY BY ANCESTRY AND ETHNICITY

Congenital heart disease is one the most common forms of Congenital disease and is defined as a structural abnormality in the heart that is present at birth. In the US, heart defects affect 40,000 babies each year (CDC, 2025). In the UK, babies that belong to non-white families tend to have a greater risk of mortality. The ethnic groups who have displayed the highest prevalence of CHD include Asian and Black ethnic groups compared to the White population. A study highlighted that the incidence ratio when Black and Asian populations were compared with white populations was 1.4 to 1.7 for Asians and 1.3 to 1.6 for Blacks (Knowles et al., 2016). In addition, another study found evidence that children belonging to Black or Hispanic ethnicities tend to have longer hospital stays and a larger number of in-hospital mortality rates compared to white children. This is because non-white ethnic groups that are impacted by CHD tend to be more likely to reside in lower income areas than white populations. 1 in 4 babies born with a heart defect require surgery or other procedures early on in their lives (CDC, 2025).

The risks associated with Congenital heart disease are individualised and can constantly change. Each case has a unique history. This means that it is important to monitor treatment strategies and document the long-term effects. CHD can place a heavy financial burden on patients and their families. Every year for the patients, the cost of treatment of complex CHD can be four times higher compared to any other heart diseases, such as coronary heart disease. (Alexander et al., 2024)

About 31% of lifetime costs for CHD are accumulated in the first five years of a patient's life with families paying a standard of $190,000 out of their own pockets.-The sum total cost of lifetime can reach $3.35 trillion and the standard financial burden for CHD is $2.2 million per patient. However, for the first five years of their life, patients may have to pay $650,000. Patients can have reduced life expectancy by 31 years due to CHD which can amount to about $4.5 million in terms of mortality cost. The yearly

economic burden, which includes the mortality cost, can equate to $74 billion in the US (Xiaoling Zhang et al., 2025).

UNDERSTANDING CONGENITAL HEART DISEASE (CHD)

Congenital refers to defects being present at birth which can affect how blood flows throughout the body. Congenital heart disease is a structural abnormality of the heart or the blood vessels which can either include blood flowing in the wrong direction or having an incorrect number of blood vessels. Congenital Heart Disease can vary from minor abnormalities, such as a small hole in the heart, issues in the heart valves to major malfunctions, such as missing parts of the heart. The treatment of this has been researched for many decades (Xiao Meng et al, 2024).

Patients with CHD are at risk of developing different kinds of complications. For instance, heart failure, stroke, pneumonia, arrhythmias and sudden death. Arrhythmias means an irregular cardiac cycle where the heart beats too fast or too slow. An added challenge to treating CHD is the fact that certain types of CHD haven't been researched enough to find appropriate treatments (Xiao Meng, 2024).

TYPES OF CHD

CHD comes in many types and forms. For example, Atrial septal defect, ventricular septal defect, and atrioventricular septal defect .Atrial septal defect (ASD) can be major or minor depending on the hole size. Minor ASDs do not require treatment most of the time. However, major ASDs may require surgery in order to lower the risk of any potential life-threatening complications. The symptoms of minor ASD can involve a faint heart murmur, which can only be heard through a stethoscope. Major ASD has symptoms which vary among different ages. For infants, common symptoms include poor appetite which can be seen from tiredness during feeding. For children, symptoms include frequent respiratory infections, fatigue and shortness of breath. For adults, the symptoms displayed include shortness of breath, heart palpitations, and edema (swelling) in the legs, feet or abdomen (Cleveland Clinic, 2024).

Out of the two, minor ASD are the most likely to go unnoticed. This is due to the fact that the symptoms of minor ASD tend to go unnoticed since Minor ASD is caused due to small holes in the heart which do not cause any noticeable consequences. The heart can also compensate for a small amount of blood which means minor ASD can go unnoticed for decades without any major signs of failure. Despite this, even Minor ASD can cause cumulative damage over a course of many decades. One example of damage that is caused by minor ASD is the weakening of heart muscle. The leakage caused by the small holes from the left to the right side of the heart can lead the heart muscles to work harder resulting in weakened muscles over time. This stretching of the heart chambers can lead to the disruption of electrical signals, which can bring about heart palpitations. Another consequence is pulmonary hypertension: which refers to constant

extra blood flow to the lungs, damaging small blood vessels present in the organ. This can cause high blood pressure in the lungs which can become severe and irreversible. Although minor ASD can go unnoticed for many years, the consequences can be detrimental (Cleveland Clinic, 2024).

Ventricular septal defect is considered to be the most common type of CHD which is identified through a hole in the heart that divides the heart's lower chamber which can result in a risk of leakage of oxygen rich blood between the right and left ventricle.Atrioventricular defect is identified through a substantial hole in the center of the heart which poses a risk of blood mixing and impairing the formation of the valve (Cleveland Clinic, 2024).

AIMS AND GOALS OF THE PAPER

This study minimizes the stigma surrounding the causes of CHD and also enhances public knowledge regarding the condition. The paper analyses the social and financial disparities that can influence the chance of certain ethnic or ancestral groups with CHD from receiving the necessary medical treatment required. The literature review examines existing research to pin down any prevailing trends, widespread prevalence and current treatments plans for CHD. This section also explores how ethnicity and genetics work as factors that influence the likelihood of CHD as well as the healthcare disparities. Furthermore the paper explains how medical technologies iPSC's have been used to develop treatment for CHD or how technologies such as machine learning and AI have been used to analyse trends in the global incidence of CHD.

LITERATURE REVIEW

CURRENT TREATMENTS FOR CONGENITAL HEART DISEASE: HEART TRANSPLANT

Presently, there are a number of treatments which aim to improve the quality of life for patients suffering from CHD. One of the most common is a heart transplant which involves replacing the patient's failing heart with a heart from a willing donor. For a heart transplant to work, the donor must be of the same blood type and body size as the patient. A major disadvantage of heart transplants is that after the surgery, the patients are required to take immunosuppressive medications in order to prevent the risk of the patient's body rejecting the transplant heart. In terms of genetics, genes of the patient can influence the dosage of medicine given, for example certain genes like cytochrome P450 affect enzymes and may cause the breakdown of drugs (Takaaki Yamada et al., 2020) In terms of ethnicity, studies have found that certain ethnicities due to genetic factors require different doses of immunosuppressives than others, for example black patients have been found to metabolise tacrolimus faster leading to lower levels of drugs in the blood as well as a higher risk of underdosing after a transplant (Thomas et al., 2025). This poses a

high risk of the patients to other bacterial, viral and fungal infections which endangers the body's ability to detect abnormal cells and pathogens (American Heart Association, 2025).

Common adverse effects of having a heart transplant include having high blood pressure, diabetes, osteoporosis, feeling fatigue and kidney damage. Due to these side effects, patients need to take other medications alongside immunosuppressiveness. As a result, this can pose a risk of adverse side effects and long term health complications (Mayo Clinic, 2024).

Over the past years, many medical records and research have proved that it's more difficult for people of colour to receive heart transplants compared to caucasians. A study which utilised data from the United network for organ sharing datasets found that among 14890 candidates listed for heart transplant, around 30.9 % were black while 69.1% were white. Another study which used data from Organ Procurement and Transplantation Network found that out of a total of 66,411 patients, 66.7% of the patients were White, 21.8% of the patients were Black, 8.5% were Hispanic and 3% were Asian. Both these studies pinpointed a similar pattern which indicated a racial bias during the process of deciding patients for heart transplant. In the US, black patients have lower rates of acceptance compared to white patients despite black patients on average having 2-3 times higher risk of developing heart failure. There are many proposed reasons as to why such racial and ethnic disparities exist. One of these is a general bias against minority groups (Knowels Rl et al., 2016).

On another level, although Heart transplants can benefit patients with CHD, heart transplants can also place a heavy financial burden on the patients and their families. This is because aside from the general cost of having a heart transplant, there are further investments required to cover the cost of medication which is required after heart transplants. For example, in the US, the estimated amount of money spent on the heart transplant procedure is around $1,240,700 to $1,664,800. In addition, there are post transplant medication costs which can reach between $15,000 to $30,000 every year. In terms of ethnic groups, for minorities in the US, such as African American, Hispanic and Native American groups, heart transplants can pose a heavier financial burden. Studies have found that non white minority families can earn less than white families. For example, a study found that a typical African American household made 15 cents for every dollar of wealth held by a typical white family. Hispanic families have reported a net worth of only one sixth that a typical white family would have. (Kassandra Martinchek et al., 2025).

SURGERY

Another treatment for CHD includes surgery. Patients are expected to prepare themselves before the surgery by taking cautionary measures, such as avoiding contact with people who have a cold or fever. Other measures can include attending a preoperative counseling and testing at least a week before the surgery. The common tests can include EKG, Echocardiogram, chest-X ray and blood tests (American Heart Association, 2025).

Blood transfusions are needed for these types of surgeries so often the patient's family members are asked to donate blood in advance (American Heart Association, 2025). The paper has established that minority groups, such as African American Native Americans, Hispanics and Asian Americans are commonly found in low income backgrounds. This increases the chance for those from minority families to receive a delayed diagnosis.People from minority groups may face a problem with accessing a proper hospital as in the US many specialised heart centers tend to be located in metropolitan areas. This may force certain families to travel hundreds of miles just to receive proper care. In addition, the medical bills that come from the appointments which are required before and after surgery, may add a financial burden (Kassandra Matinchek et al., 2025).

ROLE OF GENETICS AND RACE IN CONGENITAL HEART DISEASE

Many studies have found that a significant portion of the causes of CHD is connected to having a large genetic contribution. Recent developments in the study of genetic factors for CHD that were made possible due to new molecular biology methods have identified that some genes have increased the risk of CHD in individuals. The Genetic etiologies are regarded as being heterogeneous and tend to consist of a mixture of chromosomal and Mendelian factors (genes). The research data demonstrated that about 8 to 10% of CHD cases were caused by chromosomal anomalies (McKay Mullen et al., 2021).

Chromosomal aneuploidy was the first to be identified as a genetic cause for syndromic CHD. This refers to heart diseases that happen alongside other anomalies, such as down syndrome. In terms of race and ethnicity, the difference in incidence of genes that cause CHD is due to differences at a genome level resulting in genetic variation between individuals of different ethnicities. Due to this, certain variants of genes linked to CHD tend to be more prevalent in certain ethnic groups than others. For example, many reports have pinpointed that the incidence of CHD in African American babies is 50% higher than white babies. Further research has demonstrated that death linked to CHD is higher in African American infants compared to white infants. Despite evidence existing which indicates a link between race and incidence of CHD, the exact genetic and/or environmental causes for CHD is not well understood. The incidence of CHD between different ethnic groups is suggested to be due to socioeconomic factors, such as variations in culture, lifestyle and wealth (McKay Mullen et al., 2021).

USAGE OF IPSCS TO MODEL INFLUENCE OF RACE ON CHD.

Induced pluripotent stem cells (iPSC) are adult somatic cells, such as skin or blood cells. Scientists can reprogram these cells to an embryonic-like pluripotent state by expressing certain genes which can self-renew indefinitely and differentiate into any cell type. In terms of application in medicine, iPSCs can be used to screen new drugs or as a form of regenerative medicine. They can be utilized in disease modelling. This involves ‘creating’ diseases in a dish in order to study their mechanisms (McKay Mullen et al, 2021).

iPSCs have been used to identify genetic variants that are more prevalent in certain minorities and increase the risk of CHD. For example, Tomita Mitchell et al., (2020) found a rare variant in the alpha myosin heavy chain within a multi general family with a high number of cases of CHD within the family. Due to iPCS, numerous genes have been identified that have been linked to CHD, such as C0L3A1, MEDI3L, KDR, ANK3 and SMAD6. There are gaps and biases in results when using iPSCs due to the fact that minorities have not been well represented in medical trials compared to white people. Due to this limited data, the exact relationship between CHD and ethnicity is not clear enough (McKay Mullen et al., 2021).

INVOLVEMENT OF ADVANCED TECHNOLOGY IN CHD

The ever-changing technology continues to play a vital way in better understanding and finding ways to treat certain ailments and conditions including CHD. Apart from iPCS, an example of these advancements is genome editing technologies. This involves editing or introducing mutations in a disease causing gene as a way for biomedical researchers to analyse the role and effect of a single mutation on the impact on the disease phenotype (McKay Mullen et al., 2021). Another example of developing technology that may allow researchers to gain more insights and understanding on CHD is Machine learning which is regarded as a subset of Artificial Intelligence (AI) that enables systems to learn from data, identify patterns and make independent decisions.Machines improve their performance by analysing large datasheets and models.

For a long time, machine learning has been used to achieve early CHD diagnoses and risk assessments.The machines ability to make precise predictions and assessments on a person's likelihood of getting CHD continues to improve as more data is given.This technology is also being used to identify causes of CHD on a population level. For example, Machine learning has identified air pollution as an increasing risk of fetal CHD in pregnant women. When combined with other modelling platforms such as iPSC, Machine learning provides an immense amount of potential. For example, when paired with scRNA-seq which is a dataset used to analyse gene expression, scientists were able to make many discoveries relating to CHD. The data analysis power of machine learning and the resolution of scRNA-seq have been utilized for many purposes, such as lineage reconstruction to identify the emergence of early cardiac lineages that form in the heart and to create cell atlases of cardiac development. (McKay Mullen et al., 2021).

METHODOLOGY

INFORMATION ABOUT THE RESEARCH PAPERS

The study is a literature review that utilises four different research articles about CHD which include global meta analytic perspectives. The following papers were analysed from peer reviewed journals including PLOS ONE, Journal of the American College of Cardiology, American Heart Association Journals and Frontiers in Cardiovascular medicine.

INCLUSION CRITERIA

The papers selected were required to mainly focus on CHD and addressing the prevalence, the risk factors or the health disparities involving CHD. All of the studies were peer reviewed journals from well known publication sites. Additionally, the study the people focused on in the papers mainly where children as CHD is a disorder that is present at birth. The articles that had a methodology section and had been published within the past 15 years were included in this study.

EXCLUSION CRITERIA

Papers that included animal or purely laboratory models were excluded as well as studies that did not discreetly focus on CHD and included no relevant discussions on the risk factors, genetic factors and health disparities of CHD. Furthermore, studies that lacked a methodology section or had insufficient data were excluded. Research studies that were a decade old and non-peer reviewed studies (for example, blogs and opinion articles) were excluded to avoid any possible bias. Lastly, studies without any clinical evidence and lack of transparency in the data were also excluded from the studies.

1) PREVALENCE OF CONGENITAL HEART DISEASE IN XINJIANG MULTI-ETHNIC REGION OF CHINA BYFEN LIU ET AL,, 2015. PUBLISHED BY PLOS ONE

This article has investigated the prevalence and risk factors of CHD in Xinjiang, which is a northwestern region in China. The study has focused on how CHD varies from the various ethnic groups that are presented within the region. The research included a total of 14,530 children from ages 0 to 18 years. 240 of the children were diagnosed with CHD. Out of the 240, the distribution for the types of CHD demonstrated that 20.8% of these cases were caused by atrial septal defect, 16.5% for ventricular septal defect, and both patent ductus Arteriosus and Acelistocardia were each at 13.7%. Among these children, 17.7% were Uygur, 6.9% were Han, 11.4% were Kaza and 38.1 % were Hui Chinese.

This study has several strengths. One strength is the inclusion of primary data collection through asking standard questionnaires which increases the studies reliability. Furthermore, the standardised techniques that were used help to increase accuracy. The inclusion of multiple ethnic groups has allowed for more

valid and meaningful comparison. However, the cross-sectional design of the study which involved examining all 14,530 at once has limited the study's ability to prove ethnicity correlates with the incidence of CHD. Furthermore, the paper is focused on a specific region. This in turn reduces the generalisability of the results. The use of community based samplings presents a potential risk of selection bias

2) ADDRESSING DISPARITIES IN PEDIATRIC CONGENITAL HEART DISEASE: A CALL FOR EQUITABLE HEALTH CARE BY CHOWDARY ET AL (2024) PUBLISHED BY JOURNAL OF AMERICAN HEART ASSOCIATION

The paper has highlighted the health disparities in CHD and focused on how factors, such as race, socioeconomic status and access to healthcare can influence the risk of CHD. The results of the study have indicated that CHD associated mortality rates are higher in lower income populations. This incorporates children from disadvantaged backgrounds experiencing approximately two to three times higher death rates due to CHD compared to more advantaged groups.

The study has gathered data from epidemiological studies which focus on the the prevalence and incidence of CHD as well as risk factors and health outcomes, and conducted clinical outcome research which investigates the outcomes of disease and its effect on a patient's life The strength of this study is that it has a strong focus on health equity and its ability to integrate evidence from multiple fields and perspectives. Thereby, making it highly relevant to current health care challenges. However, the lack of any quantitative data presents bias and limits the precision of the conclusion. Moreover, the author may have only used articles and papers that support their argument which causes a potential risk of selection bias.

3) BIRTH PREVALENCE OF CONGENITAL HEART DISEASE WORLDWIDE: A SYSTEMATIC REVIEW AND META-ANALYSIS BY VAN DER LINDE ET AL (2011) PUBLISHED BY JACC JOURNALS

This study is a systematic review which aimed to estimate the incidence of CHD on a global scale by utilising and combining research from multiple papers. This study incorporated a total of 114 papers, which included a total population of 24,091,867 live births of which 164,396 individuals were found to have CHD. Overall, the results pointed to the incidence of CHD increasing throughout the years, with the incidence being 0.6 per 1000 live births in the 1930s increasing to 9.1 per 1000 live births after 1995. The overall incidence of CHD worldwide has been found to be 8 - 9 cases per 1000 live births.

A strength of this study was the inclusion of a very large sample size which helped to eliminate the risk of selection bias. Furthermore, the large amount of quantitative data made the study highly reliable and replicable, and the use of global data meant that the results were more inclusive. However, despite this,

the study may have publication bias as only studies with more significant findings were included in the paper. Furthermore, the study used secondary information from other sources. This in turn can lead to bias as the author could have mainly used studies that support the papers argument.

4) RACE AND GENETICS IN CONGENITAL HEART DISEASE: APPLICATION OF IPSCS, OMICS, AND MACHINE LEARNING TECHNOLOGIES BY MCKAY MULLEN ET AL 2021. PUBLISHED BY FRONTIERS

This paper has stressed the genetic causes for CHD and how development of technology throughout the years has helped strengthen the current understanding of CHD. This study is a review on how methods, such as iPCSs, genomic sequencing and machine learning can help further improve the understanding of CHD and its relation to race and ancestry. Genomic sequencing means determining the complete DNA sequence of an organism's genome.

The results of the paper indicated that approximately 20% to 30% of the cases linked to genetic factors are caused due to chromosomal abnormalities and genetic mutations. Furthermore, the study found that racial minorities are more disproportionately affected by CHD as chromosomal abnormalities are more likely to be found in people of color.

A key strength of this paper was the combination of perspectives from a genetic view and from data science. However, the study mainly relies on secondary data as the main source of evidence. This means the quality of the research is dependent on the quality of the papers and studies that the author used. Furthermore, there is a possibility of bias, as the author may have preferred to use papers that support the paper's argument

5)ETHNIC AND SOCIOECONOMIC VARIATION IN INCIDENCE OF CONGENITAL HEART DEFECTS BY KNOWLES ET AL (2017). PUBLISHED BY ARCHIVES OF DISEASE IN CHILDHOOD

The article investigated the variation of the incidence of CHD in multiple different ethnic groups with different socioeconomic backgrounds. The research had included a total population of 5,350 infants who have some form of heart disease. Out of these 5,350 cases. 55% of the patients were boys. The overall findings showed that the incidence of CHD was higher in minority populations with an incidence ratio of 1.5 for asian infants and 1.4 for black in infants when compared to a white reference population.

The study has many strengths, one of which is the inclusion of a robust national database framework, which can increase the validity of the data. Another strength of the article is that the tracking of specific lesion variations allows for more accurate and precise estimations of mortality defects.However a weakness of this study is that the paper mainly focused on the United Kingdom healthcare framework which reduced the generalisability of the results.

6) NEIGHBOURHOOD MATERNAL SOCIOECONOMIC STATUS INDICATORS AND RISK OF CONGENITAL HEART DISEASE BY NGUILE-MAKAO AND MARELLI (2021). PUBLISHED BY PLOS ONE

This article has studied the relationship between maternal socioeconomic standing and the risk of congenital heart disease (CHD). The study was a population based retrospective cohort study which reviewed data profiles across Ontario from April first 2012 to March 31, 2018. The data collected included maternal education thresholds, household income brackets and community employment levels.Neighbourhood boundaries were mapped by using standardized institutional consensus databases. The paper had included a population of 804,292 live births out of which 9,731 were diagnosed with CHD, showing a cohort baseline frequency of 1.21%

One strength of the study was the implementation of a multi year population sample size which makes the data more valid and reduces any potential selection bias. Moreover the detailed adjustments for neighbourhood metrics makes the study reliable. However the results of the study indicated 18% lower odds of CHD in immigrant or minority neighborhoods which weakens the correlation between ethnicity and incidence of CHD. The study also relies on secondary administrative health records which can be inaccurate in regards to individual household variables

7) DISPARITIES IN DISEASE BURDEN OF CONGENITAL HEART DISEASE AMONG 150,488 INDIVIDUALS IN WESTERN CHINA BY ZHANG ET AL, (2025). PUBLISHED BY SCIENTIFIC REPORTS

The article investigated the ethnic, sex and socioeconomic disparities that can affect the likelihood of CHD and analysed whether or not biological factors influence long term survival following surgical interventions. The study found that females show higher prevalence of postoperative complications compared to men in high altitude regions. Further data also suggest that environmental factors such as high altitude resulted in severe stress on neonatal cardiac development and economic indicators were correlated with delayed diagnostic windows.

A major strength of the study is that it uses a broad multiethnic data framework that takes into account environmental factors as well as socioeconomic metrics. The study also tracks outcomes up to post surgical stages which can significantly improve reliability. However the studies sample pool were concentrated within unique high altitude areas which can reduce the generalisability of the results.Moreover the study relies mostly on regional electronic health networks which can result in selection bias.

8) RACIAL AND ETHNIC DISPARITIES ON THE HEART TRANSPLANT WAITING LIST BY FIROZ ET AL (2025). PUBLISHED BY INTERNATIONAL JOURNAL OF CARDIOLOGY

This article analyzes the ethnic and racial inequalities present within the listing process for heart transplantations. The study focuses on how a patient's race may influence their chance of receiving a donor heart. The study included a total cohort of 66,411 adult patients registered on the national transplant queue between 2000 and 2023. Out of the 66,411 patients, 66.7% of them were white, 21.8% were black, 8.5% were Hispanic and 3% were Asian. The findings showed that black patients had a lower likelihood of receiving a transplant and had an increased risk of waitlist mortality compared to white patients.

One strength of the study is the inclusion of an exhaustive national dataset over more than two decades. This makes the data more reliable and makes it easier to find trends. The study also addresses modern clinical frameworks by proving that racial and ethnic disparities still persist despite the implementation of updated organ allocation policies. However the use of large datasets strains the authors ability to analyse the data in more detail and find biases.

FINDINGS AND DISCUSSION

The review articles that were chosen have highlighted the different factors which influence CHD. This mainly focuses on race, socioeconomic and genetic factors. The findings from these articles have indicated that people of color, especially those from disadvantaged backgrounds, have a higher likelihood of developing CHD compared to white people or people from more advantaged backgrounds. In addition, the results pinpoint that people from disadvantaged backgrounds have a more harder time accessing the proper care that is required to treat CHD than those from more privileged backgrounds.

Additionally, in terms of the genetic causes, studies have found that the most common genetic cause of CHD are chromosomal abnormalities which accounts for approximately 8-10% of cases of CHD. Moreover, the studies have provided details about how the development of technology can further improve our understanding of CHD. One example of this are IPCSs, which are adult somatic cells that are reprogrammed into a state similar to an embryo. These cells can differentiate indefinitely and are usually taken from patients' own cells. Another example is genome editing technology which involves modifying DNA and can be used to pinpoint the exact genetic causes for CHD and heart diseases in general. Furthermore, machine learning can analyse large amounts of data sheets and models to predict possible trends in CHD and identify correlations between CHD and different factors, such as air pollution or smoking. The results pinpoint that overall despite trends between race, ethnicity and incidence of CHD are being seen, there is still a clear lack of data on the exact causation of why people of color are more likely to develop CHD. The results show clear racial bias in the decision making for providing appropriate medical care and an overall lack of representation of people of color in clinical trials. These factors are further contributing to the gaps in data which is to people of color.

On another level, this study overall has many limitations. This incorporates the use of secondary data rather than primary data. In other words, this means that the quality of the research paper and the data are largely dependent on the validity of the data in the research articles that were chosen for this paper. The study also brings possible selection bias as only articles with significant findings and ones that support the argument of the study may have been chosen. Furthermore, due to the overall limited data related to CHD and the correlation to race and ethnicity, the data presented in the article is overall also very limited.To conclude, the evidence stresses that the disparities in the incidence of CHD is dependent on a combination of environmental, genetic and socioeconomic factors. These points stress that if racial disparities in healthcare continue to rise, then the incidence of CHD might increase among people of color and might continue to rise in the future and access to proper treatment for CHD might become more challenging for minorities.

CONCLUSION

In conclusion, CHD varies across ancestry and ethnic groups and genetic and socioeconomic factors greatly influence the incidence of CHD. Overall findings suggest that people of color are more likely to experience higher rates of CHD than white populations, which is strongly influenced by socioeconomic and genetic factors. The socioeconomic factors result in minorities which now include white populations to have more trouble getting access to proper treatment required as well as other problems, such as delayed diagnosis'. Genetic factors show that chromosomal abnormalities are the most common genetic cause of CHD and are found more in people of color, However, data genetic causes of CHD relating to people of color do not have enough research done to reach a proper concussion due to limited representation of people of color in clinical trials. These results highlight significant racial inequality relating to treatment of CHD and in the medical industry in general. This shows that further research must be done on underrepresented populations and these outcomes must be addressed to ensure proper healthcare for all individuals.

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