

Misconceptions regarding heart disease are prevalent among american adults and minors

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SUMMARY

Health literacy refers to the knowledge base and ability to access, understand, and utilize basic health information to participate in health decisions (1). It is an invisible barrier to effective healthcare delivery and leads to significant costs for individual as well as public health. Health literacy has been associated with limited knowledge of health conditions (2-4), medications (5), poor overall health status (6, 7), higher healthcare costs (8, 9), increased likelihood of rehospitalization (10), and mortality (11-13). This fundamental need to improve general knowledge and health literacy is especially important in cardiovascular diseases because (1) they account for more deaths in the US than any other cause including more deaths than all cancers combined, and (2) it is felt that 80% of cardiovascular deaths may be preventable. The authors were interested in assessing the knowledge level of adults and minors about cardiovascular diseases. A survey was administered to assess fundamental knowledge of demographic factors pertinent to heart disease, risk factors of heart disease, healthy dietary and exercise habits, and other general knowledge about heart disease. Our study demonstrated that significant misconceptions and knowledge deficits regarding cardiovascular diseases exist among US adults and minors. Reductions in the death burden from cardiovascular disease will require a multi-faceted approach, including removal of this invisible barrier of misconceptions and knowledge deficits by increasing public awareness about these diseases. Action must be taken to improve public knowledge and improve health literacy about heart disease in the United States.

INTRODUCTION

Approximately 1 in 4 deaths in the United States are caused by heart disease, making it the leading cause of death for both men and women (14). The type of heart disease that results in the most deaths annually is coronary heart disease (14). This condition kills over 370,000 people annually, and is caused by plaque developing on the inner walls of coronary arteries (15, 16). This compromises blood flow to the heart, leading to insufficient oxygen delivery. This can lead to death (myocardial infarction) or dysfunction (cardiomyopathy and congestive heart failure) of heart tissue (17, 18). It is important to know the warning signs of a myocardial infarction, such as

chest pain, shortness of breath, loss of consciousness, and other symptoms, so that immediate action can be taken (19). It is also important to know the risk factors for heart disease so that preventive measures can be adopted. Common risks include diabetes, high blood pressure, high cholesterol, smoking, and family history (20). Although these risk factors cannot be eliminated entirely, they can be significantly reduced by maintaining a healthy diet, exercising regularly, and following medical advice (21). It is commonly accepted that preventive measures can reduce the risk of heart disease by up to 80% (22). Although each of the common risk factors listed above may play a greater or lesser role in any individual patient, together these risk factors play a significant role. For example, high blood pressure damages arteries, causes stress, and leads to inflammation (23). The damaged arteries are more prone to developing cholesterol deposits and attempt to heal this damage, but this cycle of damage and inflammation leads to atherosclerosis, the buildup of plaque in the arteries that can block blood flow (23).

Although a significant portion of heart disease and death are preventable, formidable barriers have prevented achieving this success. This includes lack of knowledge about heart disease, preventive measures, misconceptions, and poor health literacy. Multiple studies have demonstrated that poor knowledge and health literacy are associated with poor overall health (6, 7), higher healthcare costs (8, 9), repeated need for rehospitalization and its associated costs and complications (10), as well as mortality (11-13).

Given the magnitude of heart disease, its significant morbidity burden, and it being the leading cause of death in the US, it would be of great importance to assess the general knowledge and understanding of Americans about cardiovascular disease. Improved understanding of knowledge deficits and misconceptions about cardiovascular disease may prompt efforts to reduce these knowledge deficits, which would be of great public health benefit. Therefore, we wanted to assess the general knowledge of Americans about heart disease, assess differences in this knowledge between minors and adults, and between males and females with a survey about cardiovascular disease knowledge.

Knowledge of cardiovascular diseases was assessed by administering a survey to test the participants' knowledge. Questions were centered on topics such as demography in relation to heart disease, risk factors, healthy habits, and general knowledge about heart disease. The broad categories, as well as specific questions used in the survey within these categories, were selected to test knowledge of the most important issues about heart health, risk factors for

heart disease, identify at-risk populations for heart disease, and review modifiable factors that may reduce the incidence of this disease. The study would help to determine the specific topics of knowledge deficits and where new educational efforts should be focused.

Our first hypothesis was that study participants would perform adequately on this survey. We hypothesized this because the questions were related to general knowledge rather than advanced topics or nuances of heart disease. The survey explored concepts within the sphere of general knowledge such as healthy dieting and preventable risk factors. Our second hypothesis was that adults would have a better understanding and fewer misconceptions about heart disease than minors. We hypothesized this because adults were generally expected to have more education, interactions with healthcare professionals, and life experiences than minors. Our final hypothesis was that females would score higher than males in the survey. We hypothesized this because heart disease affects more females than males, and population subsets with higher disease burden would presumably be more concerned and therefore be more knowledgeable about the subject.

RESULTS

The survey consisted of 19 questions; one was not counted toward the score because it was an opinion question, and two were worth 2 points (questions #4 and #9), making 20 maximum attainable points (See details in “Methods”). Participants were given the option to complete or decline the survey. The study was closed when we reached our goal of 50 minor and 40 adult participants.

Two-tailed T-tests were performed to compare the performances of the following groups:

- 1) adults and minors;
- 2) male and female minors; and
- 3) male and female adults.

Comparing adults to minors, adults performed better (52%) than minors (38%) (**Table 1**). This difference was statistically significant ($p < 0.0001$) (**Figure 1**).

The distribution of the scores was similar to a normal, bell-shaped distribution curve. However, it was skewed right because only 6 participants scored higher than 13 correct answers (**Figure 2**).

Among minors, females scored higher (38%) than males (34%) (**Figure 3**). This difference was not statistically

	MALES	FEMALES	ADULTS	MINORS	TOTAL
NUMBER OF PARTICIPANTS	45	45	40	50	90
MEAN SCORE/ 95% CONFIDENCE INTERVAL	42.02% ± 4.84%	44.38% ± 4.58%	51.63% ± 4.70%	36.6% ± 3.69%	43.28% ± 3.32%
MEDIAN SCORE	40%	45%	55%	35%	40%
RANGE	60%	70%	60%	50%	70%
STANDARD DEVIATION	16.57%	15.63%	15.14%	13.30%	16.03%

Table 1: Measures of distribution. An analysis of the number of correct responses in the survey.

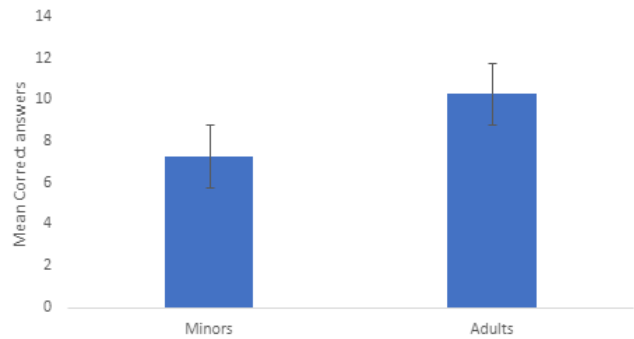


Figure 1: Adults scored significantly more points compared to minors. The mean number of points was tabulated for both the adults (n = 40) and the minors (n = 50) that were surveyed. Adults scored significantly higher compared to minors ($p < 0.0001$). Error bars represent the standard error of difference (0.604).

significant ($p = 0.3$).

Among adults, females scored higher (54%) than males (50%) (**Figure 4**). However, this difference was also not statistically significant ($p = 0.4$).

Minors had the most success answering: “You have a better chance of surviving a heart attack if you know the warning signs. Which of these is a warning sign of a heart attack?” (76% correct) and the most difficulty in answering: “How does a healthy diet reduce the risk of heart disease (select all that apply)?” (10% correct).

Adults had the most success answering: “By making healthy choices, you can help lower your risk for heart disease. Which one of these is not part of a healthy lifestyle?” (90% correct) and the most difficulty in answering: “High blood pressure most commonly causes:” (15% correct).

Participants in general had the most success answering: “You have a better chance of surviving a heart attack if you know the warning signs. Which of these is a warning sign of a heart attack?” and “By making healthy choices, you can help lower your risk for heart disease. Which one of these is not part of a healthy lifestyle?” (81% correct). They had the greatest difficulty in answering: “High blood pressure most commonly causes:” (17% correct).

In general, misconceptions about heart disease were

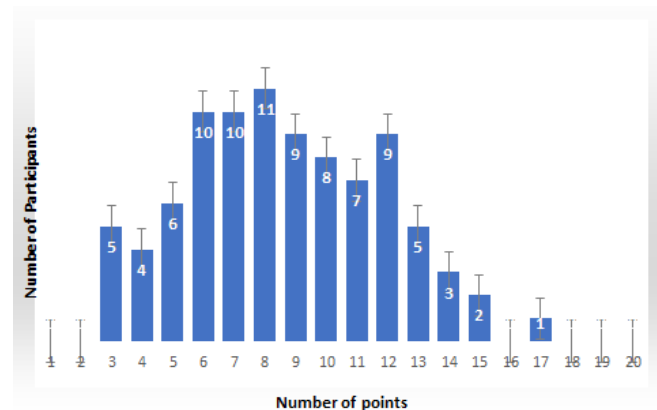


Figure 2: A large proportion of participants scored only 6-8 points. The number of participants (out of 90) that received a given number of points was tabulated. For example, it can be seen from the figure that 7 out of the 90 total participants received 11 points.

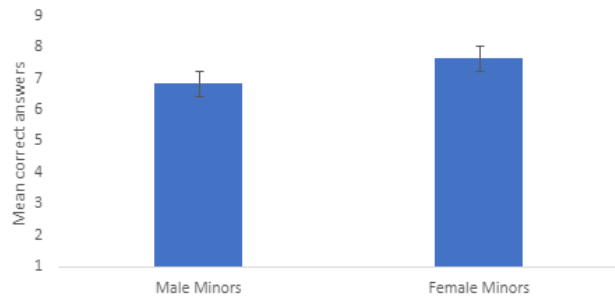


Figure 3: There was no significant difference in the performance of male minors vs female minors. The mean number of points was tabulated for both male minors ($n = 20$) and female minors ($n = 30$) that were surveyed. Female minors scored higher compared to male minors, but this difference was not statistically significant ($p = 0.3$). Error bars represent the standard error of difference (0.762).

prevalent across all ages and genders. (Table 2) The data demonstrate that participants had a poor knowledge level of cardiovascular disease because they missed questions that tested relatively basic concepts about heart disease. For example, in question 16 (“Which of the following statements is TRUE:”), only 21% of the total participants were able to correctly identify that: “Low-dose aspirin can help you avoid another heart attack”.

Overall, the results indicated that adults performed significantly higher than minors and that participants struggled with certain questions much more than with other questions.

DISCUSSION

Overall, our study demonstrated a poor general understanding about cardiovascular disease even though this is the leading cause of death in America. Our first hypothesis that participants would perform adequately on the survey was not supported by this study as the average correct responses on this survey was only 43%. Our second hypothesis that adults have a greater understanding about heart disease than minors was supported by this study. Our third hypothesis that females will have greater understanding than males was not supported by this study.

We analyzed our data to determine if there were any general patterns or trends of categories in which there were greater knowledge deficits or where subgroups such as minors, adults, males or females may have more knowledge gaps. However, no such patterns could be discerned. Adults scored better than minors in all topic areas, and minors scored better on only one question (“High blood pressure most commonly causes:”). The most probable reason for adults scoring significantly better than minors is presumed to be more education, interactions with healthcare professionals, and life experiences than minors. The participants did not exhibit a clear trend of succeeding in certain topics or struggling in others.

A strength of this study was that we were able to get a reasonable sample size across all of our subgroups. Another strength was that the study incorporated factors such as gender and age, which allows us to effectively compare results within these subgroups. However, one weakness of the study was that this was not an entirely random sample. This is because the survey was distributed to family members,

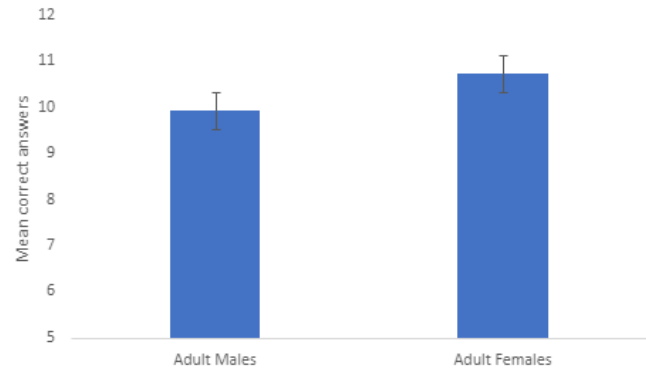


Figure 4: There was no significant difference in the performance of male adults vs female adults. The mean number of points was tabulated for both male adults ($n = 25$) and female adults ($n = 15$) that were surveyed. Female adults scored higher compared to male adults, but this difference was not statistically significant ($p = 0.4263$). Error bars represent the standard error of difference (0.975).

friends, and teachers, which does not constitute a random sample. A random sample would be more representative for the hypotheses addressed in this study. Another potential weakness of this study was that our participants were mostly from Florida and this data may not be applicable to all Americans.

This study highlights the fundamental lack of knowledge about basic information regarding cardiovascular disease. Heart disease is a major cause of death and disease which affects hundreds of thousands of lives in the US yearly, therefore it is important for people to learn about its symptoms as well as ways to prevent it. The poor knowledge base was generalized and was noted across ages and genders. Another study has also concluded that greater efforts should be made to communicate accurate information to the public so that the burden of heart disease can be reduced (24). An author has argued that everyone must be educated about how to prevent heart disease (24). The goal of our study was to assess awareness about the misconceptions regarding heart disease because knowledge of these misconceptions can assist in developing educational programs. Educating people about heart disease and adopting healthier habits may help to lower heart disease rates. It may be particularly effective to begin educational efforts in schools because heart disease is a progressive disease taking years to develop and earlier intervention would be most beneficial. These educational efforts should focus on topics such as demography in relation to heart disease, risk factors of heart disease, healthy habits, and general knowledge about heart disease. The study indicated that these are the topics that people struggled with the most. Only 12% of minors in the study knew that heart disease strikes more women than men, so it would be particularly helpful for schools to teach this information to minors. These efforts should also focus on the benefits of dieting and exercising in preventing heart disease. The survey results demonstrate that only 10% of minors in the study knew how a healthy diet reduces the risk of heart disease, and only 24% of minors in the study knew how exercise reduces the risk of heart disease. Improvements in diet and exercise habits would be most effective if healthy habits can be developed at an earlier age as poor habits, when ingrained, become

Question	Correct answer	A	B	C
1. Which statement is true? (Topic: Demography in relation to heart disease)	B. Heart disease strikes more women than men	12%	37.5%	23.33%
2. Which ethnic group has the highest risk for heart disease? (Topic: Demography in relation to heart disease)	A. African Americans	56%	70%	62.22%
3. Which ethnic group has the lowest risk of heart disease? (Topic: Demography in relation to heart disease)	C. Hispanic Americans	32%	32.5%	32.22%
4a. Which of the following are risk factors for heart disease that you can control? (circle all that apply) (Topic: Risk factors)	C. Obesity	50%	57.5%	53.33%
4b. Which of the following are risk factors for heart disease that you can control? (circle all that apply) (Topic: Risk factors)	E, F, G, H E. High Cholesterol F. high blood pressure G. smoking H. lack of exercise	52%	67.5%	58.89%
6. Which ONE of the following statements is TRUE: (Topic: Healthy Habits)	B. Getting enough sleep lowers the risk of heart disease.	24%	30%	26.67%
7. How does a healthy diet reduce the risk of heart disease (select all that apply)? (Topic: Nutrition- Healthy Habits)	A, B, C A. By reducing weight B. By lowering cholesterol C. By reducing blood pressure	10%	35%	21.11%
8. How does exercise help reduce the risk of heart disease? Select all that apply (Topic: Exercise- Healthy Habits)	A, B, C, D A. By reducing weight B. By lowering cholesterol C. By reducing blood pressure D. By reducing stress	24%	45%	33.33%
9a. What of the following foods help lower the risk of heart disease? (select all that apply) (Topic: Nutrition- Healthy Habits)	3, 4, 5 3. Nuts 4. Whole grain bread 5. More fruits and vegetables	34%	42.5%	37.78%
9b. What of the following foods help lower the risk of heart disease? (select all that apply) (Topic: Nutrition- Healthy Habits)	7, 8 7. Brown rice 8. Fish	32%	65%	46.67%
10. High blood pressure, high cholesterol, and smoking tobacco increase your risk for heart disease. What percent of American adults have at least 1 of these 3 risk factors for heart disease? (Topic: General Knowledge)	C. 47%	24%	52.5%	36.67%
12. You have a better chance of surviving a heart attack if you know the warning signs. Which of these is a warning sign of a heart attack? (Topic: Warning signs)	D. All of the above.	76%	87.5%	81.11%
13. By making healthy choices, you can help lower your risk for heart disease. Which one of these is <i>not</i> part of a healthy lifestyle? (Topic: Healthy Habits)	C. Smoking tobacco.	74%	90%	81.11%
14. Minimum acceptable levels of exercise for heart health include <u>all</u> of the following EXCEPT: (Topic: Exercise- Healthy Habits)	D. One should really get one straight hour of exercise every day.	40%	62.5%	50%
15. Which of the following statements is TRUE: (Topic: Nutrition- Healthy Habits)	C. Reducing salt may be good for your heart health.	60%	70%	64.44%
16. Which of the following statements is TRUE: (Topic: General Knowledge)	D. Low-dose aspirin can help you avoid another heart attack.	16%	27.5%	21.11%
17. Which of the following statements is TRUE: (Topic: Nutrition- Healthy Habits)	B. Eat fish at least twice a week for a healthy heart.	30%	32.5%	31.11%
18. High blood pressure most commonly causes: (Topic: General Knowledge)	D. No symptoms	18%	15%	16.67%
19. All of the following are misconceptions that reflect a poor understanding about heart disease EXCEPT: (Topic: General Knowledge)	A. "Heart disease can start at a young age."	44%	70%	55.56%
20. All of the following are misconceptions that reflect a poor understanding about heart disease EXCEPT: (Topic: General Knowledge)	D. "People should resume exercise after they have recovered from a heart attack even though it will put stress on a diseased heart."	26%	42.5%	33.33%

Table 2: Number and percentage of correct responses for each question based on age and gender.

Columns:

A : Number of Minors (out of 50) who provided the correct response to this question

B : Number of adults (out of 40) who provided the correct response to this question

C : Number of total participants (out of 90) who provided the correct response to this question

more difficult to change (25). Improved education could lead to marked changes and reduction of many deaths and should be implemented urgently.

In the future, we hope to expand this study so that it can also incorporate other groups of the American or global population. To do this, we will collect more data regarding demographics and ethnicity of the surveyed participants. Similar data could also be collected from subjects in other nations so that the results can be compared between different nations.

MATERIAL AND METHODS

Permission and Participants

Surveys were given to 50 minors (age < 18 years) and 40 adults (age > 18 years). Among the adults, 25 were male and 15 were female, while among the minors, 20 were male and 30 were female. Each participant gave informed consent. Minors were students at James S. Rickards High School, a large public high school (1300 students) in a large city (Tallahassee, FL population estimate 190,000). Minors were not required to have parental permission in order to participate in this study. Adults included teachers from James S. Rickards High School, family, and friends of the authors.

Survey Design and Testing

Survey questions were written by the authors, and no external resources were used to craft them. Two questions (question #4 and question #9) were worth 2 points because they had multiple correct answer choices, and the participants were asked to select all of the correct answer choices. These questions were each essentially divided into 2 questions to determine the number of points that the participant received. This method is demonstrated in Table 2, and more information can be found in the "Appendix" section. About half of the questions were related to a general knowledge of heart disease rather than subtle intricacies of the disease. These questions asked about concepts such as healthy dieting and factors of heart disease that individuals can control, which are within the sphere of general knowledge. However, about half of the questions required more specific knowledge of the subject and would be beyond the expected knowledge base of participants. The study took place in May of 2019. The surveys were given in classrooms and participants completed the form independently without using any resources. Statistical analyses including t-tests were utilized to analyze the data.

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