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Childhood Obesity and Risk of Adult Cardiovascular Disease

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ACCEPTANCE

This research project, Childhood Obesity and Risk of Adult Cardiovascular Disease by Tina Campbell, Kayla Gee and Patricia Hernandez, was prepared under the direction of the candidates' Advisor. It has been approved and accepted in partial fulfillment of the requirements for the degree Masters of Science in the Department of Nursing in the College of Health Science & Professions, University of North Georgia.

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Revised 10/2014

CHILDHOOD OBESITY AND RISK

OF

ADULT CARDIOVASCULAR DISEASE

by

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A RESEARCH PROJECT

Presented in Partial Fulfillment of Requirements for the
Degree of Master of Science
Department of Nursing
University of North Georgia

Dahlonega, Georgia

2016

ABSTRACT

CHILDHOOD OBESITY AND RISK OF ADULT CARDIOVASCULAR DISEASE

by

Tina Campbell
Kayla Gee
Patricia Hernandez

The Office of Disease Prevention and Health Promotion's (ODPHP) national initiative, *Healthy People 2020,* has urged health care professionals to "improve cardiovascular health and quality of life through prevention, detection, and treatment of risk factors for heart attack and stroke." One readily modifiable risk factor for heart disease is obesity. In fact, according to the ODPHP, consequences of adult obesity include increased risk of developing a number of chronic diseases, including cardiovascular disease, type 2 diabetes (T2D), and certain cancers. There is a wealth of literature describing the ways in which *childhood* obesity, specifically, may be linked to adult cardiovascular disease. A study published in 2011 found that obese children were more likely to become obese adults than those who were not obese as children.[4] Meanwhile, a systematic review explored "whether childhood obesity exerts an independent effect on adult cardiovascular health [... since] some studies suggest quite the opposite, with those who were thinnest as children and overweight as adults showing the highest adult metabolic risk." [5] Other studies have found that accelerated BMI gains in childhood, particularly at 7-11 years of age, put children at highest risk of CVD and T2D in adulthood.[4 (p1209)] Combined, the research indicates that tracking the growth of children becomes paramount for detection and prevention of prolonged accelerated gains in BMI during vulnerable early development periods. Identifying opportunities to promote appropriate physical activity and maintenance of a healthy diet in children and adolescents potentially limits development of modifiable risk factors associated

with CVD in adults, namely: hypertension, hyperglycemia, high cholesterol, physical inactivity, unhealthy diet, and being overweight or obese.[1] The following literature review seeks to answer the question, "are children ages 5-17 who are obese (BMI > 95%) compared with those of normal BMI (5-85%) at higher risk for developing cardiovascular disease as adults?"

APPENDICES

Appendix A

Guideline for evidence-based practice was obtained from Healthy People 2020 Heart Disease and Stroke goal to "improve cardiovascular health and quality of life through prevention, detection, and treatment of risk factors for heart attach and stroke; early identification and treatment of heart attacks and strokes; and prevention of repeat cardiovascular events."

Reference:

U.S. Department of Health and Human Services, Office of Disease Prevention and Health Services. (2016). Heart Disease and Stroke, Healthy People 2020. Retrieved from: https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke.

Appendix B – Letter of Inquiry

Tina Campbell, Kayla Gee & Patricia Hernandez
University of North Georgia
kaylagtatum@gmail.com

March 27, 2016

Dear Michelle Perron,

We wish to submit a new manuscript entitled "Childhood Obesity and Risk of Adult Cardiovascular Disease" for consideration by Advance for NPs & PAs.

We confirm that this work is original and has not been published elsewhere nor is it currently under consideration for publication elsewhere.

In this paper, we report on childhood obesity and the risk of adult cardiovascular. This is significant because of the Healthy People 2020 goal that identifies obesity as a common contributor to the decline of cardiovascular health. The paper should be of interest to readers in the area of primary care, pediatrics, women's health and men's health.

Our paper looks at previous research addressing childhood obesity and the implications it has on adult cardiovascular disease. This is important because of the rise in childhood obesity that is being seen today. This highlights the needs to begin patient education and exercise in childhood to prevent adult cardiovascular disease and complications. The readership would be interested in this article because pediatrics, women's health, and men's health are topics identified by reader surveys.

Please address all correspondence concerning this manuscript to me at kaylagtatum@gmail.com.

Thank you for your consideration of this manuscript.

Sincerely,

Tina Campbell, Kayla Gee & Patricia Hernandez

Appendix C – Submission Cover Letter

Manuscript submission for publication

Kayla Tatum <kaylagtatum@gmail.com>

Sun 3/27/2016 8:33 PM

To: mperron@advanceweb.com <mperron@advanceweb.com>;

1 attachment (40 KB)

Childhood obesity and risk of adult cardiovascular disease manuscript.docx;

Good evening Michelle,
Attached is our manuscript that we would like to have considered for publication.

Thanks,
Kayla Gee BSN, MS-student, RN

Appendix D – Acknowledgement by the Journal of Receipt of the Manuscript

Gmail **Kayla Tatum <kaylagtatum@gmail.com>**

Manuscript submission for publication

Michelle Perron <mperron@advanceweb.com> Mon, Mar 28, 2016 at 8:05 AM
To: Kayla Tatum <kaylagtatum@gmail.com>

Thank you for this submission. I will get in touch again after the evaluation process is complete.

Michelle Perron
Executive Editor
Nurse Practitioner Perspective
ADVANCE for Nurses
ADVANCE for NPs & PAs

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UNG UNIVERSITY of NORTH GEORGIA

College of Health Science & Professions
Department of Nursing
Master of Science Program

Project Proposal

Childhood Obesity and Risk of Adult Cardiovascular Disease

The purpose of this literature review is to answer the question, "are children ages 5-17 who are obese (BMI > 95%) compared with those of normal BMI (5-85%) at higher risk for developing cardiovascular disease as an adult?"

Submitted by:

Tina Campbell	Tina Campbell	03/29/16
Student Name (Printed)	Student Signature	Date
Kayla Gee	Kayla Gee	03/29/16
Student Name (Printed)	Student Signature	Date
Patricia Hernandez		3/29/16
Student Name (Printed)	Student Signature	Date

Approved by:

Myra Clark PhD, NP-C.	4/19/16
Faculty Advisor	Date
Myra Clark PhD, NP-C.	4/19/16
Graduate Coordinator	Date

Childhood Obesity and Risk of Adult Cardiovascular Disease

Tina Campbell, Kayla Gee, Patricia Hernandez

University of North Georgia

Introduction

Cardiovascular disease [CVD], a diagnosis that indicates dysfunction of the heart and/or blood vessels resulting from atherosclerosis, places patients at risk for heart valve dysfunction, arrhythmias, heart attack, and stroke.[1] Hypertension, hyperglycemia, high cholesterol, tobacco use, physical inactivity, unhealthy diet, and being overweight or obese are modifiable risk factors for CVD.[2] Being overweight or obese increases the work demand of the heart. It also increases blood pressure, cholesterol, and triglycerides, and reduces cardio-protective high-density lipoproteins [HDL].[1] Throughout this paper, we will focus on body mass index [BMI] to describe weight status. For children, age and gender are factored into BMI so that a BMI less than 5% indicates underweight, a BMI of 5-85% indicates a normal weight, a BMI from 85-95% indicates overweight, and a BMI greater than 95% is considered obese.

The Healthy People 2020 guidelines published in 2010 identify obesity as a common contributor to the decline of cardiovascular health.[3] A study in 2011 found that children with obesity were more likely to become obese adults than those who were not obese as children.[4] This research upholds the Healthy People 2020 statement that consequences of adult obesity include increased risk of developing chronic diseases, such as CVD, type 2 diabetes [T2D], and certain cancers.[3] A systematic review concerning childhood obesity and adult CVD risk questioned "whether childhood obesity exerts an independent effect on adult cardiovascular health [... since] some studies suggest quite the opposite, with those who were thinnest as children and overweight as adults showing the highest adult metabolic risk." [5] Other studies have found that accelerated BMI gains in childhood, particularly at 7-11 years of age, put children at highest risk of CVD and T2D in adulthood.[4 (p1209)] Therefore, tracking the growth of children becomes paramount for detection and prevention of prolonged accelerated gains in BMI during

vulnerable early development periods. Identifying opportunities to promote appropriate physical activity and maintenance of a healthy diet in children and adolescents potentially limits development of modifiable risk factors associated with CVD in adults, namely: hypertension, hyperglycemia, high cholesterol, physical inactivity, unhealthy diet, and being overweight or obese.[1] The purpose of this literature review is to answer the question, "are children ages 5-17 who are obese (BMI > 95%) compared with those of normal BMI (5-85%) at higher risk for developing cardiovascular disease as an adult?"

Whether issues arise specifically from obesity over time or from a sharp rise in BMI in early development, there is a consensus in the literature on two counts. The first is that obesity in adulthood yields an increased risk of chronic illness, including but not limited to the decline of cardiovascular health. The second is that obese children are more likely to become obese adults. Specifically, we wish to examine whether pediatric patients of normal weight, who participate in age-appropriate exercise regimens and engage in cardio-protective behaviors, prevent chronic illness.

Discussion

Articles retrieved demonstrated the link between obesity and CVD and an indication for early intervention. A British cohort study found that children and adolescents who were obese at any point in their early life along with obesity in adulthood had increased odds of T2D, hypertension or coronary heart disease.[6] However, it was also observed that those who were overweight in childhood or adolescence, but were not overweight in adulthood did not have an increased risk for T2D and hypertension.[6 (p3-4)] Since being overweight during childhood is believed to have a direct effect on cardiovascular issues during adulthood, the research features early life as an important target time to address prevention and treatment of obesity.[6 (p3)]

A quantitative cohort study conducted at a pediatric obesity care center found that 31.2% of the 774 patients in treatment between ages 1.7 and 17.9 years of age had already developed "cardiovascular disturbances" by the time they were admitted.[7] Requisite criteria for participation in the study included a BMI z-score above one standard deviation from the mean. Retrospective and prospective data were collected. Hypertension was present in 17% of participants, systolic hypertension increased almost 5 fold for extremely obese children, and lipid anomalies were present in almost a third of overweight to obese subjects.[7 (p6)] The correlational coefficient between BMI z-scores and prevalence of cardiovascular complications was statistically significant. Therefore, the study concluded that with a decrease in weight, producing a decrease in BMI, the individual's potential for developing cardiovascular disease also decreases.[7 (p7)]

Concurrent with the findings of previous studies, obese adults are at increased risk for chronic diseases, such as CVD, T2D, and certain cancers. Furthermore, results indicate that obese children are more likely to be obese in adulthood than children of normal weight. To further support this idea, a cohort including approximately 17,000 participants was followed over time to age 50 years.[4 (p1205)] This study found that the greatest predictor of adult obesity was an elevated BMI in participants at age 16 and the most common noted cardiovascular risk factors for the participants at age 45 were obesity, hypertension, high triglycerides, and elevated LDL cholesterol.[4 (p1209)]

Utilizing longitudinal research design, the Bogalusa Heart Study, a community based, epidemiologic study of cardiovascular disease, provides further evidence of childhood obesity leading to adult cardiovascular health decline.[8] Researchers found more than half of overweight or obese adolescents remained overweight or obese in adulthood and had elevated blood

pressure, cholesterol, insulin, and glucose levels.[8 (p 237)] Most notably, the presence of hypertension was increased 8.5-fold in the overweight or obese cohort of adults.[8 (p 237)]

Utilizing the data from the Bogalusa Heart Study cohort, additional researchers wished to study the longitudinal relationship between childhood BMI and adult levels of lipids, insulin, and blood pressures.[9] Children ages 5 to 17 years old were eligible for this study with reexamination occurring between the ages of 19 and 35 years. This study found childhood obesity was not associated with increased adverse cardiovascular risk factors in adulthood and risk factor levels among obese adults did not differ between those who had been normal weight or overweight as children.[9 (p 717)] One problem with these findings was the final age of reexamination of participants. It is reasonable that lifetime risk of developing CVD has not yet been established by age 35. Therefore, it is not possible to accurately deny that childhood obesity might have developed into cardiovascular disease in these individuals as adults.

Goran, Ball, and Cruz (2002) conducted a secondary data analysis of the effects of body fat, abdominal fat, ethnicity, onset of puberty, and BMI on development of CVD and T2D.[10] From their research, they determined that obesity-related conditions observed in early life is more likely an intrinsic process than a function of aging or deteriorating biological phenomenon.[10 (p1421)] It was discovered that a link between obesity and metabolic and cardiac diseases is present.

Many researchers have bypassed the umbrella statement that obesity leads to cardiovascular disease by describing instead the ways in which childhood obesity leads more specifically to additional risk factors for cardiovascular disease, such as dyslipidemia. For example, Freedman, et al[9 (p 715)] did not necessarily link childhood obesity to adult cardiovascular disease, but describe a link between obesity and adult cardiovascular disease markers such as

lipids, lipoproteins, blood pressure and insulin levels. Martinez Costa, et al[11] explained, the increase of body fat in childhood and adolescence has medium to long-term consequence. Consequences include: dyslipidemia, diabetes, metabolic syndrome, hypertension, fatty liver, biliary disease, orthopedic disorders, respiratory and psychological issues.[11 (p76)] Center for Disease Control (CDC) growth standards and the World Health Organization (WHO) criteria were used to calculate BMI for the children. Total cholesterol, high density lipoprotein, low density lipoprotein, total glucose, and uric acid were measured while the child or adolescent was fasting. The blood pressure and measurement of the right common carotid artery were also measured in each participant. According to Martinez Costa, et al[11 (p78)] 48%, by CDC standards, and 43%, by WHO standards, of the children were considered obese and overweight children showed higher blood pressures, insulin, and uric acid levels than children of normal weight. The greater the degree of obesity, the higher the likelihood that a child would be found to have additional comorbidities.[11 (p81)]

Synthesis

In summary, the evidence exists to support the hypothesis that children who are obese are indeed at increased risk for developing cardiovascular disease during adulthood. According to the American Academy of Pediatrics[12], "prevalence of pediatric obesity has increased significantly in the past few decades and is now recognized as a public health priority." There is ample evidence in the research to suggest a strong link exists between childhood obesity and the development of one or more additional risk factors for heart disease over time. Factors include increased lipid levels with resulting atherosclerotic plaques, hypertension, valve or vascular damage, ischemic changes of the heart muscle, and finally cardiac events. Post mortem and adverse events statistics demonstrated that ill effects of obesity on the cardiovascular system may

be noted as early as childhood, early adolescence, and young adulthood. Other research suggests that incidence of CVD or adverse cardiac events subsequent to or concurrent with obesity occur with greater frequency as an individual ages.[9 (p717)] In either case, however, there is a positive relationship between being obese and developing heart disease.

Application and Evaluation

According to the American Academy of Pediatrics[12], "it is never too early for the family to make changes that will help a child keep or obtain a healthy weight." Healthy eating habits and physical activity should be encouraged for all children to promote a healthy weight and aerobic exercise to strengthen the heart. These should be tailored to the child's developmental stage and family characteristics. In efforts to promote long-term cardiovascular health, advancing the mission of Healthy People 2020[3], which calls for education about and prevention of risk factors for cardiovascular disease, we propose that educational materials be created and distributed by health care providers who care for children and adolescents. During subsequent office visits, follow up conversations, which assess for understanding, compliance with, and results of diet and exercise interventions, should be evaluated and documented.

Current recommendations by the American Academy of Pediatrics[12] include but are not limited to reducing screen time (when children are largely physically inactive), and increasing participation in activities such as team sports, playing at the park, walking or riding bikes, using the stairs, or walking the dog. According to the CDC[13], sources such as families, communities, schools, medical care providers, and the media are largely influential in the success of such initiatives. In order for the patient to be successful, it is vital for the parent to model the behaviors expected of the child. Therefore, parents or guardians should be assessed for willingness as well as the child. When ready, the American Academy of Pediatrics[12] suggests the

following small changes be made, having discussed healthy BMI promotion with a provider: change the foods brought into the home, buy fewer sugar-sweetened beverages and high calorie snacks, make choosing a healthy snack easily visible (water, raw vegetables and fruits pre-washed and ready-to-eat), reducing screen time, adjusting bedtime to allow for 9 or more hours of sleep per night, and ensuring at least 60 minutes of activity per day.

For additional support and resources, parents of children with increased BMIs are encouraged to visit the American Academy of Pediatrics Institute for Healthy Childhood Weight[14] at https://ihcw.aap.org/Pages/default.aspx or Children's Healthcare of Atlanta's Strong 4 Life Campaign[15] at http://www.strong4life.com.

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