Non-Communicable Disease (NCD) Rates in Urbanized versus Rural Populations in Developing Countries

Now Bahar Alam, BS, MS4[1]; Paul Kang MS, MPH[1]; Cody Conklin, MD[2]

[1]University of Arizona College of Medicine – Phoenix, Phoenix, AZ [2]Community Health Centers of Yavapai, Cottonwood, AZ

Abstract

Background: Studies estimating the current prevalence rates and future demographics of being overweight or obese and non-communicable diseases initially demonstrated Western countries had the highest rates of obesity. Now, obesity is more prevalent in urban populations of Africa, Central and South America, Asia, and Caribbean and Pacific Islands.

Objective: Determine if any differences exist with the NCD rates in urbanized versus rural populations in developing countries.

Methods: Using PubMed, a thorough review of the literature was conducted using various search terms related to the research topic

Results: To assess for differences between the urban and rural populations, the effect size using Cohen's d was utilized to measure the size of associations or differences.

Conclusion: Cross-sectional and observational studies comparing BMI values, blood pressure levels, cholesterol levels, and blood glucose levels have addressed if living in urban versus rural areas increases the prevalence of NCDs related to these variables. Urban populations and living a sedentary lifestyle does increase the likelihood of being overweight or obese, hypertension, hypercholesterolemia, but not diabetes.

Introduction

Throughout the world, the prevalence of NCDs are increasing at an alarming rate. It is estimated that 1.1 billion adults globally are overweight, and 312 million of them are obese. Being overweight and obese has contributed to an increase in cases of diabetes and hypertension, which have predisposed individuals to other chronic diseases such as cardiovascular disease. Initially, Western countries were associated with the highest rates of obesity. Now, obesity is more prevalent in urban populations of Africa, Central and South America, Asia, and Caribbean and Pacific Islands. In the next two decades, developing countries will impact worldwide cardiovascular mortality at unprecedented proportions. NCDs account for 35% of all deaths in low- and middle-income countries. This review was started to determine if any differences exist with the NCD rates in urbanized versus rural populations in developing countries.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were utilized to complete the systematic review.

Using PubMed, a thorough review of the literature was conducted using various search terms related to the research topic. From these search terms, articles that pertained to differences in NCD rates and what factors may have influenced them were used in this systematic review.

By adhering to the inclusion criteria guidelines, 40 articles were analyzed in depth to determine if they could be used in the review. Of those 9 of the articles were excluded. The reasons these were not used in the review were only one gender was studied, they focused more on nutritional epidemiology, measured mortality or did not report results in the form of prevalence or the mean of a population.

Assessment of risk of bias in individual studies

The author assessed the risk of bias in the studies that met the inclusion criteria using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. This tool includes the specific criteria in Figure 1. If a "yes" was answered for all the criteria, it indicated a low risk of bias. If a "no" was answered for the criteria, it indicated a high risk of bias.

Results

The effect size using Cohen's d was utilized to measure the size of associations or differences between the urban and rural populations. Nine studies compared BMI values based on gender and reported the means with standard deviations. In the total male population (N=17402), there was a Cohen's d=0.64, p < 0.001, CI.95 (0.45, 0.83). In the total female population (N=18126), there was a Cohen's d=0.56, p < 0.001, CI.95 (0.31, 0.81). Overall, there was Cohen's d=0.60, p < 0.001, CI.95 (0.46, 0.74). Five studies compared mean systolic and diastolic blood pressures. In the total male population (N=16155), there was a Cohen's d=0.17, p = 0.001, CI.95 (0.02, 0.32) for systolic pressures and a Cohen's d=0.32, p < 0.001, CI.95 (-0.08, 0.71) for diastolic pressures. In the total female population (N=16852), there was a Cohen's d=0.22, p = 0.005, CI.95 (0.09, 0.35) for systolic pressures and a Cohen's d=0.38, p < 0.001, CI.95 (-0.10, 0.86) for diastolic pressures. Overall, there was Cohen's d=0.20, p < 0.001, CI.95 (0.13, 0.28) for systolic pressures and Cohen's d=0.36, p < 0.001, CI.95 (0.17, 0.55) for diastolic pressures. Eight studies compared total cholesterol levels. In the total male population (N=4961), there was a Cohen's d=0.64, p < 0.001, CI.95 (0.38, 0.90). In the total female population (N=5581), there was a Cohen's d=0.55, p < 0.001, CI.95 (0.29, 0.81). Overall, there was Cohen's d=0.59, p < 0.001, CI.95 (0.42, 0.77). Four studies compared blood glucose levels. In the total male population (N=1687), there was a Cohen's d=-0.03, p < 0.001, CI.95 (-0.55, 0.49). In the total female population (N=2100), there was a Cohen's d=-0.09, p < 0.001, CI.95 (-0.56, 0.38). Overall, there was Cohen's d=-0.07, p < 0.001, CI.95 (-0.36, 0.22).

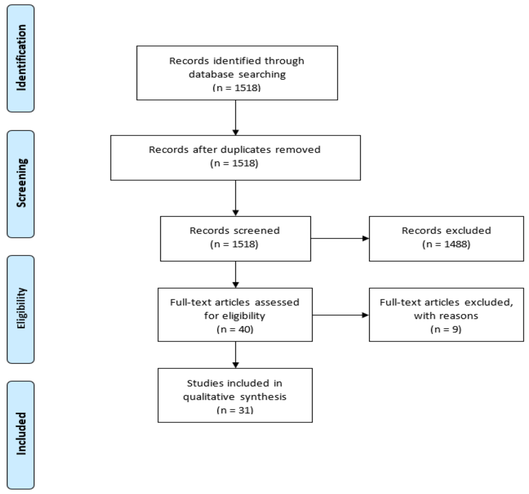

Figure 1: PRISMA Flow Diagram

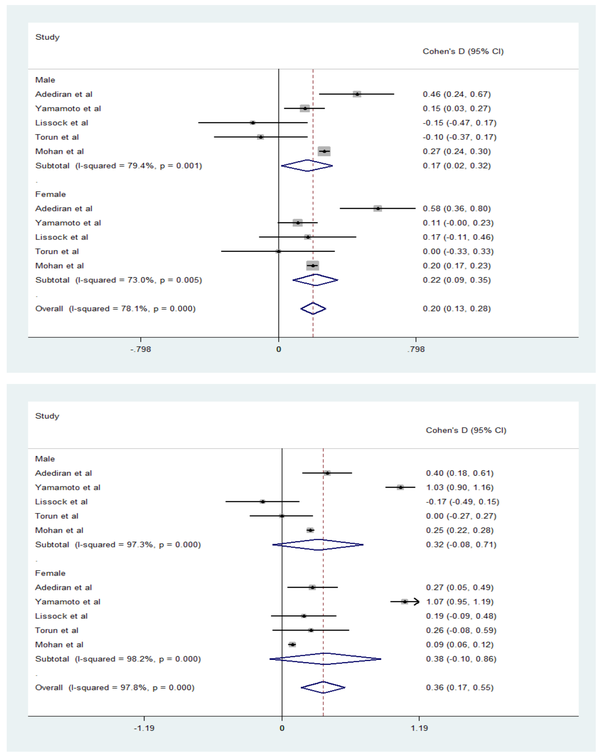

Figure 3: Effect sizes using Cohen's d of studies reporting mean systolic and diastolic blood pressures with standard deviations in males and females in urban vs rural populations

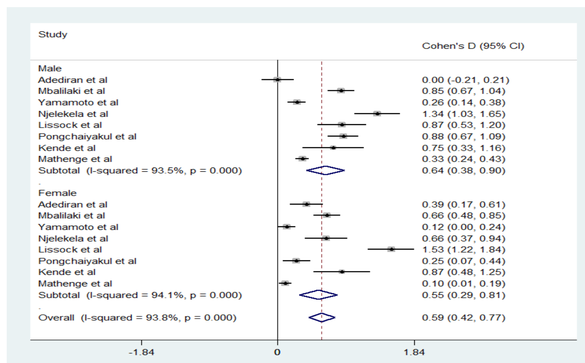

Figure 4: Effect sizes using Cohen's d of studies reporting mean total cholesterol levels with standard deviations in males and females in urban vs rural populations

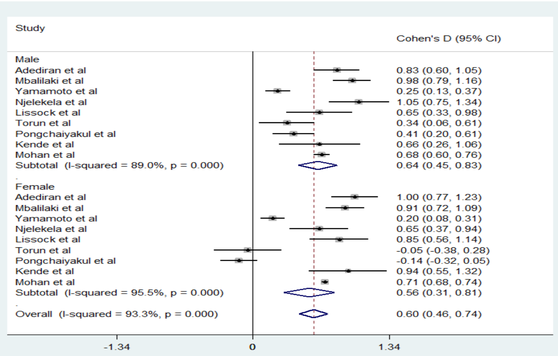

Figure 2: Effect sizes using Cohen's d of studies reporting mean BMI values with standard deviations in males and females in urban vs rural populations

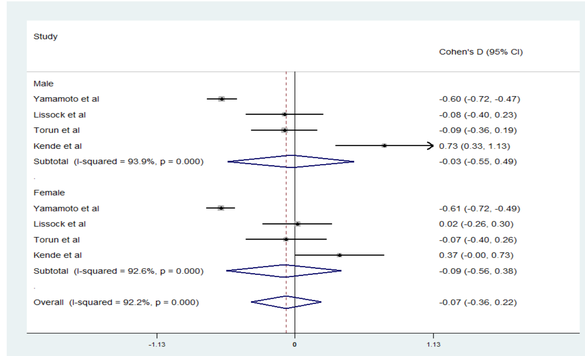

Figure 5: Effect sizes using Cohen's d of studies reporting mean blood glucose levels with standard deviations in males and females in urban vs rural populations

Discussion

The objective of this review was to determine if any differences exist with the NCD rates in urbanized versus rural populations in developing countries. A total of 9 studies reported the mean BMIs with standard deviations. From these studies, the effect sizes of the urban versus rural male and female population and the two genders combined were measured. In the total male population (N=17402), there was a Cohen's d=0.64, p < 0.001, CI.95 (0.45, 0.83). In the total female population (N=18126), there was a Cohen's d=0.56, p < 0.001, CI.95 (0.31, 0.81). Overall, there was Cohen's d=0.60, p < 0.001, CI.95 (0.46, 0.74) with a medium effect size that indicates a significant difference between the urban and rural populations.

Five studies reported mean systolic and diastolic blood pressures. In the total male population (N=16155), there was a Cohen's d=0.17, p = 0.001, CI.95 (0.02, 0.32) for systolic pressures and a Cohen's d=0.32, p < 0.001, CI.95 (-0.08, 0.71) for diastolic pressures. In the total female population (N=16852), there was a Cohen's d=0.22, p = 0.005, CI.95 (0.09, 0.35) for systolic pressures and a Cohen's d=0.38, p < 0.001, CI.95 (-0.10, 0.86) for diastolic pressures. Overall, there was Cohen's d=0.20, p < 0.001, CI.95 (0.13, 0.28) for systolic pressures and Cohen's d=0.36, p < 0.001, CI.95 (0.17, 0.55) for diastolic pressures with a small effect size that indicates a significant difference between the urban and rural populations.

Eight studies reported mean cholesterol levels. In the total male population (N=4961), there was a Cohen's d=0.64, p < 0.001, CI.95 (0.38, 0.90). In the total female population (N=5581), there was a Cohen's d=0.55, p < 0.001, CI.95 (0.29, 0.81). Overall, there was Cohen's d=0.59, p < 0.001, CI.95 (0.42, 0.77) with a medium effect size that indicates a significant difference between the urban and rural populations.

Four studies reported mean blood glucose levels. In the total male population (N=1687), there was a Cohen's d=-0.03, p < 0.001, CI.95 (-0.55, 0.49). In the total female population (N=2100), there was a Cohen's d=-0.09, p < 0.001, CI.95 (-0.56, 0.38). Overall, there was Cohen's d=-0.07, p < 0.001, CI.95 (-0.36, 0.22) with an effect size that indicates no significant differences between the urban and rural populations.

Conclusions

Cross-sectional and observational studies comparing BMI values, blood pressure levels, cholesterol levels, and blood glucose levels have addressed if living in urban versus rural areas increases the prevalence of NCDs related to these variables. Urban populations and living a sedentary lifestyle does increase the likelihood of being overweight or obese and having hypertension or hypercholesterolemia. However, there does not appear to be an association with diabetes.

A systematic review studying more types of NCDs will provide more definitive answers about whether living in an urbanized community influences the prevalence of these illnesses. If differences exist with most of the NCDs in urban versus rural areas, methods to address the issue could be evaluated and implemented. Programs that promote healthy lifestyle behaviors could be created to lower the prevalence of NCDs.

Acknowledgements

Thank you to Dr. Cody Conklin for her mentorship and support through out my medical education and for her help in having this project become a reality.

Thank you to Paul Kang for his help and contribution to the project.

Thank you to Dr. McEchron for his support in the Scholarly Project course at University of Arizona College of Medicine-Phoenix.