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Data Analysis of a National Health and Nutrition Examination Survey (NHANES) to identify the relationship between obesity and cancer

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1. Introduction

Obesity and cancer independently are two important causes of death in the USA. Obesity is a public health concern that affects 36.5% of the adults and 17% of youths in the US (1) It is estimated that 42% of people over 18 years will be obese by 2030 (2) Additionally, every year, more than half a million of people die in the US due to cancer (1) A growing number of studies shows that these two chronic illnesses- The health and nutrition status of the children and adults in the United States is monitored annually by using the National Health and Nutrition Examination Survey (NHANES). This survey combines interviews and physical examinations to obtain data from participants.

2. Objective

To examine the relationship of cancer (in general) with Obesity in the National Health and Nutrition Examination Survey (NHANES) data in 2013-2014.

3. Methodology

Study population:
NHANES data (2013-2014) were used to obtain information on BMI, Waist Circumference (WC), and Cancer (presence and absence), and Education amongst the participants.

Design:
A quantitative cross-sectional design was used to study the relationship of obesity, education, and cancer in all males and females who participated in the survey.

Statistical Analyses:
The characteristics of the participants were compared by their BMI and waist circumference and their education level using cross tabulation, Pearson Chi square, one-way ANOVA, and logistic regression. The analysis adjusted for race and gender. Logistic regression was used to calculate odd ratios and 95% confidence interval of each education levels, their BMI, and waist circumference by using less than 9th grade as a reference group. The SPSS procedure was used to perform the statistical analysis. All statistical tests were 2 sided and, $P<0.05$ was regarded as the significance level.

7. References

1. Finkelstein, E. A., *et al.* (2012). Obesity and Severe Obesity Forecasts Through 2030. American Journal of Preventive Medicine, 42(6), 563-570.

2. Ogden , C.L. *et al.* (2015). Prevalence of Obesity Among Adults and Youth: United States, 2011–2014. Center for Disease Control and Prevention NCHS Data Brief, 219.

3. Stone, T. W., *et al.* (2018). Obesity and Cancer: Existing and New Hypotheses for a Causal Connection. EBioMedicine, 30, 14-28.

4. Calle, E. E., *et al.* (2003). Overweight, Obesity, and Mortality from Cancer in a Prospectively Studied Cohort of U.S. Adults. New England Journal of Medicine, 348(17), 1625-1638.

4. Results

Cross tabulation of the education level and gender revealed that more than half of the participants (55%) had taken some college courses or graduated from college. Waist circumference, as an indicator of obesity in current report, has weak (5.6%) but significant (P<0.01) correlation with cancer.

The participants who had been diagnosed with cancer were 9.5% of total of the total participants 11483). The prevalence of cancer was higher (7.8% more) in females than males. Mexican American and other Hispanic races were the top two populations with higher rate of cancer. The average BMI for all participants were slightly higher than 25, which puts all of them in the over weight or higher spectrum of normal weight. The waist circumference revolves between 87 and 90, except for other races. Hispanic and Mexican college degree holders are much less than their white counterparts.

Frequency of Cancer, BMI^1, WC^1, and Education Level among participants

Numbers are %	Total	Male	Female	White	Black	Hispanic	p-value
Cancer	9.5	46.1	53.9	6.1	1.3	15	0.001
Body Mass Index (BMI)	25.8	25.3	26.4	26.1	26.3	26.3	0.001
Waist Circumference (WC)	-	88.0	87.2	90.9	86.5	87.9	0.001
Education Level:							0.001
Less than High School Dip.	45.3	22.5	22.7	12.1	9.9	18.7	
Post-High school	54.5	26.8	28.0	21.9	12.1	10.6	

[1] Body Mass Index [2] Waist Circumference

Regression model:

- Equation $\lambda^2(6) = 222.977$ obtained by conducting logistic regression among BMI, waist circumference, and education level, was highly significant p<0.001. The model explained 4.7% (Nagelkerke R^2) of the variation of having cancer, and correctly classified 90.5 of the cases.

- The effect of two confounding variables (race and gender) was tested by adding them to the model one at a time (tables 4 and 5). Both effects were significant. The R2 increase to 5.7%

- By adjusting the model with race and gender, R^2 increased to 10.3 and all variables were significant in the model ($\lambda^2(11) = 490.931$, p<0.001). The model explains 10.3% (Nagelkerke R^2) of the variation of having cancer, and correctly classified 90.5% of the cases.

5. Discussion

Obesity is negatively correlated with education level (3, 4). In the current report, a correlation between obesity and cancer was found in the selected population. However, this association was very weak, although it was significant. The fact that 55% of the participants attended college or held a higher education degree, might have affected the weak correlation of obesity and cancer in this group of participants.

6. Conclusion

- The main goal of this report was to address the relationship among high body mass index, waist circumference, low level of education, and having cancer in general.

- Data from NHANES 2013-14 were used and the model was adjusted for age and gender. The available data was very limited in case of having cancer (9.5% of the total population). That is why obesity has different perspective.

- Based on the results of this study, attention to the diet could help people avoiding obesity. Education also is one of the factor could help to choose a better diet and prevent cancer.