



Obesity Prevalence and Potential Comorbidities among Rural Primary Care Patients in East Texas

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Abstract

Objective: This study reports the prevalence of obesity among patients in a primary care clinic at a university teaching hospital in rural East Texas and explores potential disparities and comorbidities.

Method: The study was a retrospective review of a deidentified, non-relinkable copy of the electronic health records for 6,955 patients who visited the Family Medicine Clinic of the University of Texas Health Science Center at Tyler North Campus between August 31, 2017, and August 1, 2018.

Results: The prevalence of obesity was 43.2% with an increased likelihood of being obese among females compared to males (OR=1.49, 95%CI=1.35, 1.64), among blacks compared to whites (OR=1.24, 95%CI=1.11, 1.38), among patients 40-65 years old compared to those younger than 18 years (OR=8.83, 95%CI=7.31, 10.68) and a reduced likelihood among patients with public insurance/grants (OR=0.88, 95%CI=0.79, 0.98) and self-pay (OR=0.81, 95%CI=0.71, 0.93) compared to those with private insurance. Those who were obese were also more likely to report having hypertension (OR=2.59, 95%CI=2.35, 2.87), and diabetes (OR=3.26, 95%CI=2.85, 3.73).

Conclusion: There is a high prevalence of obesity among rural primary care patients in East Texas especially among the female, minority black and 40-65 years age groups as well as among patients with diabetes and hypertension. With this facility being a teaching hospital, these findings suggest the need for increased emphasis in the training of medical Residents on the screening and management of obesity, metabolic syndrome, and associated comorbidities in these groups, with special focus on the root cause.

Keywords

Obesity; Body Mass Index; Diagnosis; Electronic Health Records

Introduction

The obesity epidemic in the US has reached alarming proportions and demands serious attention. According to recent data from the Robert Wood Johnson's 2014 report on the State of Obesity in our nation, obesity has been on the rise since 1985 with

obesity rates doubling in some states [1]. The most concerning fact is that almost all the States in the nation have had a gradual but continuous rise in obesity over the past three decades. According to the 2018 BRFSS data per CDC, for adults eighteen years and older, the obesity trend is worsening with fourteen

States (Texas included) now falling between 34.2-39.5% obesity prevalence rate, ten States between 30.8 - 34.1 and twelve States between 27.9 -30.7. Only eight States had rates between 23 -27.8 prevalence rates [2].

Most chronic diseases seen in primary care (diabetes, hypertension, and dyslipidemia) are linked to obesity [3]. The primary care physician is in a strategic position to address the problem of obesity. Unfortunately, physicians are usually burdened with managing the health problems that result from obesity and poorly equipped to address obesity as a disease entity [2]. As a result, the disease of obesity has quietly become a major burden on healthcare and the national economy due to the associated conditions. In 2013, the American Medical Association (AMA) officially designated obesity as a disease entity [4]. This decision although needed and well-intentioned, shifted the burden of the responsibility onto primary care physicians to address, in already busy practices.

Physicians and other providers need not only treat the associated diseases but are required to shift their focus to obesity assessment, prevention, and treatment [5,6]. Several authors have noted the concern about major gaps that exist between research and practice, as well as some gaps in perception and emphasize the need to bridge those gaps [7-9]. Such constraining factors as lack of time, poor support, lack of knowledge, and ambivalence in discussing the topic have been blamed. However, there is still a need to closely examine and understand the barriers that hinder adherence to stipulated guidelines [10]. Engaging primary care providers to champion appropriate screening, counseling, and treatment of overweight/obese patients is very vital in the effort to combat the epidemic of obesity. Effectively utilizing stipulated guidelines with a comprehensive team approach has been recommended as necessary steps to achieve positive outcomes for patients [11,12]. Also, of importance is the need to expose/train primary care Resident physicians to adopt this team approach so they can implement it in their practice when they graduate.

This study reports the prevalence of obesity among

patients in a primary care clinic at a university teaching hospital in rural East Texas and explores potential disparities (in terms of socio-demographics) and comorbidities.

Methods

After obtaining IRB approval from the institution's IRB committee, we retrospectively reviewed records of 6,955 patients who had information related to obesity between August 31, 2017, and August 1, 2018. Data were derived from a de-identified, non-re-linkable copy of the electronic medical records database at the University of Texas Health Science Center at Tyler North Campus Family Medicine Clinic (UTHSCT FMC) created to document health disparities as part of the graduate medical education program. For this specific analysis involving disparities in obesity and potential comorbidities, the extracted data included body mass index (BMI), gender, race, employment status, age, payor/insurance status, cigarette smoking status, and the zip code where they live, as well as information on the history of four chronic conditions (chronic obstructive pulmonary disease (COPD), hypertension, Patient Health Questionnaire (PHQ) - 9 score related to depression, and diabetes).

BMI was originally captured in the interval scale and was dichotomized and recoded as *obese* if BMI was at least 30 and not obese otherwise. Race/ethnicity was captured for Hispanic but not as well as a variable that identified the racial categories of whites, blacks and others (American Indian/Alaskan Native, Asian, Native Hawaiian/Pacific Islander). Age (in years) at the last patient visit was classified into '<20', '20-40' and '>40' age groups. Payor sources/insurance status were grouped into public/grant (to include MEDICAID, MEDICARE, and any form of publicly-funding grants), private (for all commercial insurance payors) and self-pay. Social deprivation index (SDI) was generated from the patient's zip code using a model derived by Butler and colleagues [13]. According to that model, SDI is a composite score based on seven socio-demographic characteristics which include income (percent living in poverty), education (percent with less than 12 years of education), household characteristics (percent single-parent household/ percent living in the rented

housing unit), housing (percent living in the overcrowded housing unit), transportation (percent of households without a car), and employment (percent non-employed adults under 65 years of age). SDI - scores originally captured in scales were further categorized into low ($SDI \leq 33$), medium ($33 < SDI \leq 77$) and high ($SDI > 77$) SDI.

PHQ-9 score that was originally captured in the interval scale was dichotomized and classified as depressed if PHQ-9 [14] was at least 10 and not depressed otherwise.

Statistical Analysis:

Data management and analysis were performed using the IBM SPSS Statistics for Windows, Version 25.0. (IBM Corp, Armonk, NY, USA). A binary logistics regression model was used to generate odds ratio (OR) and 95% confidence interval (95%CI) exploring the likelihood of obesity in a patient with specific sociodemographic factors as well as the history of specific chronic conditions.

Results

For this analysis, a total of 6,955 patient records were reviewed, noting a 43.2% ($n=3008$) prevalence rate for obesity. Among the obese patients, $n=1888$ (62.8%) were female and $n=2190$ (72.8%) non-Hispanic white and $n=809$ (26.9%) black. For those who segregated as Hispanic or not, only $n=180$ (10.7%) were obese. Most of them ($n=1492$, 49.6%) were between the age group of 40 and 65 years of age, having private health insurance ($n=1442$, 47.9%), non-smokers ($n=2123$, 70.6%) and belonging to the upper third of the social deprivation index ($n=1356$, 45.0%).

There was a statistically significant increased likelihood of being obese among females compared to males (OR=1.49, 95%CI=1.35, 1.64), among blacks compared to their white counterparts (OR=1.24, 95%CI=1.11, 1.38), as well as among older patients compared to those younger than 18 years, more so among those in the 40-65 age range (OR=8.83, 95%CI=7.31, 10.68). A reduced likelihood of being obese was observed among those who owned public insurance or use grants for healthcare coverage

(OR=0.88, 95%CI=0.79, 0.98) and self-pay patients (OR=0.81, 95%CI=0.71, 0.93) compared to those with private insurance.

Smokers (OR=1.10, 95%CI=0.99, 1.23) compared to non-smokers as well as the employed (OR=1.35, 95%CI=0.98, 1.87) compared to the unemployed and those in the middle (OR= 1.05, 95%CI=0.90, 1.21) and upper (OR=1.04, 95%CI=0.90, 1.20) thirds of social deprivation compared to the lower third were also more likely to be obese. However, these were not statistically significant.

Those who were obese were also more likely to report having hypertension (OR=2.59, 95%CI=2.35, 2.87), and diabetes (OR=3.26, 95%CI=2.85, 3.73). Details of these findings are depicted in the tables below (Table-1 and Table-2).

Discussion

The overall data seen in our outpatient clinic analysis did indicate a high association of obesity with the comorbid conditions of diabetes mellitus and hypertension. Indeed, this is a well-known fact, being that the high preponderance of insulin resistance and elevated insulin levels in individuals with excessive adiposity leads to the individual's inability to handle excessive glycemic loads. It is also known that increased levels of insulin result in fluid and sodium retention thus increasing the risk for hypertension in patients with excessive adiposity and insulin resistance [14]. These findings were not surprising and were found statistically significant. These findings also present an opportunity for action by clinicians. They must see and treat obesity as a disease entity that directly leads to other health risks with serious negative long-term impacts. Although the time for patient counseling in the clinics is limited in today's typical practice setting, consideration for a multidisciplinary, team-based approach may yield better results. A broad spectrum of counseling for lifestyle modifications concerning nutrition, exercise, and mental wellness should be made a routine part of care for obese patients. The team may include physicians/providers, health coaches, nutritionists, psychologists, case management health workers, and/or physical therapists to ensure better patient

outcomes [15].

The two other measures that we explored in association with obesity were COPD and depression, but they were not found to be statistically significant for our population. However, previous studies noted that depression is higher in individuals with obesity [16] although the exact mechanism is unknown and many factors including hormonal, inflammatory, and sleep disruptive causes, among others have been

implicated. Cultural pressures locally may influence accurate patient reporting of depression symptoms since many of these may be considered *personal weakness* amongst certain ethnic groups and gender [17,18]. However, obese patients tend to be more depressed as they are physically limited in functional capability in many cases, as well as personal image issues from peer influences. Sometimes it is challenging to determine which came first, obesity which may make the individual emotionally

Table-1: Disparities in obesity among primary care out-patients of a university teaching hospital in rural East Texas (n=6955)

Variable		n (%)	Obese	Not Obese	OR (95%)	P value
			n (%)	n (%)		
			3008 (43.2)	3947 (56.8)		
Sex	Male	2970 (42.7)	1120(37.2)	1850 (46.9)	Ref	<0.001
	Female	3985 (57.3)	1888 (62.8)	2097 (53.1)	1.49 (1.35,1.64)	
Hispanic	Yes	428 (11.4)	180 (10.7)	248 (11.9)	0.89 (0.72, 1.07)	0.24
	No	3326 (88.6)	1498 (89.3)	1828 (88.1)	Ref	
Race	White	5192 (74.7)	2190 (72.8)	3002 (76.1)	Ref	<0.001
	Black	1707 (24.5)	809 (26.9)	898 (22.8)	1.24 (1.11, 1.38)	
	Other	56 (0.8)	9 (0.3)	47 (1.2)	0.26 (0.13, 0.54)	
Employment	Yes	1118 (86.9)	593 (88.5)	525 (85.1)	1.35 (0.98, 1.87)	0.07
	No	169 (13.1)	77 (11.5)	92 (14.9)	Ref	
Age	<18	1158 (16.6)	145 (4.8)	1013 (25.7)	Ref	<0.0001
	18-40	1954 (28.1)	903 (30.0)	1051 (26.6)	6.02 (4.94, 7.30)	
	>40 - 65	2672 (38.4)	1492 (49.6)	1180 (29.9)	8.83(7.31,10.68)	
	>65	1254 (16.8)	468 (15.6)	703 (17.8)	4.65 (3.77, 5.74)	
Insurance/ Payment option	Public	2649 (38.1)	1116 (37.1)	1533 (38.8)	0.88 (0.79, 0.98)	0.02
	Private	3185 (45.8)	1442 (47.9)	1743 (44.2)	Ref	
	Self-pay	1121 (16.1)	450 (15.0)	671 (17.0)	0.81 (0.71, 0.93)	
Cigarette smoking	Yes	1967 (28.3)	885 (29.4)	1082 (27.4)	1.10(0.99, 1.23)	0.07
	No	4988 (71.7)	2123 (70.6)	2865 (72.6)	Ref	
Social Deprivation Index	Lower	953 (13.7)	404 (13.4)	549 (13.9)	Ref	0.56
	Middle	2871 (41.3)	1248 (41.5)	1623 (41.1)	1.05 (0.90, 1.21)	
	Upper	3131 (45.0)	1356 (45.1)	1775 (45.0)	1.04 (0.90, 1.20)	

Table-2: Potential comorbidities of obesity among primary care out-patients of a university teaching hospital in rural East Texas (n=6955)

Variable		n (%)	Obese	Not Obese	OR (95%)	P value
			n (%)	n (%)		
			3008 (43.2)	3947 (56.8)		
COPD*	Yes	479 (6.9)	204 (6.8)	275 (7.0)	0.97 (0.81, 1.17)	0.76
	No	6476 (93.1)	2804 (93.2)	3672 (93.0)	Ref	
Hypertension	Yes	2588 (37.2)	1479 (49.8)	1091 (27.6)	2.59 (2.35, 2.87)	<0.001
	No	4367 (62.8)	1511 (50.2)	2856 (72.4)	Ref	
Depression	Yes	455 (18.5)	217 (20.1)	238 (17.3)	1.21 (0.98, 1.48)	0.07
	No	2001 (81.5)	862 (79.9)	1139 (18.7)	Ref	
Diabetes	Yes	1137 (16.3)	764 (25.4)	373 (9.5)	3.26 (2.85, 3.73)	<0.001
	No	5818 (83.7)	2244 (74.6)	3574 (90.5)	Ref	

*COPD=chronic obstructive pulmonary disease

sad/depressed or depression which may lead to emotional eating and eventually to obesity.

Demographic analysis, when accounting for payor/insurance status, revealed the higher likelihood of obesity among those individuals with private insurance although less than the combined groups of those patients who had public assistance insurance and those with no health insurance. This did support our suspicion locally of the idea that obesity is currently viewed as a disease of poverty [19]. Also, the rural Northeast Texas region is one of the more impoverished locations in the state of Texas [20]. Many food deserts exist here, leading to higher consumption of fast foods/processed foods and less healthy eating due to limited access to healthier fresh food options. This situation contributes to increasing obesity rates with comorbid conditions as noted earlier. In this analysis, females were also found to be more likely to be obese. Individuals identified as black race/ethnicity were also more likely to have excessive weight, and those individuals in the 40-65 age demographic were more likely than not to be obese. These facts confirm the problem of disparities which are rooted in the major factors of social determinants of health. Factors such as lack of insurance and limited access to care may stem from unemployment which

may be related to limited or no education. Undeniably, many of these challenges are outside the scope of the healthcare provider whose role is to see patients when they are scheduled. However, healthcare providers may join in the advocacy for healthcare access for the disparate populations. Also focused nutrition and multidisciplinary education should target this group in public health promotion efforts.

As previously mentioned, primary care providers are in a vantage position to address the epidemic of obesity with associated comorbid conditions. Indeed, primary care providers are the largest stakeholders in providing care for individuals with obesity and related comorbid conditions, such as diabetes mellitus, hypertension, sleep apnea, and many others. Unfortunately, primary care providers are often tasked with increasing numbers of patients to see each day which limits how much time they spend with each patient, as well as the quality of time with each patient. Decreasing revenues and the looming advent of pay for performance without proper infrastructure and built-in support systems may strain the clinician's ability to care for these patients. When this is combined with increasing costs of diagnostics and medications, it is very difficult to assure optimal care and positive health outcomes for those patients

requiring the most effort. This not only frustrates patients but also providers who are unable to provide the necessary time and care to improve the patient's health in a meaningful way.

Findings from this study confirm the need to consider changes in the paradigm with respect to caring for patients with obesity, metabolic syndrome, and all associated conditions and comorbidities. Rather than attacking *symptoms* (e.g. insulin resistance, diabetes mellitus, hypertension, sleep apnea), providers are more likely to make a larger impact if given the tools, time, and resources to attack the *root cause* of all these conditions. Since obesity and excessive abdominal and visceral adiposity have consistently shown to increase the risk of comorbid conditions, tackling the issues that lead the patient to the path of obesity may offer a much more positive impact on patient health and curb the current obesity crisis. As research and our knowledge about obesity continue to improve, it is has become evident that this is a much more complex disease process than the paradigm of '*calories in, calories out*'. There is need to a focus on the role of multiple factors that must be considered, like brain pathways and chemistry, endocrinopathies, genetics, diet, exercise/activity, mental health, and even gut flora. All these may have a role in a patient's case and maybe the cause for excess weight and thus, in turn, multiple comorbidities. Allowing a provider more time to address the multiple causes factoring into a patient's excessive weight and by enlisting a multidisciplinary approach (behavioral health counseling, physical therapy and/or personal trainers, sleep medicine, registered dietitians, bariatric surgery, geneticists) to treat the patient should be strongly considered for the future if the battle has to be won against the complex disease of obesity which is constantly on the rise instead of in decline [21]. Beyond further research, the solution may come from serious collaborations between healthcare systems/providers, government, the food industry, and insurance carriers, for better results.

Limitations

The study was a retrospective review of a deidentified, non-re-linkable copy of the electronic health records (EHR) of patients who visited the

Family Medicine Clinic at a university teaching hospital within a specified period (August 31, 2017, and August 1, 2018). While EHRs have huge potential to serve as a resource for epidemiological studies such as in this and other large-scale studies, it has a few challenges as well. In this study, it was hard to determine who receives care at this institution, whether they were all from the rural communities of East Texas and whether this EHR could be considered a random sample of rural East Texas. There is also the issue with the quality and data cleaning of EHR data. We determined obesity based on BMI but used diagnosis and billing codes for the potential comorbid conditions. Billing codes do not always capture the complete picture of patient experience and codes can change without the investigators being fully aware. The first appearance of code may not correspond to the onset of a condition. Also, the data structure was non-trivial and we did not make any adjustments of missing data nor perform any sensitivity analysis. All these need to be considered as we interpret the results.

Conclusion

In this study we explored the prevalence rate of obesity among primary care patients in a rural teaching hospital as well as the potential disparities and comorbidities, using electronic health records. According to this analysis, there is a high prevalence of obesity among rural primary care patients in East Texas and this is particularly more profound among the females, minority blacks and those in the 40-65 years age group. Comorbidities included diabetes and hypertension. These findings highlight the need for increased emphasis on the importance of proper training for primary care Resident physicians about the screening and management of obesity and associated comorbidities in these groups, in teaching hospitals. Future studies may explore how much nutrition education/training is included in today's medical school curriculum.

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