



Obesity Prevalence, Awareness, Potential Risk Factors and Comorbidities among Healthcare Workers in Rural Northeast Texas

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Abstract

Objective: The purpose of this study was to perform a preliminary assessment of the prevalence, awareness, potential risk factors and comorbid health conditions among workers at a healthcare institution in rural Northeast Texas.

Methods: A self-administered 20-item health status survey was conducted among workers of a healthcare institution in rural Northeast Texas. The survey included questions on work-related factors, modifiable health behaviors, history of specific health issues, perceived body size as well as height and weight from which actual obesity was assessed. Odds ratios (OR) and associated 95% Confidence Intervals (CI) were generated to explore the potential association of each variable with obesity.

Results: The response rate was 23.7% (340/1432). Over 77% of the respondents were obese/overweight. The prevalence was significantly higher among Blacks (compared to Non-Hispanic Whites), those earning \leq 50K, among administrative assistants, those consuming high fat/carbohydrate diet, high sugar beverages, as well as those not eating balanced meals, and significantly lower among respondents who jog. Correct perception of obesity was noted by only 19.4%. Potential comorbidities included high blood pressure, diabetes, sleep apnea and hypothyroidism.

Conclusions: The prevalence of obesity is high and a very small proportion of the healthcare workers in this study view themselves as such. Poor dietary habits are the main potential risk factors for obesity, with hypertension, diabetes, sleep apnea and hypothyroidism as comorbidities. While more studies focusing on identifying risk factors of obesity among healthcare workers is warranted, preventive intervention, especially on nutrition and lifestyle are critical, to ensure a healthier healthcare workforce.

Keywords: Obesity; Healthcare workers; Risk factors; Co-morbid conditions

Abbreviations: UTHSCT: University of Texas Health Science Center at Tyler; OW: Overweight; OB: Obesity; BMI: Body Mass Index; HTN: Hypertension; SAS:

Statistical Analysis System; OR: Odds Ratios; CI: Confidence Intervals

Introduction

As a general trend, overweight and obesity (OW/OB) in the United States (US) is increasing [1]. According to America's Health Rankings, 2017, body mass index (BMI) scores of >30, have increased by 8% from 27.8% of the US population to 29.9% within the past 5 years [2]. As comorbidity, obesity in particular is associated with increased risk for type 2 diabetes, hypertension (HTN), and various cancers [3]. While most studies on chronic disease trends are focused on the larger US population in aggregate, some have investigated healthcare workers. Sharma and colleagues [4] made a cross-sectional assessment of six Texas hospitals in 2012-2013. They found 78% of employees were OW/OB and had sedentary lifestyles outside of work. Being OW/OB was also associated with HTN in those employees. Another long-term observational assessment of nurses found that cardiovascular risks increased with obesity, but more so in those who were metabolically unhealthy [5].

Further, a large, observational study of health workers in the US also found a strong association between type 2 diabetes and colorectal cancers in both men and women [6]. According to America's Health Rankings, when assessing the overall health status in the US, Texas ranks 34th, with a rank of 43/50 in obesity, 34th in physical inactivity and preventable hospitalizations [2]. Over 68% of Texans are OW/OB, 11.4% of adults have type 2 diabetes, and 29.5% have HTN; equal to the same number who are physically inactive [7]. It is of interest to explore whether the Texas healthcare workforce would mirror the health-related characteristics of the general population of the state.

In 2016, The University of Texas Health Science Center at Tyler (UTHSCT) published an assessment of the health status of Texans in the Northeast part of the state [8]. This report examined a 35-county area in northeast Texas that coincides with the Department of State Health Services, Health Service region 4/5N. The report indicated that overall age-adjusted mortality rates for several causes of death from chronic diseases were higher for the region than for the state of Texas. Crude mortality rates were also above the Texas average as well as the US national average. The initial hypothesis was that health care workers' knowledge, attitudes, and beliefs about health would make them less at risk for various diseases.

Therefore, UTHSCT embarked on an employee survey to determine the risks associated with OW/OB and other chronic disease risk factors among employees. An assessment was designed to see what factors might predispose a healthcare worker to risks of OW/OB and

other chronic diseases, to determine the variation in risks among these workers and the general public based on existing and collected data, and to what extent workers might be willing to make lifestyle modifications in order to mitigate those, and other risks. Thus, the specific purpose of this study was to perform a preliminary assessment of the prevalence, awareness, potential risk factors and comorbid health conditions among workers at a healthcare institution in rural Northeast Texas.

Materials and Methods

UTHSCT leadership approved the employee health status study in November of 2016 and Institutional Review Board approval was secured. Data were collected utilizing a health status survey. A locally designed survey tool comprised of 20 questions (not including the typical demographics) and employing a Likert scale, was used. Questions focused on specific areas of interest that have the likelihood to affect health outcomes with respect to obesity and related health issues. The survey was anonymous and utilized an on-line approach to reach participants. At the time the survey was administered, the institution employed over 1432 full-time individuals and this captive audience provided a convenience sample for the project. All full-time employees of the institution were invited to participate.

The survey was posted for a period of two weeks between the last week of November and the first week of December 2016. Respondents were asked to report their height (in inches/feet), weight (in pounds) as well as their perceived body weight category as either underweight, normal weight, overweight, or obese. Potential risk factors that were queried included work-related factors (such as job types, shift, and stress levels), modifiable health behavioral risk factors such as hours of sleep per day, eating pattern/habit, amount/type of fluid intake per day, and exercise habit (type and frequency). Comorbidities of interest included self-reported prior history of high stress, HTN, high cholesterol, diabetes, sleep apnea, hypothyroidism and cancer.

Body mass index, (in Kg/m²) was computed from self-reported height and weight and was further categorized into the standard body weight categories: underweight (BMI<19.5), normal weight (19.5- <25), overweight (25- <30), obese (30 - <35) and morbidly obese (>=35). In assessing obesity (prevalence, predictors and comorbidities), a binary categorical obesity variable was defined as either obese if BMI>=30 or "not obese" otherwise. Hypertension was defined as "yes" if a respondent answered affirmatively to having high blood pressure and "no" otherwise. Apart from behavioral and

work-related factors, information was also obtained on the typical demographics (gender, race/ethnicity, age, education and income).

Data analysis

Data collected via the online questionnaire were imported into the Statistical Analysis System, version 9.4 (SAS Institute, Cary, NC, USA) software for data management and analyses. Descriptive data analyses generated basic frequencies, and prevalence of obesity in the study population. Other risks were also examined. The level of awareness of obesity among the study participants was assessed by comparing the responses of the subjects on their perceived body mass to computed BMI (from weight and height) using simple cross tabulations with Pearson's chi square and relative risk options. The distribution of self-reported body weight against the computed BMI was assessed at the 5% level of significance. Odds ratios (OR) and associated 95% Confidence Intervals (CI) were generated from binary logistic regression models to explore the potential association of socio-demographics, work-related, health and modifiable behavioral factors with obesity.

Results

Socio-demographics and work-related characteristics

Of the 1432 full-time employees of the institution, only 340 (23.7%) completed the survey. Among these, 273

(79.4%) were females and 67 (19.7%) males, 242 (71.2%) Non-Hispanic Whites, 48 (14%) Blacks, 25 (7.25%) Hispanics, 21 (6%) Asians and 4 (1%) other.

On the basis of calculated BMI using self-reported height and weight, 167 (49%) respondents were obese and 95 (28%) were overweight, representing 77% obesity/overweight prevalence rate in this population. Prevalence of obesity was significantly higher among Blacks (OR = 2.02, 95% CI = 1.04 - 3.88) and lower among Asians (OR = 0.15, 95% CI = 0.04 - 0.51) compared to Non-Hispanic Whites. Those earning \$50K and less were also more likely to be obese compared to those earning over \$50K (OR = 2.00, 95% CI = 1.18 - 3.33).

Apart from socio-demographics, table 1 depicts association of obesity and work-related characteristics. Some job types were statistically protective related to obesity such as researchers (OR = 0.10, 95% CI = 0.02 - 0.45) and physicians (OR = 0.20, 95% CI = 0.06 - 0.72), while administrative assistants (OR = 3.12, 95% CI = 1.55 - 6.30) were more likely to be obese. Although nurse assistants (CNA) showed over 180% increased odds of being obese, this was not statistically significant (OR = 2.80, 95% CI = 0.73 - 10.75). Most of the participants reported working day shift (90.5%) and over 91% reported medium to high stress. However, although these work-related features depicted an increased likelihood to be related to obesity, they were not statistically significant.

Factors		Obese n (%)	Not obese n (%)	OR(95%CI)
Socio demographic factors				
Gender	Female	141(52.0)	130(48.0)	0.60(0.35,1.04)
	Male	26(39.4)	40(60.6)	Ref
Race/ethnicity	White	118(49.0)	123(51.0)	Ref.
	Blacks	31(67.0)	16(34.0)	2.02(1.05,3.88)*
	Hispanics	15(60.0)	10(40.0)	1.56(0.68,3.62)
	Asian/Others	3(12.5)	21(87.5)	0.15(0.04,0.51)*
Age	Mean (standard deviation)	45.7(11.2)	45.2(13.1)	1.00(0.98,1.02)
Education	Less than college	34(59.7)	23(40.4)	Ref.
	Some college/degree	111(51.9)	103(48.1)	0.73(0.40,2.17)
	Graduate/Professional degree	22(33.3)	44(66.7)	1.79(0.79,4.08)
Household income per year	0-50K	63(60.0)	42(40.0)	Ref.
	>50 - 100K	52(43.0)	69(57.0)	0.50(0.30,0.85)*
	>100K	52(46.9)	59(53.1)	0.59(0.34,1.01)
Work-related Characteristics				
Researcher	Yes	2(10)	18(90.0)	0.10(0.02,0.45)*
	No	165(52.0)	152(48.0)	Ref
Physician	Yes	3(17.7)	14(82.3)	0.20(0.06,0.72)*
	No	164(51.3)	156(48.7)	Ref

Faculty-Academic	Yes	3(37.5)	5(62.5)	0.60(0.14,2.57)
	No	164(49.9)	165(50.1)	Ref.
Administration	Yes	8(50.0)	8(50.0)	1.02(0.37,2.78)
	No	159(49.5)	162(50.5)	Ref.
Nurse practitioner	Yes	5(62.5)	3(37.5)	1.72(0.40,7.31)
	No	162(49.2)	167(50.8)	Ref.
Registered nurse including LVN	Yes	43(48.9)	45(51.1)	0.96(0.59,1.57)
	No	124(49.8)	125(50.2)	Ref.
Management	Yes	18(43.9)	23(56.1)	0.77(0.40,1.49)
	No	149(50.3)	147(49.7)	Ref.
Lab tech	Yes	4(26.7)	11(73.3)	0.35(0.11,1.14)
	No	163(50.6)	159(49.4)	Ref.
Administrative Assistant	Yes	32(72.7)	12(27.3)	3.12(1.55,6.30)*
	No	135(46.1)	158(53.9)	Ref.
CNA	Yes	8(72.7)	3(27.3)	2.80(0.73,10.75)
	No	159(48.8)	167(51.2)	Ref.
Other support staff	Yes	50(52.6)	45(47.4)	1.19(0.74,1.91)
	No	117(48.4)	125(51.6)	Ref.
Work Shift	Day	149(48.9)	156(51.2)	Ref.
	Evening	3(42.9)	4(57.1)	0.79(0.17,3.57)
	Night	15(60.0)	10(40.0)	1.57(0.68,3.61)
Stress level	Stressed	154(50.0)	154(50.0)	1.23(0.57,2.65)
	Not stress	13(44.8)	16(55.2)	Ref.

Table 1: Socio-demographics and work-related factors potentially associated with obesity among rural healthcare workers (The University of Texas Health Science Center at Tyler, Texas, n=340).

Life-style and modifiable risk behavior

Table 2 depicts life-style and modifiable behavioral factors that are potentially associated with obesity among these workers. Poorer dietary habits revealed an association with the consumption of high fat or carbohydrate diet (OR = 1.69, 95% CI = 1.10 - 2.61) and high sugar beverages like sodas (OR = 1.94, 95% CI = 1.25 - 2.99) as well as not eating balanced meals (OR = 1.47, 95% CI = 1.14 - 2.94) showing statistically significant increased odds. Exercise habit, particularly among those who jog regularly was associated with statistically

significant reduced odds of obesity (OR = 0.30, 95% CI = 0.12 - 0.76).

Reduced odds of obesity were also noted among those who eat regular breakfast, run, and do strengthening exercise as well. However, these were not statistically significant. Over a third of the study sample reported having less than six hours of sleep with these workers showing an 8% increased odds of being obese compared to those having at least six hours of sleep, though not statistically significant.

		Obese n(%)	Not obese n(%)	OR(95%CI)
Hours of sleep per day	< 6	53(51.0)	51(49.0)	1.08(0.68,1.72)
	>=6	114(48.9)	119(51.1)	Ref.
Eating Habit				
Regular breakfast	Yes	80(47.1)	90(52.9)	0.82(0.53,1.25)
	No	87(52.1)	80(47.9)	Ref.
Balanced meals	Yes	40(39.2)	62(60.8)	0.55(0.34,0.88)*
	No	127(54.0)	108(46.0)	Ref.
Snack between meals	Yes	116(49.0)	121(51.0)	0.92(0.58,1.47)
	No	51(51.0)	49(49.0)	Ref.
5-9 servings of fruits/vegetable	Yes	19(41.3)	27(58.7)	0.68(0.36,1.28)
	No	148(50.9)	143(49.1)	Ref.

Fat/high carb diet	Yes	104(55.3)	84(44.7)	1.69(1.10,2.61)*
	No	63(42.3)	86(57.7)	Ref.
Fruit juice	Yes	36(50.0)	36(50.0)	1.02(0.61,1.72)
	No	131(49.4)	134(50.6)	Ref.
Soda	Yes	89(58.6)	63(41.4)	1.94(1.25,2.99)*
	No	78(42.2)	107(57.8)	Ref.
Exercise habit				
Walk	Yes	110(50.9)	106(49.1)	1.17(0.75,1.82)
	No	57(47.1)	64(52.9)	Ref.
Jog	Yes	6(24.0)	19(76.0)	0.30(0.12,0.76)*
	No	161(51.6)	151(48.4)	Ref.
Run	Yes	5(41.7)	7(58.3)	0.72(0.22,2.31)
	No	162(49.9)	163(50.1)	Ref.
Strength	Yes	22(40.0)	33(60.0)	0.63(0.35,1.13)
	No	145(51.4)	137(48.6)	Ref.
Exercise frequency	Regular	128(48.7)	135(51.3)	0.79(0.46,1.36)
	Never	36(54.6)	30(45.4)	Ref.

Table 2: Life style and modifiable behavioral factors potentially associated with obesity among rural healthcare workers (The University of Texas Health Science Center at Tyler, Texas, n=340).

		Obese n(%)	Not obese n(%)	OR(95%CI)
Self-perceived Obesity	Obese	69(41.3)	1(0.6)	119.00(16.30,870.25)*
	Not obese	98(58.7)	169(99.4)	Ref.
Health conditions				
Self-perception of general health	Excellent	63(53.4)	55(46.6)	Ref.
	Good	84(46.4)	97(53.6)	0.76(0.48,1.20)
	Fair	16(51.6)	15(48.4)	0.93(0.42,2.06)
	Bad	4(57.1)	3(42.9)	1.16(0.25,5.43)
Hypertension	Yes	67(61.5)	42(38.5)	2.04(1.28,3.25)*
	No	100(43.9)	128(56.1)	Ref.
Diabetes	Yes	29(76.3)	9(23.7)	3.76(1.72,8.21)*
	No	138(46.2)	161(53.8)	Ref.
Sleep apnea	Yes	43(82.7)	9(17.3)	6.20(2.91,13.21)*
	No	124(43.5)	161(56.5)	Ref.
High Cholesterol	Yes	51(57.3)	38(42.7)	1.53(0.94,2.49)
	No	116(46.8)	132(53.2)	Ref.
Hypothyroidism	Yes	31(66.0)	16(34.0)	2.20(1.15,4.19)*
	No	136(46.9)	154(53.1)	Ref.
Cancers	Yes	8(66.7)	4(33.4)	2.09(0.62,7.07)
	No	159(48.9)	166(51.1)	Ref.
Have Primary care physician	Yes	147(50.9)	141(49.1)	1.45(0.78,2.69)
	No	20(41.7)	28(58.3)	Ref.
Tried weight management Program	Yes	130(77.8)	77(45.3)	4.24(2.64,6.82)*
	No	37(22.2)	93(54.7)	Ref.
Tried Bariatric surgery	Yes	20(12.0)	5(2.9)	4.49(1.64,12.26)*
	No	147(88.0)	165(97.1)	Ref.
Successful weight management	Yes	70(47.3)	64(55.7)	0.72(0.44,1.17)
	No	78(52.7)	51(44.4)	Ref.

Table 3: Obesity awareness, management and potential comorbidities among rural healthcare workers (The University of Texas Health Science Center at Tyler, Texas, n=340).

Obesity awareness, weight management and comorbidities

Obesity awareness (knowledge) was assessed based on self-reported body weight. Correct perception was reported for normal weight by 80.2%, for overweight by 74.7% and for obesity by 19.4% of the respondents. Of the 100 respondents who were morbidly obese based on computed BMI, 56 (56%) thought they were obese, and the rest thought of themselves as being overweight. Dichotomizing both the perceived and computed body weights simply as obese versus not obese, 41% of those who were obese correctly perceived of themselves as being obese and 99% of those who were not obese correctly stated as such ($p < 0.001$).

The respondents were more likely to state that they had tried some form of weight management program, in general (OR = 4.24, 95% CI = 2.64 – 6.82) and bariatric surgery, in particular (OR = 4.49, 95% CI = 1.64 – 12.26). Over 50.6 percent stated that their past weight management efforts, in general, were successful, indicating a 28% reduced odds (OR = 0.72, 95% CI = 0.44 – 1.17). Statistically significant association with obesity was noted among those with high blood pressure (OR = 2.04, 95% CI = 1.28 – 3.25), diabetes (OR = 3.76, 95% CI = 1.72 – 8.21), sleep apnea (OR = 6.20, 95% CI = 2.91 – 13.21) and hypothyroidism (OR = 2.20, 95% CI = 1.15 – 4.19).

Discussion

Findings from this study are similar to that of Sharma and colleagues⁴ who explored factors associated with obesity in hospital workers. Their study revealed that 78.1% of the 924 participants were OW/OB. Our study focused on specific objectives to help answer relevant questions identified as important related to risks and obesity status. Our findings indicate that obesity is a major issue, not just for the general public, but as much, or more so for the healthcare workforce in this region. While our results show self-reported BMI based obesity rates of about 49%, the current reported national average for Texas is 32.4%.⁷ While the obesity rates in general are high for all races, rates were higher in non-Hispanic Blacks and Hispanics. The rates are significantly lower among Asian respondents. This finding may suggest a look at the typical Asian diet, eating patterns and general lifestyles as a potential effect modifier for risk reduction. Although related factors are multifactorial, dietary management and exercise are keys to overall optimal healthy weight.

The habit of skipping breakfast may lead to improper snacking with calorie dense foods such as cookies, as well

as increased consumption of sodas having calories. In our sample, those who consumed soda were more likely to be obese. If the two are related, that would be a possible point to relay to workers and target for lifestyle modification programming. Over 50% noted that they do not eat three balanced meals in a day. Although we do not know what respondents considered a “balanced meal,” those who reported eating three balanced meals were less likely to also report being obese. Some may have a tendency to think that skipping meals will help them lose weight, but unfortunately, that habit may negatively affect body metabolism.

Fruit and vegetable consumption among respondents was also noted to be somewhat low and those reporting more consumption were less likely to be obese. According to the current U. S. Dietary Guidelines (2015 – 2020), fruits and vegetables should be consumed more than grains and meats which tend to occupy most of the traditional American plate, and about nine servings or more of fruits and vegetables are recommended daily [9]. While a significant number of respondents noted that they were engaged in some form of exercise, only about 18.7% were engaged in daily activity. Consuming calorie dense foods along with drinking high sugar sodas and juices all increase the likelihood of weight gain. When these are combined with lack of regular exercise, unhealthy weight gain is more likely. Most of the participants in this study happened to be day shift workers (90.5%) and only about 7.5% were night shift workers. However, most respondents noted some medium (57.6%) to high (33.5%) level stress. In animal models studying the associations of obesity, cortisol levels and stress have also been suggested as interacting risk factors [10]. Luckhaupt and colleagues assessed the National Health Interview Survey data and found approximately 28% of the U.S. healthcare workforce met the criteria for obesity and suggested working >40 hrs/week and a hostile workplace to be risk factors, but did not address stress in general [11].

One of the key issues explored in this study was obesity awareness among healthcare workers. The results from this analysis reveal that although the study participants were much more likely to correctly perceive their body sizes in the favorable categories (e.g. 80% of normal weight predicted correctly), the same was not true for the unfavorable categories. Only 19% of those who were obese perceived themselves as such. In fact, none of those who were morbidly obese thought so (thinking they were either only obese or overweight). This held true even with the binary categorization of self-reported and computed body weights (obese vs. not). Over 99% of those in the not obese category perceived of themselves in that category,

and only 43% in the obese category reported same. The sampled population constituted respondents who were relatively educated with about 45% holding a bachelor's degree or higher, even though that may not have necessarily translated into obesity and nutrition knowledge or healthy behaviors. Many support staff were a part of the study population. They may not have had the same level of health literacy as other formally trained health care workers.

Nonetheless, the results indicated that even though the population was primarily comprised of healthcare workers, their behaviors associated with obesity and lifestyle was somewhat similar to that of the lay public. Household income also indicates an unfavorable risk profile for those whose income fell under the \$50,000/year level. Lower income could create a challenge in meeting other needs along with choosing to eat healthy. In addition, nutrition education is critical for the highly educated and high income and those who are less educated with lower income as well. It is not safe to assume that all healthcare workers, including physicians, have adequate nutrition knowledge, or that this knowledge translates into healthy behaviors. The Ecological Theory of Health Promotion suggests that causation is multi-factorial [12]. This would take into account not only knowledge, attitudes, and beliefs, but policies around food service in healthcare settings, regulations, norms of the regions and so on. All of these could have effects on individual behaviors.

Comorbidities for obesity in this study included HTN, diabetes, sleep apnea and hypothyroidism, some of which mirror well with what has been previously reported in the general public [3-5,7]. As previously noted, a large proportion of the respondents reported medium to high level of stress, but most reported getting 6-8 hours of sleep (66%) which may not necessarily be enough to counter the stress levels related to working in a healthcare environment. Sleep deprivation has been shown to impact cognitive performance, and memory, as well as blood pressure levels [13]. Sleep disturbances are likely related to anxiety and depression as well [14]. Healthcare workers can be sources of positive health-based information for patients. However, if they experience the same behavioral risks as OW/OB patients, they may not champion healthy behaviors as successfully.

Limitations

As with all survey research, this study has limitations. We had hoped for at least a 30% response rate. Out of the

1432 full-time employees, 340 (23.7%) responded to the survey. Therefore, it is less generalizable than it could have been, but may be representative of the healthcare worker population in our region. Our questions were also designed in-house and were not tested for other than face-validity. These, and other limitations related to survey research should be taken into consideration in interpretation of the results of the study. While BMI could be calculated, the height and weight that the calculations are based on were also self-reported. In addition, health history was self-reported and not provider diagnosed or verified by other means. The sample was also skewed toward the female gender.

Conclusion

This study explored the prevalence, awareness, risk factors and comorbidities of obesity among workers in a healthcare institution in rural Northeast Texas where health status indicators are very poor. The prevalence of overweight and obesity is high and a very small proportion of the healthcare workers in this study view themselves as such. Poor dietary habits are the main potential risk factors for obesity with hypertension, diabetes, sleep apnea and hypothyroidism as comorbidities. The health and wellness needs of healthcare workers in this region are similar to the general population. It is often assumed that those who work in the health field know better about health and wellness issues and how it impacts their health. Our results indicate this may not be the case, or that this does not translate into healthy actions related to behaviors. Healthcare organizations need to champion comprehensive wellness programs for the workforce. This could improve the health of employees, enhance productivity, and possibly reduce the burden of health insurance cost for the institutions. Healthier, informed healthcare workers might also make better champions for healthy lifestyles for their patients, their families and the community at large. While more studies focusing on identifying risk factors of obesity among healthcare workers is warranted, preventive intervention, especially on nutrition and lifestyle are critical, to ensure a healthier healthcare workforce.

Conflicts of Interest

There are no conflicts of interests; all authors, but one are employees of the same institution and this work was done to determine need for an employee wellness program specific to the organization. One of the supporting authors – Dr Evans also declares no conflict of interest.

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Data Availability

The data that supports the conclusions are provided in the results section, as well as in the tables at the end of the manuscript.

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