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Depression, Metabolic Syndrome, and Locus of Control in Arab Americans Living in the DC Metropolitan Area: A Structural Equation Model

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Abstract

Background—Arab Americans have high prevalences of metabolic syndrome (MetS) and depression. Depression and external locus of control (LOC) may worsen MetS.

Methods—We examined the relationship between depression and MetS with a convenience sample of 136 Arab Americans living in the Washington, DC, metropolitan area. Participants were surveyed with the Multidimensional Health Locus of Control questionnaire and the Center of Epidemiological Studies-Depression scale. Laboratory measurements were collected based on the components of MetS. A structural equation model was used to explore the relationship between MetS and depression through analysis of LOC.

Results—MetS was significantly correlated with external LOC (powerful others and chance), and depression was correlated with a weak internal LOC.

Conclusions—Future study of the effect of LOC on health outcomes in Arab Americans may be used to mitigate MetS and depression in this population.

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Conflicts of Interest:
Nawar M. Shara declares that she has no conflicts of interest.
Alexander Zeymo declares that he has no conflicts of interest.
Zeid Abudiab declares that he has no conflicts of interest.
Jason G. Umans declares that he has no conflicts of interest.
Soleman Abu-Bader declares that he has no conflicts of interest.
Asqual Getaneh declares that she has no conflicts of interest.
Barbara V. Howard declares that she has no conflicts of interest.

Compliance with Ethical Standards: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Keywords

Arab Americans; depression; locus of control; metabolic syndrome; SEM

INTRODUCTION

Lifestyle, health, and care-seeking behaviors are determined by complex cultural and psychological factors, including locus of control (LOC). Assessing linkages between physical and mental health conditions may provide opportunities for targeted prevention and treatment in high risk groups. Such linkages are particularly important in the growing Arab American population, a difficult-to-access population (1,2,3) in which both depression and metabolic syndrome (MetS) are common (4,5,6,7).

Some sociologists believe that Arab American Muslims are especially at risk for depression because of the stressors associated with acculturation (8,9,10,11,12,13). Stressors experienced by Arab Americans and Arab-American Muslims are unique among U.S. subpopulations in the post-9/11 era (13). Arab-American Muslims face greater acculturation stress than their Christian counterparts and this may make them more prone to depression (2,8). Acculturation stress affects Arab Americans at all ages (11,12).

Health outcomes are affected by LOC. LOC is a construct used to capture patients' perceptions regarding who or what determines their health state or has power to influence it. LOC can be either internal, as when patients believe they are in control or have sufficient influence over their health, or external, when patients believe their health is influenced by outside parties. External LOC is further divided into "powerful others" LOC, such as family, friends, doctors, institutions, and "chance" LOC. Patients may feel that they influence their health but also that powerful others influence their health. Studies of Middle Eastern Arabs in Jordan, Egypt, and Israel that measured LOC using the Multidimensional Health Locus of Control (MHLC) questionnaire indicate that a strong external LOC is related to poor physical and mental health, and that a strong internal LOC protects against depression (14,15,16). One study showed that Arab respondents tended to have external LOC (i.e., they believed their health was determined by external factors and had a weak sense of personal control) (16). No studies on the impact of LOC on mental and physical health in Arab Americans have been conducted.

MetS is a major risk factor for CVD and type 2 diabetes (6,17,18). While the etiology and progression of MetS are not completely understood, the prevalence of MetS is high and growing worldwide (4). In the United States, an estimated 34% of adults have MetS (5). MetS prevalence also is high across the Middle East (approximately 33%) (6–7). Meta-analyses of studies throughout the United States, Europe, and Asia have confirmed an increased risk for CVD and type 2 diabetes among individuals with MetS (approximately 1.8 relative risk (RR) for CVD and 4.0 RR for type 2 diabetes) (19,20). Components of MetS include central adiposity, hypertriglyceridemia, hyperglycemia, low high-density lipoprotein cholesterol (HDL-C), and hypertension (5,19,21).

The literature shows racial/ethnic disparities in MetS prevalence and components (5,22). While MetS prevalence among an Arab American population in southern Michigan was comparable to other ethnicities and to the general population (23), the condition seemed to manifest differently in Arab Americans, with low HDL-C, 48% vs. 24.7% compared with the general U.S. population. These findings are similar to rates among Middle Eastern Arabs (7).

With as much as 20% of the U.S. population estimated to have mood disorders, it is important to understand the mechanism by which MetS and depression may be associated (24–25). While rates of mood disorders and depression in Arab Americans are comparable to those of the general U.S. population (26–27), Arab Americans experience additional stress from the mistrust and discrimination generated after the terrorist attacks of September 11th and subsequent terrorist episodes (13). Studies exploring the relationship between MetS and depression have been inconclusive, but some have shown a reinforcing association (28,29,30,31,32,33,34).

In this article, we report the prevalence of MetS and depression in a sample of Arab Americans and examine the relationship between these two conditions through the medium of LOC (35). We hypothesize that MetS will be related to both depression and specific LOC factors.

METHODS

A convenience sample of 136 Arab Americans living in the DC metropolitan area (1) underwent a physical exam, including measures of height, weight, waist circumference, and blood pressure (BP). Glucose and lipids were measured via fasting blood sample, and participants were asked to complete the MHLC Form A questionnaire (35). Details of the recruitment have been published (1). Informed consent was obtained from all participants. The study was approved by the Georgetown University Institutional Review Board.

LOC was evaluated using the MHLC Form A; this scale has been used in numerous studies of Arab populations and has high reliability (11,14,15). The questionnaire includes 18 items which divide into three subscales corresponding to the three LOC types. Each LOC score is determined by the sum of the answers to six questions within each subscale. Studies of Arab populations have shown the MHLC subscales to have adequate consistency (11,14,15).

To evaluate depression, participants were asked to complete the Center of Epidemiological Studies-Depression (CES-D) scale (36). CES-D scores were calculated by summing responses to the questions asking how often the participants exhibited depressive symptoms. Scores >15 indicate clinical depression. An in-depth evaluation of the CES-D in second-generation Arab Americans indicated high reliability (α=0.9), and the findings were consistent with previous applications of the CES-D in Arab and Arab American populations (14,15,37).

Participants' scores were calculated for the MHLC and CES-D scales (35–36). MetS was defined as having at least three of its components (5,38). MetS components included systolic BP, diastolic BP, serum triglycerides, fasting blood glucose, HDL-C, and waist

circumference, and were evaluated during the physical examination. Demographics and health behavior were not included because of overfitting concerns. After excluding patients without values for MetS components and either CES-D or LOC, 103 participants remained in the analysis.

Statistical Analysis

Descriptive statistics were calculated for each MetS component, the MHLC subscales, the CES-D aggregate score for the total sample, and by gender. Structural equation modeling (SEM) was conducted to determine whether LOC could explain a link, if any, between depression and MetS. Correlations were calculated using the pairwise-complete method, which estimates correlations between each variable pair with available values and disregards missing data on other variables. The variables used for building the SEM were the MetS components and the scores for CES-D, internal LOC, chance LOC, and powerful others LOC. MetS was modeled as a latent factor and the MetS components were correlated only with the MetS latent factor. The MetS latent factor was then correlated with the CES-D score as well as the three LOC scores, which were also assumed to be correlated with each other and with the CES-D score (39). Analyses were conducted in R 3.3 (40), using the SEM package (41).

RESULTS

One hundred thirty-six participants were sampled. Patients were excluded if they had fewer than two of the components needed for the SEM model: any MetS components, CES-D score, or LOC score. Patients with only MetS components and no CES-D or LOC score also were excluded. Therefore, data for 103 participants were analyzed. Demographic and health-related factors for the whole sample have been published (1). Of the whole sample, 58% (n=60) were female, 90% (n=92) identified as Muslim, 91% (n=94) were born outside the USA, 56% (n=53) were from families earning more than $75,000 yearly, and 73% (n=76) had at least an undergraduate degree.

Table I shows the number of participants who reported that their doctor had diagnosed them with one of several common conditions; no gender differences were seen. The proportion of these self-reported diagnoses, however, was lower compared with results from the physical exam and laboratory data.

Table II shows the participants' laboratory data, MHLC and CES-D scores, and mean values and proportions of MetS components. Nearly a third (31%) of the population had hyperglycemia in the range of diabetes, yet only 6% reported a diagnosis of diabetes. Similarly, one third (36%) of the participants had high BP in the range of hypertension, yet only 19% reported having been told they had hypertension. Even fewer participants (5.8% vs 26.1%) reported that they had been diagnosed or told by their doctor that they had depression, compared to those identified as having depression by the CES-D. Our population had a strong internal LOC in both sexes, with approximately one fourth of the participants scoring >30 out of 36. Twenty-five percent of the sample had MetS (26% of men and 25% of women), as indicated by the presence of three components (5,38).

We found significant positive correlations between MetS and external LOC (MetS and powerful others LOC [correlation=0.35], powerful others LOC and chance LOC [correlation=0.32], and chance LOC and MetS [correlation=0.21]) (Figure 1). Conversely, a significant negative correlation also was found between depression and internal LOC (correlation=−0.30). No significant correlation between mental health and MetS was observed (α=0.05), although the estimated correlation with depression score and chance LOC was nearly significant (correlation=0.18, p=0.055).

DISCUSSION

High internal LOC scores usually correlate with higher education and income and less depression (16,42,43,44). In this first study to examine the relationship between LOC, MetS, and depression among an Arab American population, our population was found to have high internal LOC. Despite high internal LOC, high education levels, and socioeconomic advantages compared with the general U.S. population and the Arab American sub-population (1), our population had high depression scores and was underdiagnosed for common conditions, including diabetes, hypertension, and clinical depression. Acculturative stress may explain the correlation between the prevalence of depression and underdiagnosis in this population.

Consistent with findings from previous studies (4,7,22,23), serum triglyceride, fasting blood glucose, and high BP were lower compared with estimates for the general U.S. population (5,17,20). Further, MetS appeared to manifest differently between the genders, with central adiposity more common among the women and high BP and serum triglycerides common among the men. These results are consistent with previous studies of MetS in Arab Americans (23).

The relationship between depression and low internal LOC was consistent with other studies (14,45), as represented by the correlation in the SEM, as was the relationship between physical health (MetS) and external LOC (14,46). The relationships between chance LOC and physical and mental health separately also were consistent with previous research (14,15,46). Taking into account the marginally significant correlation between chance LOC and depression score, there may be a path between MetS and depression. These three factors are positively correlated to each other, suggesting that having MetS may strengthen the belief that one's health is out of one's control and thereby increasing depressive symptoms. Alternatively, depressive symptoms may strengthen the sense that one's health is out of one's control, which may affect healthful behaviors and result in worsening of MetS components. Subsequent analyses including information on health behaviors may further elucidate this relationship.

This study was limited by the sample size (103 participants) and the substantial amount of missing data. Information regarding health behaviors was sparse. A larger sample may illuminate these potential relationships, particularly the weak correlation between internal and powerful others LOC. Larger samples would also allow for adding more factors to the SEM, including health behaviors and demographic information, without the risk of overfitting. Psychological theory suggests internal LOC and powerful others LOC are

usually negatively related (47). These correlations should be explored further. This study was further limited by the convenience sample, which by its nature biased the analyses, limiting generalization of the findings. The homogeneity in income, education, and religion of the participants is likely a result of the convenience sampling (1). Due to factors discussed in previous articles, studying Arab Americans specifically makes random sampling challenging (1).

Further study of the effect of LOC on physical and mental health is needed. Future studies with randomly selected samples, larger numbers of participants, and fewer missing data may lead to discovery of a link between depression and MetS. Additional information about health behaviors may help fully explore the relationship between MetS and depression as affected by LOC. While the MHLC is effective as a general tool, the use of scales specifically related to the morbidities of interest may offer greater sensitivity (48).

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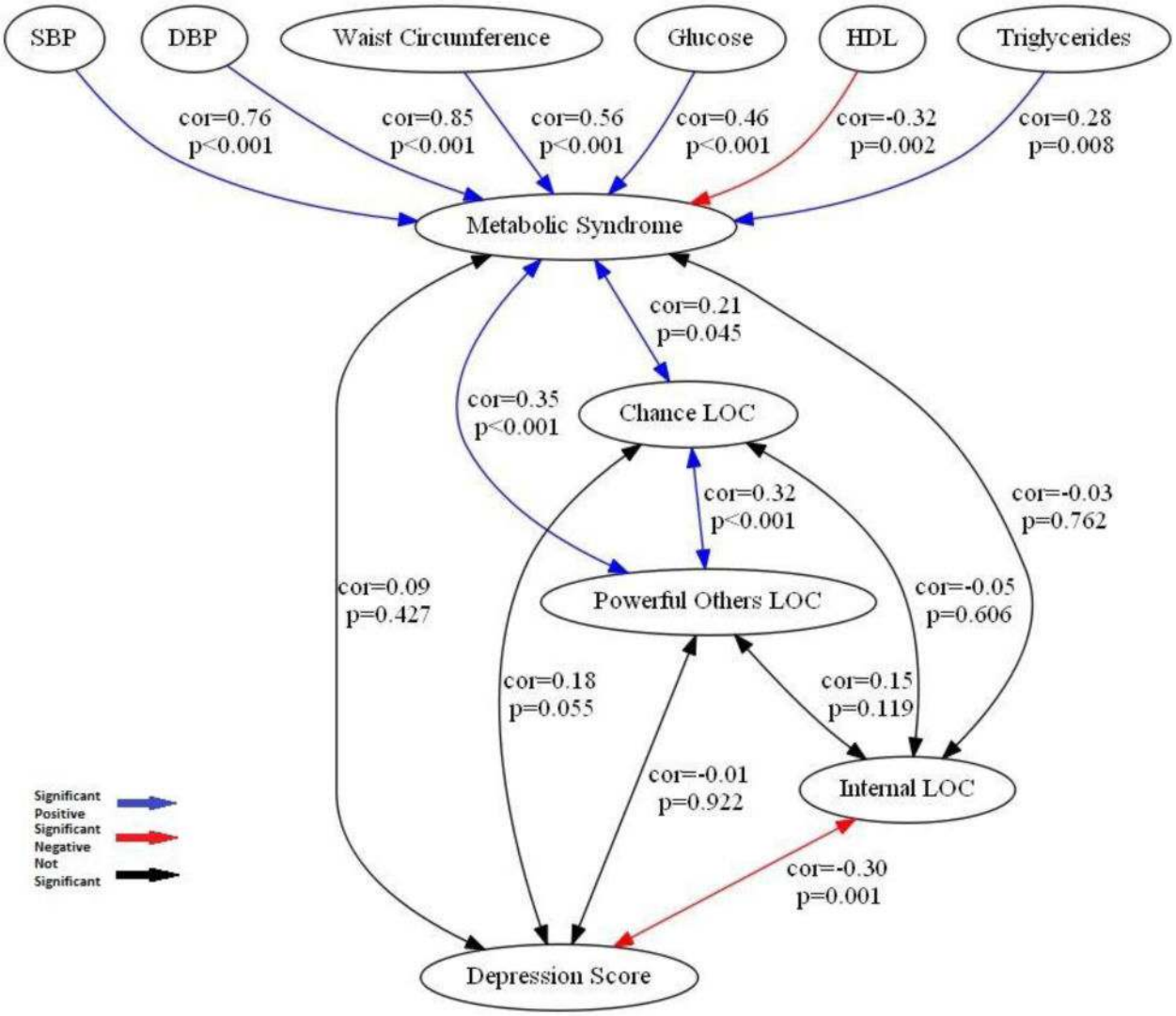

Figure 1.
Structural Equation Model

Table I

Reports of Diagnoses by a Doctor Among a Sample of Arab Americans Living in DC

	Total (N = 103)[a] n (%)	**Male (N = 42) n (%)**	**Female (N = 60) n (%)**	**Test[b]**
Kidney stone	5 (4.85)	2 (4.8)	3 (5.0)	1.000
Arthritis (rheumatism)	10 (9.71)	2 (4.8)	8 (13.3)	0.181
Depression[b]	6 (5.83)	0 (0.00)	6(10.0)	0.041
Migraine headache/chronic headache	17 (16.50)	6 (14.3)	11 (18.3)	0.788
High cholesterol	31 (30.10)	15 (35.7)	15 (25.0)	0.275
Hypertension or high blood pressure	20 (19.42)	8 (19.0)	12 (20.0)	1.00
Heart attack, heart failure, chest pain due to heart disease or angina	5 (4.85)	1 (2.4)	4 (6.7)	0.646
Stroke or mini-stroke	0 (0.00)	0 (0.00)	0 (0.00)	----
Diabetes mellitus (excluding gestational)	6 (5.83)	1 (2.4)	5 (8.3)	0.396
Cancer	0 (0.00)	0 (0.00)	0 (0.00)	----
Asthma	15 (14.56)	7 (16.7)	8 (13.3)	0.778

[a] One participant did not indicate his or her sex on the questionnaire.

[b] Fisher's exact test

Table II

Summary of Metabolic Syndrome, Depression, and Locus of Control in a Sample of Arab Americans Living in DC

	Total (N = 103)[a]		Men (n = 42)		Women (n = 60)		Test	
	Mean (SD)	Percentage High*†‡	Mean (SD)	Percentage High*†‡	Mean (SD)	Percentage High*†‡	T-test	X^2
Waist circumference (missing = 4)	94.73 (12.18)	47.96	99.43 (13.21)	30.0	91.39 (10.41)	60.3	0.002	0.003
TG (missing = 5)	114.5 (79.63)	18.37	124.95(60.31)	28.2	107.26 (93.95)	12.1	0.252	0.045
FBG (missing = 5)	95.47(10.97)	30.61	98.18(11.20)	38.5	93.78 (10.59)	25.9	0.056	0.188
SBP (missing = 5)	122.8 (16.95)	35.7	127.56 (14.75)	51.3	119.91 (17.69)	25.9	0.023	0.011
HDL-C (missing = 5)	52.63 (15.30)	74.22	43.82 (9.37)	74.4	58.83 (15.59)	74.1	<0.001	0.981
Total cholesterol (missing = 5)	198.2(37.79)	42.86	196.64(41.04)	41.0	199.19 (36.12)	43.1	0.754	0.839
Metabolic syndrome components	26 (25%)		11 (26%)		15 (25%)			1.000
Albumin-creatinine ratio								
(missing = 13)	165.16 (126.27)	---	224.29 (147.02)	---	129.85 (93.95)	---	0.001	---
Microalbuminuria	---	61.80	---	34.3	---	79.6	---	<0.001
Macroalbuminuria	---	19.10	---	45.7	---	1.9	---	<0.001
CES-D (missing = 11)	12.03(7.47)	26.09	10.54 (5.54)	22.0	13.36 (8.62)	30.0	0.062	0.386
Internal LOC (missing = 6)	26.02 (4.83)	25.77	26.02 (5.10)	26.2	25.98 (4.71)	25.9	0.967	0.977
Powerful others LOC (missing = 3)	20.67 (6.10)	6.00	21.81 (5.32)	7.1	19.68 (6.46)	5.3	0.076	0.698
Chance LOC (missing = 7)	17.05 (5.21)	1.04	16.79 (4.82)	0.0	17.26 (5.59)	1.9	0.656	0.371

Abbreviations: CES-D=Center of Epidemiological Studies-Depression scale; FBG = fasting blood glucose; HDL-C=high-density lipoprotein cholesterol; LOC=locus of control; SBP=systolic blood pressure; TG=triglycerides.

[a]One participant did not indicate his or her sex on the questionnaire.

*Percentage high for CES-D is the percentage scoring greater than 15, indicating signs of clinical depression. "Percentage high" for metabolic syndrome components is based on the ATP III definition of a high percentage: > 102 cm waist circumference for men; > 88 cm waist circumference for women; ≥150 mg/dl serum triglycerides; ≥135/85 blood pressure; ≥100 mg/dl fasting blood glucose.

†Percentage high for HDL-C is the percentage of men with ≥40 mg/dL and the percentage of women with ≥50 mg/dL. Low HDL-C is a metabolic syndrome component.

‡Percentage high for MHLC LOC is a score of ≥30 for each subscale.