Metabolic Syndrome: A Preventable & Treatable Cluster of Conditions

An analysis of patients with Metabolic Syndrome in a predominately African American population at Central Mississippi Health Services in Jackson, Mississippi

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Background

The definition of Metabolic Syndrome has been greatly debated for many years. Known as a cluster of conditions that increase the chance of developing cardiovascular disease (CVD) and diabetes, metabolic syndrome garnered great interest. In 2009, a joint interim statement was issued outlining an agreement of guidelines for diagnosing metabolic syndrome. (K.G.M.M. Alberti, 2009)

Metabolic Syndrome is diagnosed if a patient meets 3 out of 5 of the following conditions:		
	Men	Women
Waist Circumference* (*country specific)	≥40 inches (101.6 cm)	≥35 inches (88.9 cm)
Triglycerides	≥1.7 mmol/L (150 mg/dL)	
HDL	<1.04 mmol/L (<40 mg/dL)	<1.29 mmol/L (<50 mg/dL)
Blood Pressure	≥130/85 mmHg	
Fasting Glucose	≥5.6 mmol/L (100 mg/dL)	

Although the guidelines still need fine-tuning and are continually being researched to better identify specificities amongst countries and ethnicities, the diagnostic tools that exist are appropriate to help prevent and diagnose metabolic syndrome.

Diagnostic Criteria has also helped to better identify prevalence and incidence of the syndrome.   The National Health and Nutrition Examination Survey 1999-2004 and IDF revision in 2005 showed an overall prevalence of 35.2% and 40.1% respectively.
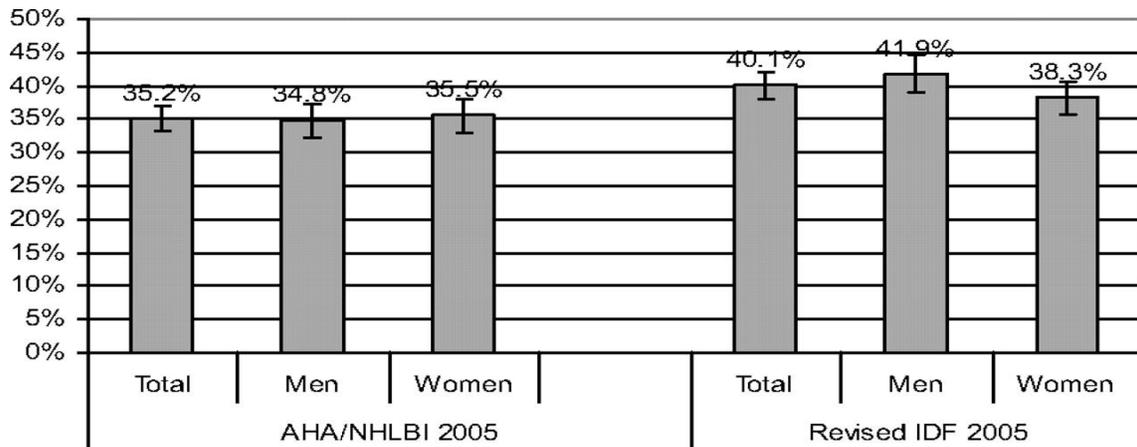
Figure. Unadjusted prevalence (95% confidence interval) of the metabolic syndrome among US adults ≥20 years of age, National Health and Nutrition Examination Survey 1999 to 2004. Revised IDF 2005 eliminates elevated waist circumference as a requirement for diagnosis of the metabolic syndrome. In both AHA/NHLBI 2005 and revised IDF 2005 definitions, the presence of any 3 of 5 risk factors constitutes a diagnosis of the metabolic syndrome. Analysis performed by Dr E.S. Ford of the Centers for Disease Control and Prevention. (K.G.M.M. Alberti, 2009) (Ford ES, 2002)

The prevalence of Metabolic Syndrome was also shown to increase consistently with increasing age, 6.7% for patients ages 20 to 29 years, to 43.5% for ages 60 to 69 years, and 42% for ages 70 years and older. (Ford ES, 2002). As pointed out in *Harmonizing Metabolic Syndrome*, the commonality of the syndrome worldwide makes it both a public health and clinical problem. Addressing Metabolic Syndrome clinically involves identifying affected patients so that multiple risk factors and lifestyle can be managed (K.G.M.M. Alberti, 2009).

Identification of patients is of great importance for Mississippians; as heart disease, stroke, and diabetes are the 1st, 5th, and 7th leading causes of death in Mississippi respectively. (Mississippi State Department of Health, 2011). Cardiovascular diseases, being a severe complication of metabolic syndrome, accounted for 26% & stroke 5% of deaths in Mississippi in 2010. Mississippians were reported to suffer from other contributing conditions, including hypertension and high cholesterol, 41% and 39% respectively. This unfortunately is not surprising as Mississippians rank above the national average amongst every associated risk factor that contributes to metabolic syndrome and ultimately cardiovascular disease. These include tobacco use, lack of moderate/vigorous physical activity, poor nutrition, and obesity. (Mississippi State

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Department of Health, 2011) By identifying and educating patients that display these risk factors as wells as those that are suffering from Metabolic Syndrome, health providers will be able to begin managing their patient population effectively and appropriately.

This study aimed to address the clinical aspect of reducing the prevalence of metabolic syndrome in the community served by Central Mississippi Health Services (CMHS) in Jackson Mississippi. Clinic patients that met diagnosis criteria were identified and educated on Metabolic Syndrome began this process.   It is also a hope that the information obtained from this study will lay groundwork for creating management plans for patients that suffer with Metabolic Syndrome.

Since CMHS serves 98% African Americans, the study highlighted the conditions that are more prevalent in the African American Community. These have been identified in the, *Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey*, as abdominal obesity and Hypertension. (Scott M. Grundy, 2004)

Methods

Clinical data was obtained from a sample of patients over a four-week period in the Winter Street location of the Central Mississippi Health Services (CMHS) Clinic.   Patients meeting 3 out of 5 risk factors of Metabolic Syndrome were identified from Electronic Medical Records and included in the study. Note: waist circumference was not included in the initial identification of patients, as it is not current practice to measure waist circumference at the clinic. Selected patients were surveyed and educated on the complications associated with the syndrome as well as appropriate lifestyle modifications.

Gender, age, ethnicity, current diagnosis, and lab results associated with individual conditions were obtained from the clinic's electronic medical records. In addition, waist

circumference was taken from each patient identified with metabolic syndrome. Data obtained provided information to help determine the percentage of individuals meeting criteria for metabolic syndrome within a subset of patients utilizing healthcare from CMHS. Moreover, providing analysis of average lab values of individual conditions.

The survey provided to identified patients contained the following 7 questions:

1. **How often do you visit the doctor's office?**

This question was intended to gauge the amount of times that the patients seek out medical attention. This also could potentially provide insight into the importance of medical care to the patients.

2. **How often do you exercise? (cardiovascular, strength resistance)**

3. **Do you smoke?**

4. **How much alcohol do you drink?**

These questions were intended to provide a qualitative understanding of lifestyle behaviors that are associated with development of metabolic syndrome risk factors.

5. **Do you have a family history of....?(Diabetes, Hypertension, Hyperlipidemia, Obesity)**

This question was intended to provide qualitative information regarding the predisposition of patients to risk factors associated with metabolic syndrome.

6. **Has your diet changed since you found out you had (Diabetes, HTN, High Cholesterol)?**

This question was intended to provide qualitative information regarding perceived management of diet in reference to metabolic syndrome conditions. The patient also described what their diet consisted of.

7. **Do you know what metabolic syndrome is?**

This question was intended to provide a qualitative assessment of patient's knowledge on the subject of metabolic syndrome.

Results

Patient numbers were based on one provider's patient base over a four-week period. One Hundred and Fifty Five patients were evaluated consisting of all African-Americans. There were 39 patients identified with at least 3 out of 5 conditions qualifying for a Metabolic Syndrome Diagnosis, with ages ranging from 39-82 years (average age=59.3). Out of the 39 identified patients, 20 were female and 19 were men.

Within the 39 patients identified for the study, 27 were diabetic. Fasting glucose (random if patient had eaten) was taken at time of visit. Patients' blood sugar ranged from 87-426 mg/dL with an average of 155.78 mg/dL. The HbA1C results were taken from previous lab history. Patient HbA1C ranged from 5.5-14.6% with an average of 10.46%. Although all identified patients were on treatment regimens, survey results reveal various lifestyle choices that may explain some uncontrolled lab values. This wide range of results indicates a variety of management issues to be discussed.

Waist Circumference along with BMI was also obtained with identified patients. 34 patients were identified with central obesity with waist circumference ranging from 37-55 inches. BMI's ranged from 22.71 to 46.43 with an average of 35.75. With waist circumference being one of conditions within Metabolic Syndrome that occur at higher frequencies in the African American Community, it is a condition that should be focused on in clinical treatment.

Another condition in high prevalence within Metabolic Syndrome amongst African Americans is hypertension. Out of patients identified 38/39 were diagnosed with hypertension. The systolic and diastolic pressures were taken at time of visit. Systolic ranged from 102-182 mmHg and diastolic ranged from 62-110 mmHg. The results in this

category concur with documented prevalence's, proving that hypertension should also be an area of focus for CMHS.

The final conditions measured as a part of Metabolic Syndrome diagnosis was increased triglycerides and low High Density Lipoprotein (HDL) levels. 29 out of 39 identified patients had a diagnosis of hyperlipidemia. HDL ranges from 38-82 mg/dL and 25-78 mg/dL for females and males respectively. Five females had HDL's <50 mg/dL and four males <40 mg/dL. Triglycerides amongst identified patients' range from 48-638 mg/dL. There were 25/39 patients currently treated for hyperlipidemia of which 5 patients had triglycerides >150 mg/dL. Five patients with Triglycerides >150 mg/dL were not currently treated and two other patients did not have recent lipid panels on record. The wide range of lab results indicates a variety of management levels that may be examined to ensure standard of care.

Because all the conditions associated with Metabolic Syndrome has been individually associated with the incidence and progression of Chronic Kidney Disease (CKD) it is imperative that healthcare providers pay close attention to their patient's renal function. (Lopes, 2010) Therefore, in this study I included the eGFR to highlight renal functioning among Metabolic Syndrome patients. Amongst identified patients the eGFR ranged from 10->90. An eGFR <60 mL/min/1.73m^2 with or without Kidney Damage meets diagnostic criteria for CKD. Five patients had an eGFR <60. However, 14 patients had eGFR's ranging form 61-80 and only 8 above 100.   Screening for kidney damage, including Microalbuminuria, Proteinuria, & Hematuria, with patients having an eGFR of 61-89 would greatly benefit providers in slowing the progression of CKD in their patient base.

The first survey question, "*How often do you visit the doctor's office?",* received a variety of answers. The response, "As needed", was the predominate answer. Patients also

answered every 2-3 months. Only 3 patients surveyed indicated that they came more often. After reviewing results, it was quite apparent that most patients made doctor's visit for the purpose of prescription refills. It would be beneficial to explore incorporating disease education in each encounter to maximize patient visit time and move toward the Patient Center Medical Home model.

Questions 2-4 of the survey gave insight into lifestyle factors contributing to the prevalence of Metabolic Syndrome. Only 6/39 patients admitted to smoking and 9/39 admitted to drinking alcohol. Question 2, *"How often do you exercise?"* received a variety of answers and could be categorized in 3 groups: No Exercise, Light Exercise, and Moderate Exercise. The vast majority of the participants admitted to "No Exercise." It was indicated in those who had some exercise in their lifestyle, that they did not have an understanding of the importance of aerobic and strength exercise. In managing lifestyles of Metabolic Syndrome patients, it is imperative that they are educated on the appropriate type and amount of exercise. This is important in reducing weight, abdominal obesity, as well as promoting cardiovascular health.

NO EXERCISE
LIGHT EXERCISE: Walking <15 min (3x/week), Yard work, leisure dance
MODERATE EXERCISE: Walking >15 min (3x/week), Bicycling, Treadmill, Basketball

Question 5, *Do you have a family history of..."* any of the conditions underlying Metabolic Syndrome showed 23/39 patients indicating some type of family history. The most common conditions were obesity, diabetes, and hypertension. 7/39 patients indicated a family history of all conditions associated with Metabolic Syndrome. Only 6

patients indicated no family history. Aside from genetic disposition, emphasis should be placed on lifestyle choices and education of the younger generation to decrease the prevalence of these conditions.

Questions 6, *"Has your diet changed since you found out you had?"* would have been a good indicator of patient's value on the importance of maintaining a balanced diet. However, a precise answer was hard to come by and results actually were more focused on the type of diet each patient ate. The greatest changed noted in survey answers was a decrease/withdrawal of salt from the diet. Although a good start, patients reported eating a less than diverse group of fruits and vegetables. Many patients ate bananas and apples, but did not consume berries or citrus fruits on a regular basis. Also, green vegetables that were common in the diet were greens (collards, mustard, turnip) and lacked in other green vegetables including broccoli, green beans, kale, and the like. Many indicated that they changed the preparation of meats to include baking but admitted to still deep-fry their meats. In interviewing the patients, the vast majority of them felt they were leading healthy lifestyles. Conversely, this judgment was not supported when comparing lab results for each Metabolic Syndrome condition.

The last survey question, *"Do you know what Metabolic Syndrome is?"* proved to be an eye opener for each patient surveyed. None of the patient's surveyed were aware of the term, Metabolic Syndrome, nor had an understanding of the meaning. The patient response served as an opportunity to educate each patient on Metabolic Syndrome and possible lifestyle modifications. The majority of the patients were receptive and asked questions relating to lifestyle modifications. Nonetheless, there were a few that were defensive and others that were content on the life that they chose to live. The conundrum of "the Mind-Set" is the greatest threat to reducing the prevalence of Metabolic Syndrome. The hope,

however, lies in the patient population that is receptive and willing to make lifestyle modifications upon being educated on the subject.

Discussion

The purpose of this study was to identify and educate patients at Central Mississippi Health Services Inc. on Metabolic Syndrome. It is the hope to highlight the need for more comprehensive care to be dedicated toward the care of this patient population consequently reducing the risk of cardiovascular disease.   The results obtained in the study categorically garner such attention.

It is to be noted, the patient cohort analyzed for this study only represented one provider's patients. Thus the prevalence of those identified with Metabolic Syndrome is bound to be much greater than the 25% seen in this small group of 155 patients. It is likely to be close to or exceed the national prevalence of 35.2% and 40.1%; this is especially true for the African-American population in Jackson. As shown in the The Jackson Heart Study, Metabolic Syndrome is greatly prevalent in the Jackson, MS area. Prevalence was found to be amongst the highest reported for population-based cohorts worldwide with significant association with increased probabilities for cardiovascular disease, coronary heart disease, and cerebrovascular disease. (HERMAN TAYLOR, 2008) The study also noted that abdominal obesity, increased blood pressure, and low HDL cholesterol (without triglyceride elevation) are surprisingly prominent. This was also reflected in this study as 34/39 patients had central obesity and 38/39 were being treated for hypertension.

Central obesity is especially important in metabolic syndrome.   The pathophysiology associated with obesity leads to insulin resistance and fatty acid utilization.   Although not fully understood, it is insulin resistance that is believed to link the conditions associated with Metabolic Syndrome. (K.G.M.M. Alberti, 2009)   The

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resulting hyperinsulinemia and hyperglycemia have been shown to induce vascular endothelial dysfunction, an abnormal lipid profile, hypertension, and vascular inflammation, all of which contribute to the athrogenic properties of Metabolic Syndrome. (Lopes, 2010) This contributes to the increased risk of cardiovascular disease as well as the 2 to 3 higher risk of cardiovascular disease-related mortality. (Anagnostis, MD & Harsoulis, MD, 2012) As discussed in results, this pathogenic process also leads to renal dysfunction and highlights another area that should be closely monitored by providers.

With limited clarity of a single cause that links the components of Metabolic Syndrome, it is noted that overnutrition, athrogenic diets, and sedentary lifestyles are the primary cause of the increased prevalence of the syndrome. (Anagnostis, MD & Harsoulis, MD, 2012) The answers to the study survey questions corroborate such lifestyle risk factors. This greatly emphasizes the need for clinicians to design tools that efficiently identify patients with Metabolic Syndrome so that lifestyle risk factors, as well as, health risk factors can be reduced. (K.G.M.M. Alberti, 2009)

The tools used by clinicians at CMHS to treat patients with Metabolic Syndrome may focus on those in highest prevalence among African Americans, central obesity and hypertension. However, management plans that target these conditions also help to reduce other metabolic syndrome conditions including hypertriglyceridemia, low HDL cholesterol, and high fasting glucouse. The first line of thearpy for Metabolic Syndrome is lifestyle modification including weight loss, diet, and physial activity. To reduce indiviual risk factors and the 2nd line of therapy for Metabolic Syndrome, clinical management includes drug therapy. . (Scott M. Grundy, 2004)

In conclusion, it appears that there is a notable amount of patients within the Central Mississippi Health Services Inc. patient population that meet the criteria for a diagnosis of Metabolic Syndrome. There is a definite need for the clinic to focus on

developing tools to reduce and prevent conditions associated with Metabolic Syndrome. This includes identification, education, lifestyle modification, and drug therapy management. None of the patients that participated in the survey understood the meaning or implications associated with Metabolic Syndrome. Therefore, there should be dedicated time given in patient appointments for education.

The American College of Preventive Medicine in, "Metabolic Syndrome Time Tool" shares the above opinion. It has outlined a management plan that could be adjusted to the needs of CMHS and implemented as a standard in managing Metabolic Syndrome Patients. It recommends reorganizing practice systems according to the Chronic Care Model and streamlining the office visit to facilitate management and behavior change. (American College of Preventive Medicine., 2009).

Integrating the Chronic Care Model includes re-designing the practice to provide self-management support. This includes developing care teams by hiring personnel or utilizing community resources equipped to manage the varying aspects of the Syndrome. Care teams should include clinicians, nurses, dietitians, social workers, behavioral health professionals, health coaches, exercise therapists, and community health workers. The development of clinical information systems to assist tracking care should also be considered. Developing patient registries for specific conditions and designating a team member to periodically review, update, identify needed services, and send out reminders to patients can accomplish this. (American College of Preventive Medicine., 2009)

During the office visit, there should be standard protocols followed to facilitate management of care. The American College of Preventive Medicine recommends an integrative approach. In addition to the standard vital signs and review of symptoms, Medical Assistants/Nurses should:

- Measure & record waist circumference

- Calculate a Framingham CVD Risk Score
- Identify patients that meet 3 or more criteria for Metabolic Syndrome
- Code as "Dysmetabolic Syndrome", ICD-9 code: 277.7

Medical Providers should:

- Review patient's risk factors and order necessary lab tests to identify individual conditions associated with the Syndrome.
- Explain the syndrome
- Discuss the risks
- Outline a plan to reverse the Syndrome
- Assess willingness to try lifestyle approach
- Prescribe pharmacotherapy if patient not willing to try lifestyle approach
- Describe follow-up plan

By implementing the outlined recommendations, CMHS stands a chance in effectively reducing the risks associated with Metabolic Syndrome in the patient population it serves. However, leadership must understand and embrace the Chronic Care Model and develop the foundation for re-organizing the practice. (American College of Preventive Medicine., 2009)

It is the hope that as leadership embraces a more comprehensive approach to treating Metabolic Syndrome and patients take an active role in their healthcare; the prevalence of Metabolic Syndrome will decrease in the population served by CMHS. The success of implemented models will serve as a framework for prevention models and treating other conditions prevalent in the African American Community.

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Appendix A

The following is the survey used during the patient encounter of identified patients:

1. How often do you visit the doctor's office? _____

2. How often do you exercise?
   - ❐ Cardiovascular (Walk, Run, Jog)? _____
   - ❐ Strength Resistance (Lift Weights)? _____

3. Do you smoke? Y / N   If Yes, How many packs/day? _____

4. How much Alcohol do you drink? _____ Kind? _____

5. Do you have a family history of ….?
   - ❐ Diabetes (Sugar)
   - ❐ Hypertension (High Blood Pressure)
   - ❐ Hyperlipidemia (High Cholesterol)
   - ❐ Obesity (Overweight)

6. Has your diet changed since you found out you had (Diabetes, HTN, High Cholesterol)? Y / N

   What do you eat everyday? _____

7. Do you know what metabolic syndrome is?

Appendix B

The following is the Power Point presentation used to educate patients about Metabolic Syndrome: