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The Metabolic Syndrome in Diabetic Hispanic Adults and the Role of Secondary Actos Treatment in Insulin Sensitivity Based on Gender

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Abstract

Background: The prevalence of the metabolic syndrome in diabetics is highest among Hispanic adults. A thiazolidinedione antidiabetic agent found in Actos contributes to its mechanism of action. Actos also decreases insulin resistance in margin of the liver, resulting in increased insulin-dependent glucose disposal and decreased hepatic glucose output. This study primarily focuses on the effects of the secondary treatment of Actos on a group of South Texas Hispanics at risk for Type II diabetes; the participants' ages ranged from 22 to 86 years. These results were based on their metabolic syndrome health data and the extent of recovery on the basis of their gender. Multiple regression analyses have been conducted to determine the factors affecting the metabolic syndrome data on the gender after secondary treatment. Some auxiliary analyses pertaining to cholesterol levels and weight vs. gender comparisons have been carried out to show the gender disparity.

Aims and Objectives: The purpose of this study was to establish the prevalence of the metabolic syndrome in the South Texas region and of individual variables which contributed to obesity of Hispanics at risk for Type II diabetes. Patients with the metabolic syndrome have three or more of these risk factors that include excessive abdominal fat, hypertension, low amounts of HDL cholesterol, elevated triacylglyceride levels, and abnormal blood sugar. They are also three-and-a-half times as likely to die from risks associated with coronary heart disease, as well as an increased risk of liver and kidney disease, and possibly cancer. Non-drug treatment programs for metabolic syndrome such as weight loss, dietary changes, and increased physical activity, decreased the incidence of metabolic syndrome by almost 41 percent, whereas the incidence rate among these patients on drug therapy was reduced by

only 17 percent to conclude that there are other options available.

Methods and Experimental Design: A group of individuals comprising of both males and females, had been treated with Actos. Some were administered secondary medication. They were frequently monitored and health data was collected afterwards. Participants in the study were selected by the utilization of a convenience sample technique from those who lived in Laredo, Webb County, Texas, US. Criteria for inclusion included being treated with Actos for metabolic syndrome or diabetes mellitus. The patients were of Hispanic background ranging in age from 22 to 86 with a roughly equal gender representation. Half of the sample was treated with Actos and the other half was not. Data collection included levels of total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triacylglycerides, fasting blood glucose prior to each scheduled visit with the provider every three to four months. Blood pressure, height, weight, and abdominal girth measurements were taken on the scheduled appointment day.

Results and Findings: Statistical analysis was done to determine the gender differences in physical and metabolic characteristics after secondary Actos treatment using the general linear model and other relevant statistical determinations. Some auxiliary analyses have been done to show the effects of secondary medications on weight, cholesterol, as well as on the gender. For each category of data, the percentages of the average metabolic syndrome data reductions using means $\pm$ standard error of means (SEM) among Weight, Girth, B/P (blood pressure), BMI (body mass index), FBS (fasting blood sugar), Chol. (Cholesterol), HDL (high-density lipoprotein), LDL (low-density lipoprotein), and TG (triacylglycerides or Trigl.) were computed. However, the lower B/P reading is noted as more critical than upper reading for the analysis of the individual metabolic syndrome health data. The aggregate test indicator (ATI) was introduced to measure overall benefit from all metabolic syndrome variables.

Conclusion: Data concluded that 8 percent of the participants using ATP III criterion and 11 percent of the participants using WHO criterion as potentially at risk of having metabolic syndrome. It was determined that the secondary treatment helped 77.78 percent of males and 66.67 percent of females. Also 55.56 percent of all subjects without the secondary treatment demonstrated noticeable reduction of metabolic syndrome concluding that the secondary dose of medication was needed for stronger long-term relief from Actos treatment. This secondary treatment was more effective for males than for their female counterparts. Linear correlations between health data appeared more insignificant for males compared to that of females. For all other subjects, regardless of gender, the secondary treatment helped to reduce their metabolic syndrome variables. The aggregate test indicator (ATI), which measures the effectiveness of the secondary medication, showed that males were doing better as compared to females.

Keywords: Metabolic syndrome, Diabetic, Hispanic, Actos, Insulin

Introduction

There are two sets of criterion that determine if a participant has the metabolic syndrome. The recently released Adult Treatment Panel III provided a definition of the metabolic syndrome in adult and emphasized the importance of this syndrome which put individuals at risk for Type II diabetes, cardiovascular diseases, and other life-threatening diseases. According to ATP III criteria (ATP III, 2001), a participant has the metabolic syndrome if he or she meets three or more of the following criteria:

1. Abdominal obesity: waist circumference > 102 cm in men and > 88 cm in women
2. Hypertriglyceridemia: ≥ 150 mg/dl (1.695 mmol/l)
3. Low HDL cholesterol: < 40 mg/dl (1.036 mmol/l) in men and < 50 mg/dl (1.295 mmol/l) in women
4. High blood pressure: ≥ 130/85 mmHg
5. High fasting glucose: ≥ 110 mg/dl (≥ 6.1 mmol/l)

Secondly, the World Health Organization (WHO) has also stipulated the guidelines for diagnosing the metabolic syndrome. According to WHO criteria (Alberti et al., 1998), a participant has the metabolic syndrome if he or she has diabetes, impaired glucose tolerance, impaired fasting glucose, or insulin resistance plus two or more of the following abnormalities:

1. High blood pressure: ≥ 160/90 mmHg
2. Hyperlipidemia: triacylglyceride concentration ≥ 150 mg/dl (1.695 mmol/l) and/or HDL cholesterol < 35 mg/dl (0.9 mmol/l) in men and < 39 mg/dl (1.0 mmol/l) in women
3. Central obesity: waist-to-hip ratio of > 0.90 in men or > 0.85 in women and/or BMI > 30 kg/m^2
4. Microalbuminuria: urinary albumin excretion rate ≥ 20 µg/min or an albumin-to-creatinine ratio ≥ 20 mg/g.

In addition, the International Diabetes Federation (IDF, 2005) has established criteria for someone having the metabolic syndrome (Selig, 2006). Percentages of individuals who are prone to have metabolic syndrome in accordance with ATP III and WHO guidelines are calculated. Table 1 provides the percentages of each criterion that could contribute to someone having metabolic syndrome under these guidelines. From this group, more subjects have the potential of being diagnosed with metabolic syndrome using ATP III criteria rather than WHO criteria.

Table 1: Percentages of each criterion for metabolic syndrome

	ATP III Criterion	WHO Criterion
The Percentage of Participants Identified as having Metabolic Syndrome	B/P - 26% FBS - 8% HDL - 36%	B/P - 4% Trig. - 20%, HDL - 11% BMI - 23%

However, the definition of the metabolic syndrome given by ATP III includes that hyperglycemia does not necessarily meet the criterion for a diagnosis of diabetes (Selig, 2006). Therefore, this study was to establish its prevalence and its individual components relevant to overweight Hispanic adults, to find the role of insulin sensitivity on the metabolic

syndrome data in the secondary treatment option, and whether there is any relationship between the treatment options and the gender. The present study is necessary as previous studies have been conducted to find out the prevalence of metabolic syndrome across ethnic groups (Foldout Feature, 2004).

Identifying Risk Factors

Patients suffering from metabolic syndrome are subjected to three or more risk factors that include excessive abdominal fat, hypertension, low levels of HDL cholesterol, elevated triacylglyceride levels, and abnormal blood sugar. They can die more than three-and a-half times as likely from risks associated with coronary heart disease, as well as an increased risk of liver and kidney disease, and possibly cancer. Generalized metabolic disorder in which the body's inability to use insulin efficiently is closely associated with metabolic syndrome. Even if some people are genetically disposed, others can still develop the syndrome due to physical inactivity and excess body fat. Furthermore, there are non-drug treatments for metabolic syndrome that include weight loss, dietary changes and increased physical activity. A study (Dennison, 2005) found that programs focusing on weight loss and exercise decreased the incidence of metabolic syndrome by almost 41 percent, whereas the incidence rate among patients on drug therapy was reduced by only 17 percent. Accordingly, better dietary and exercise habits are parts of treatment for metabolic syndrome and the prevention of diabetes.

Subjects and Methods

Subjects and Protocol

This study included 44 individuals who lived in Laredo, Webb County, Texas, US, of which 23 were males and 21 were females. Twenty-two of the subjects, 12 males and 10 females, had been treated with Actos; the rest had not been administered any secondary medication. They were frequently monitored and health data was collected afterward. They were all selected by the utilization of a convenience sample technique. Criteria for inclusion included being on Actos for treatment of metabolic syndrome or diabetes mellitus. The patients were of Hispanic background ages ranging from 22 to 86 with a roughly equal gender representation. Half of the sample was taking Actos and the other half were not. Data such as total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triacylglycerides, fasting blood glucose collected prior to each and every three to four months scheduled visit with the provider. Blood pressure, height, weight, and abdominal girth measurements were all taken on the scheduled appointment day.

Actos Treatment

A thiazolidinedione antidiabetic agent found in Pioglitazone (Actos) contributes to its medicinal action. It decreases insulin resistance in the liver, resulting in increased insulin-dependent glucose disposal and decreased hepatic glucose output. Actos also reduces the hyperglycemia, hyperinsulinemia, and hypertriglyceridemia characteristic of insulin-resistant conditions such as Type II diabetes in animal models of diabetes (Actos® Lilly, 2005). The metabolic changes occurred by pioglitazone result in increased responsiveness of insulin-dependent tissues as observed in the models. Actos has not lowered blood glucose level in animal models that lack endogenous insulin. The US Food and Drug Administration (FDA or USFDA) reviewed the safety of medications including troglitazone and reported that 35 patients out of approximately 1.5 million have either died or required liver transplant. As a

result, Rezulin has been removed from the market. Experiments showed that rosiglitaone (Avandia) and pioglitazone (Actos) introduced as alternatives to troglitazone (Rezulin), appear to have low risk of hepatotoxicity. This treatment enhances the ability of smooth muscle to metabolize sugar, thereby reducing insulin resistance. This study analyzes the long-term relief from secondary treatments of Actos administered on patients.

Results

Statistical Analysis

The impact of gender in physical and metabolic characteristics after secondary Actos treatment was examined using the general linear model and other possible relevant statistical determinations. Some auxiliary analyses have been done to show the effects of secondary medications on weight, cholesterol, as well as on the gender.

For each category of data, the percentages of the average metabolic syndrome data reductions using means ± standard error of means (SEM) among Weight, Girth, B/P (blood pressure), BMI (body mass index), FBS (fasting blood sugar), Chol. (Cholesterol), HDL (high-density lipoprotein), LDL (low-density lipoprotein), and TG (triacylglycerides or Trigl.) have been computed in Table 2. For B/P, it might be more informative if analyses were done for each blood pressure reading. However, the lower B/P reading is considered more critical than upper reading; hence, the same is considered for the analysis of the individual metabolic syndrome health data.

Physical Characteristics of Subjects

Table 3 shows the physical and metabolic characteristics of subjects based on their gender after secondary treatment of Actos medication similar to findings of (Cruz et al., 2004). In this regard, means and standard error of means (SEM's) are calculated for each gender group with or without secondary treatment of Actos medication.

Table 2: Physical and metabolic characteristic of subjects (gender vs. treatment)

	Females with Actos	Females w/o Actos	Males with Actos	Males w/o Actos
Age (yr)	63.8 ± 4.5	64.2 ± 6.3	66.2 ± 4.3	51.4 ± 5.4
Height	63.4 ± 1.2	63.4 ± 1.5	64.8 ± 1.3	64.3 ± 2.5
Weight	146.2 ± 17.9	141.7 ± 7.3	166.2 ± 7.6	185.0 ± 10.1
Girth	36.3 ± 2.1	37.7 ± 1.4	37.9 ± 1.1	39.5 ± 0.8
B/P (Lower)	118.8 ± 2.8	128.2 ± 5.1	114.8 ± 5.2	121.3 ± 3.9
BMI	25.6 ± 2.9	25.0 ± 1.3	28.6 ± 1.2	26.2 ± 1.6
FBS	86.6 ± 7.0	103.6 ± 11.5	94.0 ± 2.3	98.6 ± 8.5
Chol.	175.6 ± 9.9	202.6 ± 13.6	160.8 ± 7.3	163.3 ± 8.1
HDL	57.6 ± 5.5	54.6 ± 4.7	47.8 ± 5.5	48.2 ± 6.0
LDL	95.9 ± 7.5	127.0 ± 10.8	89.8 ± 6.6	104.8 ± 13.0
TG (Trigl.)	96.0 ± 8.4	121.1 ± 6.8	121.4 ± 10.5	142.9 ± 28.3

Values are: means ± SEM's. For gender: $p < 0.05$

The treatment is considered effective if either mean or SEM decreases following the secondary dose of medication. Besides age and height, the table shows that the treatment is 66.67 and 100 percent effective for females and males, respectively. Actos treats males more

effectively.

Prevalence of Features of the Metabolic Syndrome

Table 3 gives a summary of the individual syndrome data improvement following the secondary treatment of medication.

Table 3: Summary of syndrome data improvement

	W/O *Actos* Treatment	With *Actos* Treatment
Male	55.56%	77.78%
Female	55.56%	66.67%

It revealed that the secondary treatment helped 77.78 percent of males, 66.67 percent of females, and 55.56 percent of all individuals without the secondary treatment to improve metabolic syndrome; thus, concluding secondary dose of medication is necessary for a greater relief. Table 3 shows that there is an improvement of metabolic syndrome following the Actos treatment on the adults; this reduction is larger for males than for their female counterparts. The results are gender independent if there is no secondary treatment of medication.

Simple and Partial Correlation between Actos Treatment and the Metabolic Syndrome Data

Multiple regression analysis allows researchers to address the relationships among variables (Polit, 1996). Multiple linear regression analysis is used to access the independent contribution of Actos treatment to each metabolic syndrome variable (Shannon & Davenport, 2001). A partial correlation is the portion of a bivariate correlation that remains after the influence of a third variable has been removed.

The first outputs which appear in Tables 5 and 6 summarize the results of relationships between various syndrome data such as Weight, Girth, B/P, BMI, FBS, Cholesterol (Chol.), HDL, LDL, and TG (Trigl.). The Pearson correlation coefficient for Chol. and HDL is 0.57237, indicating a moderate positive correlation between Chol. and HDL. The square of 0.57237 is 0.3276; thus, the coefficient of determination is approximately 33%. That is, approximately 33 percent of the variance in Chol. can be attributed to HDL, or vice versa. A correlation exists between Chol. and HDL, however, this relationship is not as strong as the one we have seen for BMI and Weight. The correlation matrix for female subjects and metabolic syndrome health data after secondary treatment of Actos is shown in Table 4:

Table 4: Correlation matrix for multiple regression for females

	Age	Height	Weight	Girth	B/P	BMI	FBS	Chol.	HDL	LDL	TG
Age	1										
Height	0.18394	1									
Weight	-0.57746	0.23927	1								
Girth	-0.30806	0.52113	0.91655‡	1							
B/P	0.15000	0.30496	-0.29830	-0.13653	1						
BMI	-0.63489†	-0.01232	0.96584‡	0.80361‡	-0.43336	1					
FBS	-0.26146	-0.12295	0.20532	0.19994	-0.20160	0.25072	1				
Chol.	0.12438	-0.13467	-0.18257	-0.19570	0.11590	-0.16919	-0.44670	1			
HDL	0.51443	-0.42140	-0.80525‡	-0.77821‡	0.28290	-0.73555†	-0.54078	0.57237	1		
LDL	-0.16689	0.15135	0.25951	0.24789	0.22896	0.18571	-0.14496	0.84987‡	0.01014	1	
TG	-0.36052	0.31485	0.71270†	0.50767	-0.17284	0.52027	-0.00610	0.15831	-0.54654	0.37758	1

†. Correlation is significant at the 0.05 level (2-tailed).
‡. Correlation is significant at the 0.01 level (2-talied).

Similarly, the correlation matrix for male subjects and metabolic syndrome health data after secondary treatment of Actos is shown in Table 5:

Table 5: Correlation matrix for multiple regression for males

	Age	Height	Weight	Girth	B/P	BMI	FBS	Chol.	HDL	LDL	TG
Age	1										
Height	0.00207	1									
Weight	-0.11512	0.55230	1								
Girth	0.10433	-0.07623	0.72542†	1							
B/P	0.74407‡	0.06747	-0.16744	-0.29251	1						
BMI	-0.17492	-0.39121	0.54635	0.82508‡	-0.33160	1					
FBS	0.30338	-0.29257	0.10345	0.64637†	-0.14275	0.45221	1				
Chol.	0.13999	0.79225‡	-0.01802	-0.36600	0.34308	-0.65791†	-0.25555	1			
HDL	0.04524	0.28071	0.12250	-0.15191	0.41660	-0.08396	-0.11929	0.35627	1		
LDL	0.34925	0.66333†	-0.05200	-0.25062	0.27590	-0.65113†	-0.15226	0.80327‡	-0.19918	1	
TG	-0.61179†	-0.07375	0.03938	0.00171	-0.60055†	0.12735	-0.16829	-0.04029	-0.62211†	0.12333	1

†. Correlation is significant at the 0.05 level (2-tailed).
‡. Correlation is significant at the 0.01 level (2-talied).

A significant problem in multiple regression occurs when there is a very high correlation between some of the predictor variables. The best solution is to determine the cause of multicollinearity and avoid them. For females, there are high correlations among variables: Weight/Girth, Weight/BMI, and LDL/Chol., and for males: Weight/BMI, LDL/Chol. Chol and FBS are negatively correlated, suggesting that as FBS decreases, the faster it varies with Chol. Tables 4 and 5 show the correlation matrices for both females and males, and these comparisons are more insignificant for males than females under secondary treatment. The most important aspect to notice from these tables is that the correlation is significant if it is greater than 0.111.

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Further Auxiliary Analyses

The weight comparison before and after the secondary medication revealed that they are linearly correlated with a strong correlation coefficient ($r = 0.9982$) for primary data with medication vs. secondary data with or without medication.

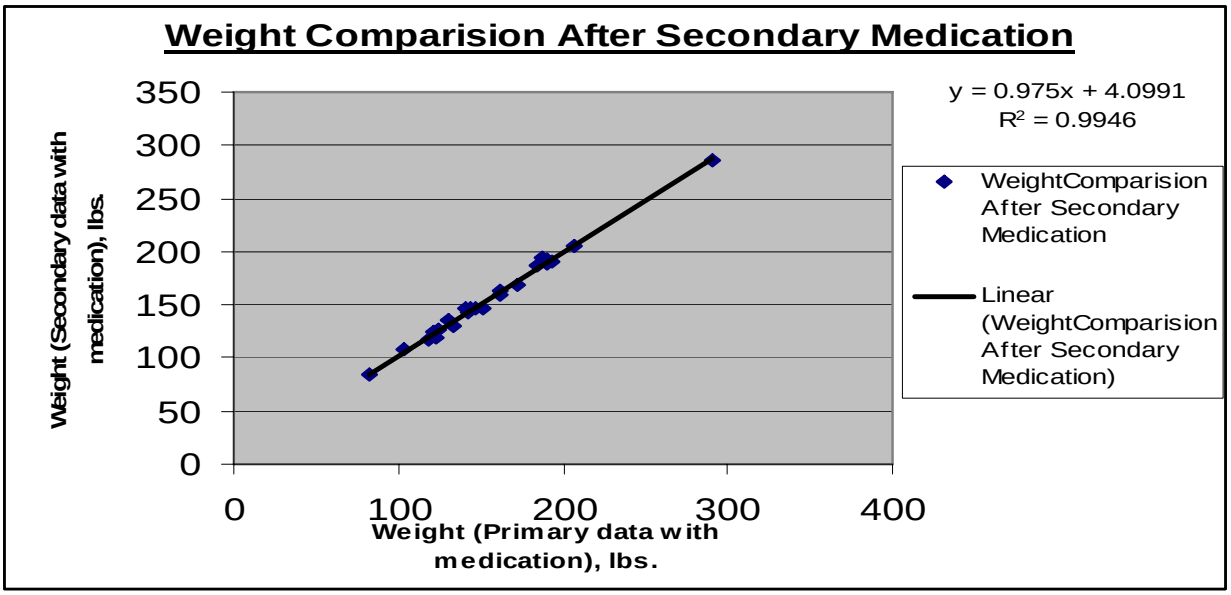

Figure 1: Weight comparison with secondary medication

Further comparison of weight in the absence of secondary dose had the same result as that of those with secondary dose. This time, the linear correlation coefficient was 0.9833 ($r = 0.9833$).

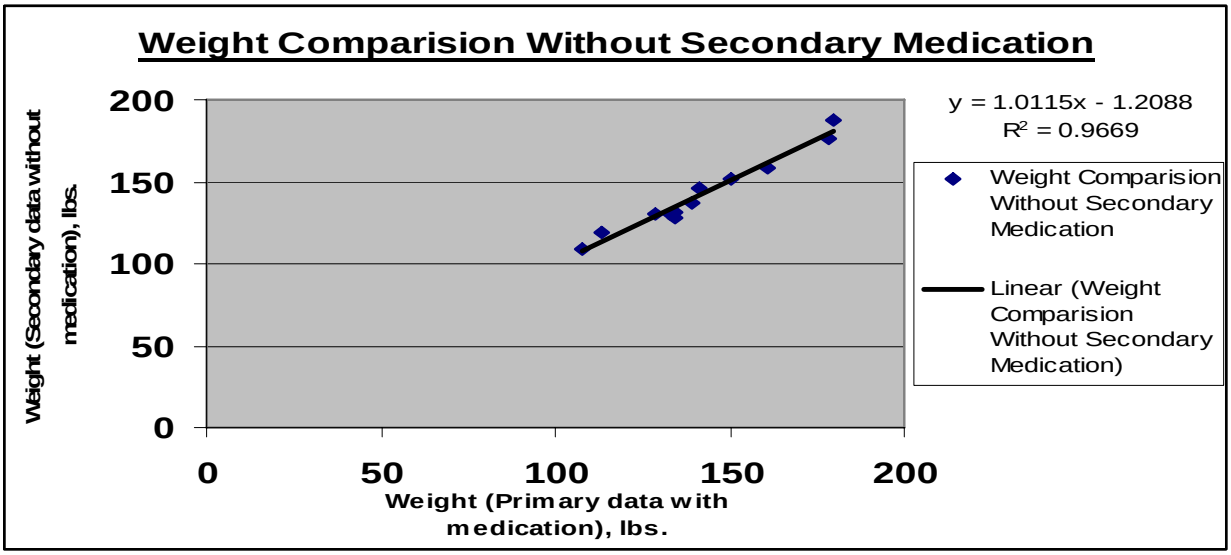

Figure 2: Weight comparison without secondary medication

Regression Analysis and Correlation

A total of 35 subjects were divided into two groups on the basis of administration of secondary medication. Two scatter-plots have been drawn for their weights before and after (the observation period) for the two groups. The results concluded from these two graphs are summarized below. Similar analyses can be done for other metabolic syndrome data.

1. There was a weight gain (at 1.0115) for the (12) subjects not administered secondary medication compared to a weight gain at a lower rate (at 0.975) for the (23) subjects administered secondary medications. This concluded that the administration of secondary medication was necessary for the subjects to maintain a successful body weight.
2. Weight comparison of the subjects before and after the secondary medication was strongly linear (coefficient of determination $R^2 = 0.9946$) when compared to that of the subjects not administered secondary medication (coefficient of determination, $R^2 = 0.9669$) .

Chi-Square Test of Independence (vs. Multiple Regression)

Many major methods that address the entire period are bivariate correlation and regression, multiple regression, factor analyses, and chi-square. The use of nonparametric methods is on the rise, although the frequency of their occurrence is still low. Special autocorrelation and advanced multiple regression appear to be new to the discipline. The chi-square (χ^2) distribution is of interest both because of its role in data analyses and its relation to the normal, *t* and *F* distribution. This test will serve as a hypothesis test to decide whether two variables, namely, weight gain/loss, and gender are associated. Assumptions are:

1. All expected frequencies are 1 or greater
2. At most 20 percent of the expected frequencies are less than 5
3. Simple random sample

Since the size of the sample was small; all possible chi-square tests did not satisfy the three assumptions above. A group of 23 subjects administered secondary medication was analyzed using this test. The null and alternative hypotheses were:

H_0: Weight gain/loss and gender are not associated.

H_a: Weight gain/loss and gender are associated.

Table 6: Contingency table for weight and gender

	Male	Female	Total
Weight loss or equal	5	5	10
Weight gain	7	6	13
Total	12	11	23

$$\chi^2 = \frac{(5-5.22)^2}{5.22} + \frac{(5-4.78)^2}{4.78} + \frac{(7-6.78)^2}{6.78} + \frac{(6-6.22)^2}{6.22} = 0.0269$$

$\chi^2_{0.05}|_{df=1} = 3.841$.

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From this test, we concluded not to reject the null hypothesis, H_0. Thus, at the 5 percent significance level the data did not provide sufficient evidence to conclude that an association existed between weight gain/loss and gender after secondary medication. Similar analysis can be done for other pairs of metabolic syndrome data if they satisfy the three assumptions, 1, 2, and 3.

Analysis of Cholesterol Levels vs. their Gender

The level of cholesterol became a much discussed topic among the visits to the physicians. Therefore, the level of Cholesterol among the subjects and their gender was worth studying. Cholesterol (Chol.) levels of the subjects before and after secondary medication were analyzed on the basis of their gender using the line graphs in Figures 3 and 4. First this was done for males and then, for females. Figures 3 and 4 represent the analyses for males and females.

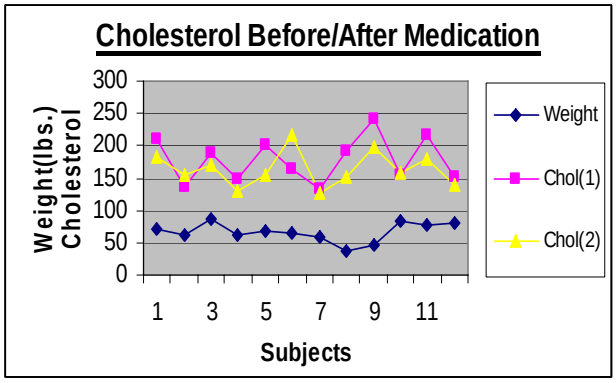

Figure 3: Cholesterol levels vs. males

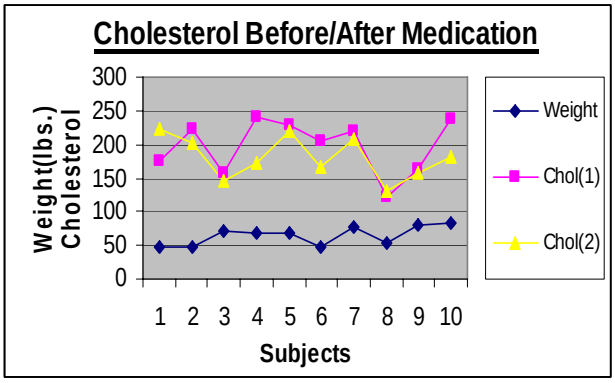

Figure 4: Cholesterol levels vs. females

The two line graphs showed that there was a slight increase in the cholesterol level after the subjects were administered secondary dose before the levels started falling. This characteristic was independent of gender. This increase diminished as the ages of the subjects increased.

Aggregate Test Indicator (ATI)

We wanted to find out how the subjects did on average in terms of metabolic syndrome variables. Hence, an aggregate test indicator in short (ATI) was introduced. The following value assignments were made on the basis of: +1 signifying that there was an increase of test data, -1 signifying that there was a decrease of test data, and 0 signifying that there was no change in test data. +2, -2, +1, -1, and 0 were assigned if there were changes in low and high readings of data in B/P. For LDL, + 1 was for a decrease and -1 was for an increase were assigned, accordingly. Note that the scale above may be improved on considering the extent of individual effect. That is, +1 $\Rightarrow \uparrow$, -1 $\Rightarrow \downarrow$, and 0 $\Rightarrow$ if, no change. If the changes in health set are $X_1, X_2, X_3, X_4, \cdots, X_{n-1}, X_n$, then the aggregate test indicator for n indicators was defined by $ATI = \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \cdots + \alpha_{n-1} X_{n-1} + \alpha_n X_n$. We chose $\alpha's$ to be +1$\Rightarrow \uparrow$, -1 $\Rightarrow \downarrow$, and 0 $\Rightarrow$ if, no change. (These $\alpha's$ may be improved). Aggregate test indicator (ATI) for all subjects (males and females) after secondary dose of medication were

computed in Table 7.

Table 7: Sign chart for all subjects after secondary dose of medication

Subject	1	6	8	10	11	12	13	15	16	17	18	21	24	28	30	32	33	34	35
Weight	-1	+1	+1	+1	0	+1	+1	+1	-1	-1	+1	+1	+1	+1	-1	-1	+1	+1	-1
Girth	-1	+1	-1	+1	0	+1	+1	+1	-1	+1	0	+1	-1	+1	+1	-1	+1	-1	+1
B/P	0	-1	-2	0	+1	+1	+1	+1	0	-2	+2	0	0	+1	0	0	0	-2	0
BMI	-1	+1	+1	+1	0	+1	+1	+1	-1	-1	+1	-1	+1	-1	-1	-1	+1	+1	-1
FBS	+1	-1	+1	-1	-1	-1	0	0	-1	-1	+1	+1	+1	-1	+1	+1	-1	+1	+1
Chol.	-1	-1	-1	-1	-1	-1	-1	-1	+1	-1	+1	-1	-1	-1	-1	+1	-1	-1	-1
HDL	+1	+1	-1	-1	-1	-1	+1	+1	+1	+1	+1	-1	-1	-1	-1	-1	-1	+1	-1
LDL	-1	-1	-1	-1	-1	-1	-1	-1	+1	-1	+1	-1	+1	-1	-1	+1	-1	-1	-1
TG	-1	+1	-1	+1	-1	+1	+1	-1	+1	-1	0	-1	-1	+1	+1	+1	-1	-1	+1
ATI	-4	+1	-4	0	-4	+1	+4	+2	0	-6	+8	-2	0	-1	-3	0	-2	-2	-2

Figure 5 depicts individual indicators for all subjects (males and females). The columns above the horizontal axis indicates favorable reductions of health variables, and the columns that appear below the axis are unfavorable. We computed the average of these variables to determine aggregate test indicator. These columns were identified on the basis of the individual's gender and age as listed at the bottom of each column in Figures 5, 6, and 7.

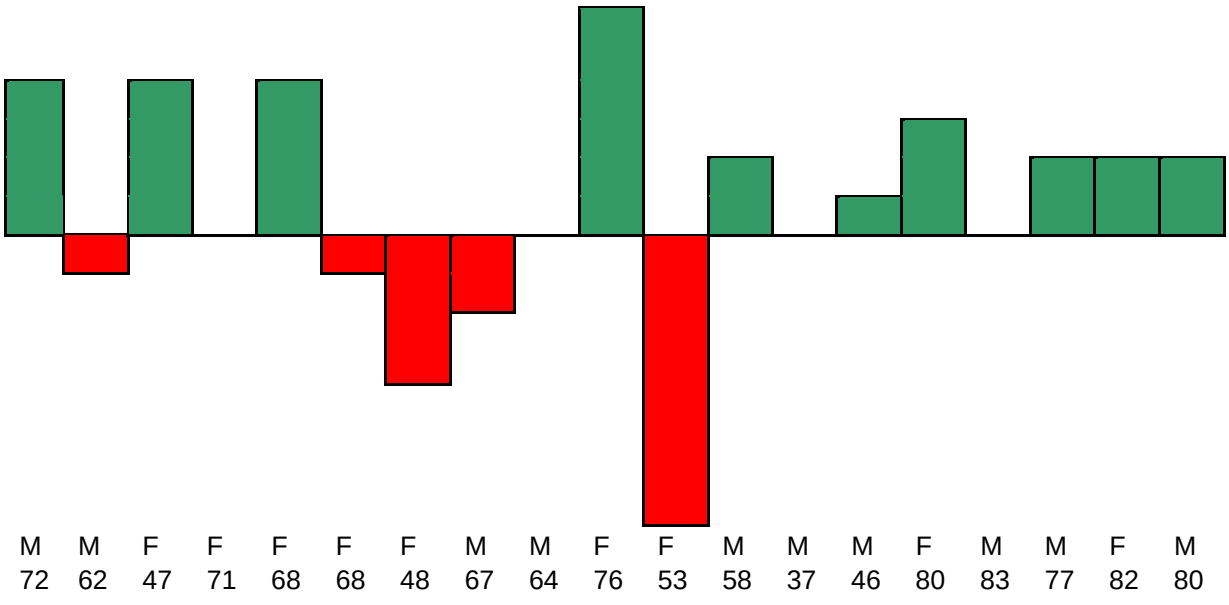

Figure 5: Test indicators for all subjects (males and females)

The mean of the aggregate test indicator for all subjects (males and females) was:

$$\frac{(-4)+(+1)+(-4)+(0)+(-4)+(+1)+(+4)+(+2)+(0)+(-6)+(+8)}{+(-2)+(0)+(-1)+(-3)+(0)+(-2)+(-2)+(-2)}{19} = \frac{-14}{19} = -0.74$$

Thus, on average, the aggregate test indicator decreased as secondary medication was administered. Medication was effective as there was a reduction of the aggregate test indicator for all of the subjects. Figure 6 is for male subjects.

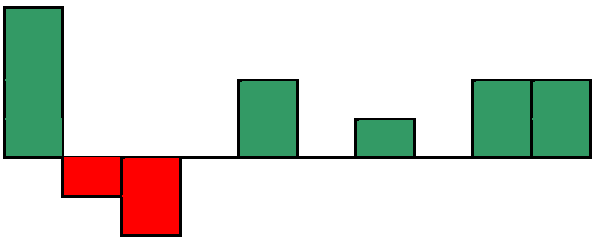

Figure 6: Test indicators for males

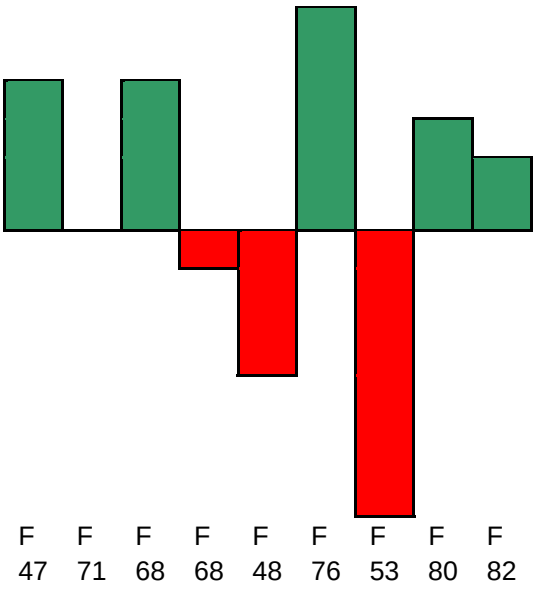

Figure 7: Test indicators for females

The mean of aggregate test indicator for males was 0.80. Thus, aggregate test indicator decreased for male after administration of secondary medication. Secondary medication was effective as there was a reduction of the aggregate test indicator for the male subjects. Figure 7 is for female subjects. The mean of aggregate test indicator for females was 0.67. Thus, the aggregate test indicator decreased for female after administration of secondary medication. Secondary dose of medication was effective as there was a reduction of aggregate test indicator for females.

Discussions and Conclusions

The purpose of this study was to establish the prevalence of the metabolic syndrome in the South Texas region and of individual variables which contributed to the obesity of Hispanics ranging from 22 years to 86 years of age (at risk for) Type II diabetes. According to the data, 8 percent of the participants using ATP III criterion and 11 percent of the participants using WHO criterion can be identified as potentially having metabolic syndrome. Individual physical characteristics determined that the secondary treatment helped 77.78 percent of

males, 66.67 percent of females, and 55.56 percent of all subjects without the secondary treatment to reduce metabolic syndrome data. Accordingly, the secondary dose of medication was needed for stronger long-term relief from Actos treatment. This was more effective for males than for their female counterparts.

It was necessary to find any relationship among Girth, B/P, BMI, FBS, Cholesterol (Chol.), HDL, LDL, and TG (Trigl.) with one another in determining Weight. This occurs when the predictors are highly correlated; however, multicollinearity could be an issue. One way of checking multicollinearity is to regress each predicator variable, in turn, against all other predictors and to examine the R^2 values. If the R^2 value goes above 90 percent multicollinearity, it is said to be a problem. We compared the results from bivariate and multivariate regressions. It is safe to conclude that our analysis was free of any possible multicollinearity effect except for males: Girth/BMI, Chol./LDL, and for females: Weight/Girth, Chol./LDL, Weight/BMI. Tables 5 and 6 present the intercorrelation among the criterion variables. Furthermore, for males, correlations in between health data apparently were more insignificant compared to that of females. The metabolic syndrome health variables displayed have substantially strong correlations with one another; if linear correlation coefficients, r's were between 0.60 and 0.80, they were significant beyond the 0.01 level. This study showed that there was a reduction of metabolic syndrome data following the secondary dose of Actos treatment in the adults. These reductions were higher for males than their female counterparts. Furthermore, for the two gender groups considered in the study, there was a weight gain (at 1.0115) for the 12 subjects not administered secondary medication, compared to a weight gain at a lower rate (at 0.975) for the (23) subjects administered secondary medications. This means that the administration of secondary medication was necessary for subjects to maintain a successful body weight of the subjects. Weight comparison of the subjects before and after the secondary medication was strongly linear (coefficient of determination, $R^2 = 0.9946$) compared to that of the subjects not administered secondary medication ($R^2 = 0.9669$).

The chi-square (χ^2) test of independence conducted for the data showed that, at the 5 percent significance level, the data did not provide sufficient evidence to conclude that an association existed between weight (gain/loss) and gender after medication. However, there was a slight initial increase in the cholesterol level after the subjects were administered secondary medication before it started decreasing. This characteristic was gender independent and the increase got smaller as the ages of subjects increased. For all other subjects, regardless of gender, the secondary treatment helped to reduce their metabolic syndrome variables. The aggregate test indicator (ATI) which measures the effectiveness of the secondary medication showed that males are doing better as compared to females.

Further Analyses and Remedial Actions

Since the sample size for each category in the study was $n = 11$, the correlation was significant if it is greater than 0.111. It is possible that multicollinearity made the regression coefficients unstable and unreliable. The $t-$value and the standard error may change depending upon which other predictors were in the model. The impact of multicollinearity can be reduced by increasing the sample size.

This study suggested an effective intervention for the prevention of chronic disease in patients based on their gender and secondary dose of medication. It was concluded that poverty-struck women in the age group 15 to 49 years had greater health status than their wealthy counterparts in a country like Jamaica. The poverty is synonymous with rural area and women, and in spite of this reality this study revealed that the secondary treatment was more effective for males than for females even though this disparity still may exist (Bourne & Rhule, 2009). The results from this sample of Hispanic adults from the South Texas region who were at risk for Type II diabetics showed that the metabolic syndrome was highly prevalent. Thus, interventions with individuals who have metabolic syndrome may have important implications for the healthcare sector and its staggering cost in treatment and prevention. However, a long-term study is needed to solidify these findings with a larger cohort of patients and more follow-up monitoring.

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