BIOCHEMICAL DIFFERENCES IN ETHNIC GROUPS IN DURANGO, MEXICO

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Objective: The aim of this study was to assess biochemical differences between Tepehuano indigenous people, and Mennonite and Mestizo populations of Durango, Mexico.

Methods: Our study involved 334 volunteers aged 15 to 80 years; 132 Mennonite and 130 Mestizo individuals from Nuevo Ideal Municipality and 72 Tepehuano indigenous people from Mezquital Durango were evaluated. A clinical history and fast determination of aspartate aminotransferase (AST), alanine aminotransferase (ALT), uric acid, urea and creatinine were performed on each studied case.

Results: Statistically significant differences between the three studied groups were found for age, weight and height ($P<.05$), with higher values observed in men. The highest plasma urea levels were found in Mennonite compared to Mestizo people, followed by the Tepehuano indigenous. Higher biochemical parameters were found in men (vs women) in the studied groups. The percentage of individuals with abnormal levels for AST, ALT and uric acid were higher in Tepehuano indigenous people than in Mestizo, whereas the urea and creatinine percentages were higher in Mestizo people.

Conclusion: The differences found on biochemical tests, could be explained by differences in lifestyle such as diet and sanitary habits. (*Ethn Dis.* 2012;22(1):102–105)

Key Words: Clinical Biochemistry, Ethnic Groups, Renal and Hepatic Functions

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INTRODUCTION

Different ethnic groups are at a higher risk of certain diseases and health problems.[1] Such diseases are the result of interactions between environment and susceptibility genes. Some studies have been conducted demonstrating the usefulness of racial and ethnic categories in epidemiological and clinical research. These studies attempt to generate and explore hypotheses regarding the impact of interactions between genetic and environmental factors for disease development.[2]

Evidence suggests that ethnic composition, together with environmental and pathophysiological factors, generates differences in clinical and biochemical parameters. Pendino et al[3] conducted a study on the population of Cittanova in Italy, comparing the differences in the nutritional habits of this and all other populations in Italy and their influence on the observed differences for aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels. They found the alcoholics from Cittanova had higher levels of these hepatic enzymes.

It has been established that chronic kidney disease is related to low hemoglobin concentrations, as well as changes in the concentration of sodium, potassium, calcium, phosphate, bicarbonate and hydrogen ions.[4] The presence of chronic kidney disease is increasing in all ethnic groups, especially in ethnic minorities primarily due to an increase in cardiovascular and renal risk factors such as obesity, diabetes mellitus, metabolic syndrome, hypertension, and others.[4]

Wickramasinghe et al[5] demonstrated differences in levels of AST and ALT between Asian and European men with a record of alcoholism, concluding that the former could be much more susceptible to organ damage induced by hemoglobin-ethanol modification, compared with Europeans.

Lim et al[6] reported differences in the evolution of hepatitis to hepatic cirrhoses in African Americans, compared with that observed in the White population. They noted that 85% of African Americans had an earlier onset and a more severe condition of liver cirrhosis that was observed in only 38% of the Caucasian population studied. Both groups responded well to therapy with a significant reduction in AST and ALT levels.

Interethnic differences have been reported in the anemic state,[7] without an underlying genetic cause to explain it. When a much more strict control of genetic and epigenetic variables is applied, the reported differences tend to disappear.[8] African Americans have lower concentrations of serum hemoglobin than White North Americans as well as a higher globular sedimentation speed of serum ferritine. However, these differences were related to social class rather than ethnic differences.[8] Williams[9] pointed out that such differences can not be explained either by differences in copper, iron or zinc levels.

Carmel et al[10] studied different ethnic groups looking for differences in total bilirubin levels in healthy patients vs patients with pernicious anemia, confirming higher levels in men than in women. Likewise African

Table 1. Median, minimum and maximum demographic values for three ethnic groups in Durango, Mexico

Intergroup comparison					
		Mennonites	Mestizo	Tepehuano indigenous	
Variable		*n*=132	*n*=130	*n*=72	*P*[a]
Age, years		39 (18–82)	45 (16–80)	25 (15–65)	<.001
Weight, kg		81.5 (44–148)	75 (45–117)	56.5 (40.5–137.5)	<.001
Height, m		1.70 (1.52–1.97)	1.61 (1.47–1.96)	1.58 (1.48–1.78)	<.001
Comparisons according to sex					
Variable	**Sex**	**Mennonites**	**Mestizo**	**Tepehuano indigenous**	***P*[a]**
Age, years	Women	39 (18–82)	42 (16–77)	28 (15–65)	ns
	Men	39 (19–80)	46 (22–80)	20 (15–54)	
Weight, kg	Women	81 (44–148)	70 (45–107)	54.5 (40.5–85.5)	<.001
	Men	82 (60–144)	83 (50–117)	57.8 (46.5–138)	
Height, m	Women	1.62 (1.52–1.77)	1.58 (1.47–1.82)	1.55 (1.48–1.68)	<.001
	Men	1.78 (1.57–1.97)	1.74 (1.58–1.96)	1.67 (1.54–1.78)	

[a] Variance analysis Kruskal Wallis.

Americans have average lower bilirubin levels than Whites, with results more pronounced in women than men for both healthy patients and patients with pernicious anemia. Finally Punyadeera et al[11] demonstrated a greater content of fat for White obese women than for Black obese women, which could induce a higher lipid postprandial profile and a faster atherogenesis.

Few, if any, comparative reports that assess the differences in biochemical parameters in ethnic groups of Durango State in Mexico exist in the literature. We evaluated AST, ALT, uric acid, urea and creatinine levels in Tepehuano, Mestizo and Mennonite populations of Durango State in order to determine biochemical markers to predict the appearance of health problems based on ethnicity.

MATERIAL AND METHODS

Studied Populations and Data Sources

Three hundred and thirty four volunteers were included in the study; 130 Mestizo from Nuevo Ideal Municipality, 72 Tepehuano indigenous from Mezquital Municipality, and 132 Mennonites from Nuevo Ideal Municipality. All were from Durango State with a local ancestry of at least three generations in the last two groups. The study sample included men and women aged 15 to 80 years.

Clinical history and anthropometric measures were taken of all study participants. At the same time 10 mL of peripheral blood after 12 hours of fasting was obtained for plasmatic determination of AST, ALT, uric acid and creatinine.

Ethical Aspects

Protocol was authorized by Ethical and Research Committees of Hospital General de Durango SSA. Volunteers were informed in their language about the nature of the study; they provided their authorization to participate in the study in an informed consent document.

Analytical Methods

Aspartate aminotransferase, ALT, uric acid, urea and creatinine analytical determinations were performed by specialized personnel, employing an Abbott™ Automated Clinical Biochemical Equipment, Spectrum Series II (Abbott Park, IL), using reactives of the same commercial brand.

Validation and Quality Control

Aspartate aminotransferase (reference values 15–46 U/L);[12] the assay was lineal until 500 U/L. The sample was stable for 7 days at 2–8°C. ALT (reference values 11–66 U/L);[12] the assay was lineal until 500 U/L. The sample was stable for 3 days at 2–8°C. Creatinine (reference values 0.7–1.5 U/L);[12] the sample was stable for 24 hours at 2–8°C. Uric acid (reference values 2.4–7.0 mg/dL);[12] the assay was lineal until 25 mg/dL. The sample was stable for 7 days at 2–8°C. Urea (reference values 15–43 mg/dL);[12] the assay was lineal until 300 mg/dL. The sample was stable for 7 days at 2–8°C. In all cases precision and exactness tests were performed considering the variation coefficient less than 5%; likewise calibration curves were done for each employed kit.

Statistical Analysis

Biochemical differences between ethnic groups were compared using the values for median and ranges with the Kruskal-Wallis test[13] based on, asymmetric distribution and wide data dispersion of values. A value of $P<.05$ was considered statistically significant.

RESULTS

Table 1 shows the median, minimum and maximum values for chronological age, weight and height parameters. Differences for these values between

Table 2. Comparison of medians, minimum and maximum values for different biochemical parameters in three ethnic groups from Durango, Mexico

	Mennonites	Mestizo	Tepehuano indigenous	
Biochemical Test	***n*=132**	***n*=130**	***n*=72**	***P***
AST, UI/L	18.0 (5–48)	18.0 (7–123)	30.5 (17–71)	<.001[a]
ALT, UI/L	15.0 (.7–03)	16.0 (4–120)	37.5 (18–100)	<.001[a]
Uric acid, mg/dL	4.65 (1.7–16.2)	4.0 (1.3–17.1)	5.0 (3.1–8.8)	<.001[a]
Urea, mg/dL	29.5 (13–56)	27.0 (12.3–116)	19.3 (8.6–42.8)	<.001[a]
Creatinine, mg/dL	.8 (.3–1.8)	.8 (.4–5.2)	.7 (.5–1)	<.021[a]

[a] Variance analysis Kruskal Wallis.

groups are expressed as *P* value (statistical significance). Mennonites presented the highest values for weight and height (81.5 kg and 1.70 m) compared to the Mestizo (75 kg and 1.61 m) and Tepehuano indigenous populations (56.5 kg and 1.58 m) ($P<.001$).

Table 1 also shows the comparison of median values for chronological age, weight and height among the three ethnic groups by sex. The youngest population was the Tepehuano indigenous group; however, no statistically significant differences for age were observed between the three analyzed groups. All three populations showed higher median values for weight in men than in women. Weight was slightly lower for Mestizo women (70 kg) compared to Mennonite women (81 kg), whereas indigenous women's weight (54.5 kg) was significantly lower than Mennonites and Mestizo women. No significant differences were seen for weight between Mennonite and Mestizo males, but a significant difference was noted with regard to the male indigenous population vs the two other populations. Differences in height between males and females were evident independent of ethnic group. Height was significantly lower for males (1.67 m) and females (1.55 m) from the indigenous population, compared to both sexes in Mestizo (male=1.74 m, female=1.58 m) and Mennonite populations (male=1.78 m, female=1.62 m) ($P<.001$).

Table 2, shows the comparisons of median, minimum and maximum values for all studied biochemistry tests in the three ethnic groups. All parameters showed statistically significant differences ($P<.001$). The values of AST and ALT were similar between Mennonites (18 UI/L AST and 15 U/L ALT) and Mestizos (18 UI/L AST and 16 UI/L ALT); however, the Mestizo group had a wider range of variation. The indigenous population showed very high median values for AST (30.5 UI/L) and ALT (37.5 UI/L), nearly doubling the observed values in the Mennonite and Mestizo populations.

Table 2 also shows that uric acid values were slightly higher for the indigenous population (5.0 mg/dL), but with less variation than the values observed for the Mennonite (4.65 mg/dL) and Mestizo populations (4.0 mg/dL). The corresponding median values for urea were higher in the Mennonite (29.5 mg/dL) and Mestizo populations (27 mg/dL) in comparison to the indigenous population (19.3 mg/dL). Median values for creatinine were very similar between groups with a wider range of variation in the Mestizo population (.4–5.2 mg/dL).

The indigenous population had a higher percentage of individuals with abnormal levels of AST and ALT (7% for both values) compared to the Mestizo population (5% for both values) and Mennonite populations (0 and 2%, respectively). We also found abnormal values for uric acid in 11% of the indigenous, 8% of the Mennonite and 6% of the Mestizo populations; abnormal values for urea appeared in 7% of the Mestizo population, 2% in the Mennonites but in none of the indigenous participants. Only 1 Mestizo was found with abnormal values of creatinine.

DISCUSSION

The results of this study demonstrate the interethnic differences with regard to biochemical tests on fasting state concentrations for AST, ALT, uric acid, urea and creatinine. Belonging to an ethnic group was not sufficient to affect the biochemical parameters studied, which are strongly influenced by lifestyles, geographical location and health status of individuals of each ethnic group. The evaluation of patients with elevated transaminases is a regular problem in the clinical practice; many of these cases are accidentally detected on preoperatory studies, during blood donations or through medical checking.[14] The most common biochemical status is the increase of transaminases in a previously asymptomatic patient as observed in one case in our study. In these circumstances, it is recommended

The differences found for levels of uric acid, urea and creatinine in our participants may be explained by differences in hygienic and dietary habits and certainly by lifestyle.

to confirm hypertransaminasemia after 6 to 8 weeks. If hypertransaminasemia is prolonged, hepatic diseases as well as non-hepatic causes, should be considered.

The differences found for levels of uric acid, urea and creatinine in our participants may be explained by differences in hygienic and dietary habits and certainly by lifestyle. The Mennonite population is characterized by a diet high in fat and protein found in dairy derivatives; the Mestizo people, besides having a high fat and meat intake, consume significant amounts of carbohydrates and have a more sedentary lifestyle. The indigenous people have a very poor diet (mostly protein and fat) but have a high level of physical activity due to their environment. We found the highest levels of AST, ALT and uric acid among the indigenous people. These higher levels may be caused by diet and exercise factors mentioned above along with other risk factors such as poverty and social margination of the indigenous people. The increased levels of AST and ALT could also be the consequence of high alcohol consumption. In a previous study by the authors, similar findings for hypertransaminemia were reported for Asians and Europeans.[5]

Early detection of diseases through the use of functional biochemical markers is important for improving the health of patients.[15] For our study and according to the commitment made to study participants, those who were found to have abnormal biomarkers were referred to specialist and other state health services. Also, based on our results for the indigenous population, we recommended routine testing for AST, ALT, and uric acid levels in Tepehuano adults who visit a hospital to assess their health.

In this study it was not possible to determine genetic ancestry and to predict whether an individual carried specific genetic risk factors that could influence renal or hepatic damage. In this sense Bamshad et al[16] established that making accurate ancestry inferences is crucial to evaluating common diseases and drug responses that are influenced by gene variants known to differ in frequency between racial groups.[17,18] Similar to research demonstrating the benefits of understanding ethnicity impact on cardiovascular disease,[19] ethnicity should be considered when searching for risk factors associated with the development of hepatic and renal diseases.

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AUTHOR CONTRIBUTIONS

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