

# Relation of Race and Sex to the Frequency of Local Tissue Changes Suggestive of Malnutrition

## The Five Year Experience of a District Health Center Nutrition Clinic in New York City

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THE CLINICIAN'S awareness of host factors in the causation of disease is evidenced in classic as well as contemporary descriptions of nutritional disorders.<sup>1-11</sup> The occurrence of physical signs commonly associated with malnutrition appears related to such constitutional characteristics as sex, race, age and body weight.<sup>12-22</sup> A previous report from this clinic<sup>24</sup> discussed relationships between local tissue changes and the parameters of age and body weight. The present study is concerned with relationships of these lesions to the patient's race and sex.

### MATERIALS AND METHODS

The study population and general procedure have been described in the earlier report. Records were analyzed for 3,431 of the 3,500 consecutive patients representing the first five years' of nutrition clinic experience. Of 2,729 patients of both sexes and all ages, 2,076 were white, 307 Negro, 328 Puerto Rican† and eleven of unidentified ancestry. Of a separate subgroup of 702 pregnant women, referred

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† The term "race" is loosely employed in this report. Puerto Rican subjects are an ethnic subgroup which may be considered distinctive by reason of the contribution of Caribbean Indians, mixed with Caucasian colonizers and to some extent Negroes. While not representing a major division of mankind, the Puerto Ricans appear to comprise a distinct group with common biologic and cultural characteristics.

chiefly for anemia and/or suspected malnutrition,‡ 148 were white, 107 Negro and 447 Puerto Rican.

The frequencies of selected tissue changes were assessed in the clinic population's principal subgroups, with factors of age and body weight matched to the extent permitted by the sample size. Relationships to race and sex were evaluated separately within subgroups relatively homogeneous in respect to other variables.

Individual diet histories were not specifically analyzed; inherent methodologic limitations, compounded by language difficulties, precluded reliable evaluations of the routinely recorded food intake. Although broad cultural dietary patterns are ordinarily apparent in this clinic population, notably among Puerto Rican patients, personal and economic factors are commonly responsible for pronounced variations within ethnic groups. Family customs and "status" seem important determinants of eating habits, with no evident relation to subject sex in the population of predominantly young persons.

### RESULTS

In general the frequency of *total* lesions appears unrelated to race, sex or gestational state (Tables I through IV). Individual tissue changes, however, do seem to vary with race and sex, with seeming interdependence of these relationships and further differences among age groups.

‡ Patients referred from a Health Center Maternal Hygiene Clinic, which provided routine antepartum care for gravida without complications. Six patients could not be satisfactorily classified according to race, and/or had incomplete records.

In nonpregnant patients the relationships of these tissue changes to race seem more important and more consistent than those to sex (Tables I and II, Fig. 1 and 2). Racial relationships are manifested in both sexes. Sex differences are generally less pronounced and often evidenced in only one racial group; sometimes in but a single age or weight subgroup.

The principal associations between race and sex and the occurrence of individual tissue changes in the nonpregnant subjects are summarized as follows (statistical appraisals are given in Tables V and VI):

*Acne vulgaris*: Race: more common in white and Negro subjects. Sex: more frequent in females under twenty years of age, of all races except in overweight subjects.

*Acne rosacea*: Race: no apparent relationship in low over-all frequency. Sex: no apparent relationship in low over-all frequency.

*Follicular hyperkeratosis*: Race: generally most common in white subjects, least common in Puerto Rican subjects. Sex: no apparent relationship.

*Xerosis*: Race: more common in Negro (particularly) and Puerto Rican subjects. Sex: more common in females of all races.

*Conjunctival thickening*: Race: more common in Puerto Rican (particularly\*) and Negro subjects. Sex: no apparent relationship.

*Marginal blepharitis*: Race: most common in white subjects; least common in Negro subjects. Sex: possibly more common in males (under thirty years of age).

*Dyssebacea*: Race: no apparent relationship

\* Conjunctival thickening occurred more commonly among Puerto Rican patients born in Puerto Rico (12.0 per cent of 209 under twenty years of age) than among those born in the United States (5.2 per cent of seventy-seven under twenty years of age) Of thirty-five Puerto Rican born patients over twenty years of age eighteen (55 per cent) showed conjunctival thickening. The 439 pregnant Puerto Rican women, with an over-all frequency of 12.2 per cent, included only twelve patients born in the United States, none of whom showed this lesion.

In white women over fifty years of age conjunctival thickening was also more prevalent among those born in Europe (47 per cent of eighty-eight) than among those born in the United States (32 per cent of seventy).

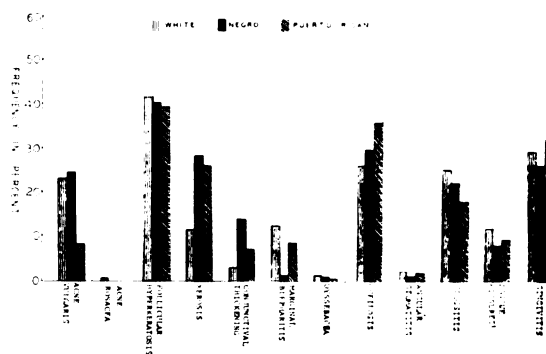


FIG. 1. Frequency of selected tissue changes in nutrition clinic patients: nonpregnant female subjects, 0 to nineteen years of age, by race.

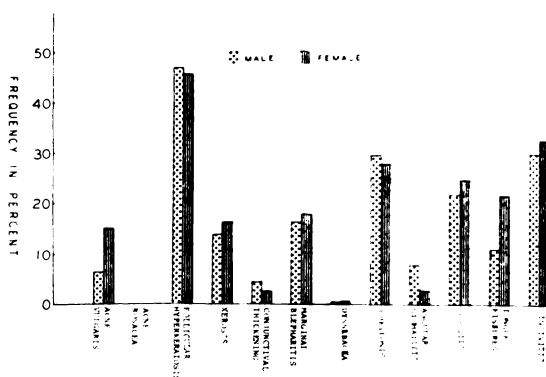


FIG. 2. Frequency of selected tissue changes in nutrition clinic patients: normal weight, white subjects 0 to nineteen years of age, by sex.

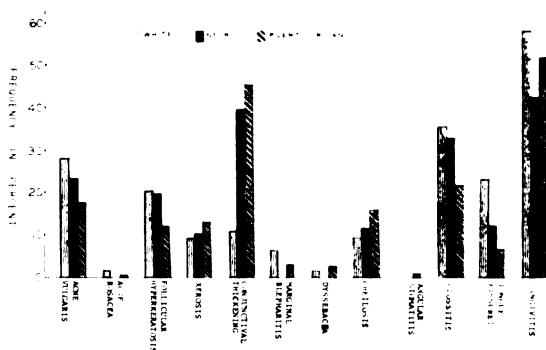


FIG. 3. Frequency of selected tissue changes in nutrition clinic patients: pregnant women, normal weight, twenty to twenty-nine years of age, by race.

in low over-all frequency. Sex: no apparent relationship in low over-all frequency.

*Cheilosis*: Race: most common in Puerto Rican subjects. Sex: generally more common in males, notably after puberty.

*Angular stomatitis*: Race: generally more

TABLE  
Frequency of Blood Hemoglobin Levels and Selected Tissue Changes

Subjects	No. of Patients	Hemoglobin (gm.)				Acne Vulgaris	Acne Rosacea	Follicular Hyperkeratosis
		<7.5	7.5-10.0	10.0-12.4	>12.4			
White males	522	0	1.0	33.3	65.7	15.7	0	45.0
Negro males	53	0	13.2	45.3	41.5	13.2	0	39.6
Puerto Rican males	115	0	7.0	55.6	37.4	7.0	0	38.3
White females	720	0	0.4	36.9	62.7	23.6	0.3	42.5
Negro females	183	0	7.7	56.8	35.5	25.1	0	41.0
Puerto Rican females	160	0	6.3	47.5	46.3	9.4	0	40.0

TABLE  
Frequency of Blood Hemoglobin Levels and Selected Tissue Changes in

Subject	Age (yr.)	No. of Patients	Hemoglobin (gm.)				Acne Vulgaris	Acne Rosacea	Follicular Hyperkeratosis
			<7.5	7.5-10.0	10.0-12.4	>12.4			
White males	5-9	75	0	2.7	50.6	46.7	0	0	27.3
White females	5-9	64	0	0	60.1	39.9	0	0	42.2
White males	0-19	165	0	1.8	39.6	58.6	6.7	0	47.0
White females	0-19	145	0	0	52.1	47.9	15.2	0	45.5

TABLE  
Frequency of Blood Hemoglobin Levels and Selected Tissue Changes in

Subject	No. of Patients	Hemoglobin (gm.)				Acne Vulgaris	Acne Rosacea	Follicular Hyperkeratosis
		<7.5	7.5-10.0	10.0-12.4	>12.4			
White	112	0.9	28.6	61.6	8.9	26.8	0.9	20.5
Negro	89	4.5	41.6	50.6	3.4	20.2	0	16.9
Puerto Ricans	365	2.7	35.9	54.2	7.1	14.5	0.3	11.8

common in white and Puerto Rican subjects. Sex: More common in males.

*Glossitis*: Race: most common in white subjects; least common in Puerto Rican subjects. Sex: more common in females.

*Tongue fissures*: Race: most common in white subjects, least common in Puerto Rican subjects. Sex: generally more common in

females, except in fifteen to nineteen year age group.

*Gingivitis*: Race: most common in white subjects. Sex: no apparent relationship.

Hemoglobin levels are generally higher for white patients and for male subjects throughout most age and weight groups. A notable exception is the relatively higher hemoglobin

I  
in Nutrition Clinic Patients 0 to Nineteen Years of Age, All Weights, by Race and Sex

Individual Tissue Change (%)									
Xerosis	Conjunctival Thickening	Marginal Blepharitis	Dyssebacea	Cheilosis	Angular Stomatitis	Glossitis	Tongue Fissures	Gingivitis	Average All Lesions
13.6	4.8	12.8	1.1	30.1	4.6	21.1	13.0	33.3	16.3
37.7	9.4	1.9	1.9	30.2	0	22.6	9.4	26.4	16.0
18.3	14.8	9.6	0	43.5	5.2	17.4	11.3	29.6	16.3
11.9	3.3	12.6	1.5	26.7	2.6	25.4	11.9	29.6	16.0
29.0	14.2	1.1	1.1	30.1	1.1	22.4	8.2	26.2	16.6
26.3	7.5	8.8	0.6	36.3	1.9	18.1	9.4	32.5	15.9

II  
Nutrition Clinic Patients in Selected Age Groups, Normal Weight, by Sex

Individual Tissue Change (%)									
Xerosis	Conjunctival Thickening	Marginal Blepharitis	Dyssebacea	Cheilosis	Angular Stomatitis	Glossitis	Tongue Fissures	Gingivitis	Average All Lesions
8.0	2.7	16.0	0	34.7	6.7	17.3	2.7	20.0	12.1
21.9	0	17.2	0	40.6	3.1	17.2	23.4	18.8	15.4
13.9	4.8	16.4	0.6	35.8	7.9	21.8	10.9	29.7	16.3
16.6	2.8	17.9	0.7	33.8	2.8	24.8	21.4	32.4	17.8

III  
Nutrition Clinic Patients; Pregnant Women of All Ages, Normal Weight, by Race

Individual Tissue Change (%)									
Xerosis	Conjunctival Thickening	Marginal Blepharitis	Dyssebacea	Cheilosis	Angular Stomatitis	Glossitis	Tongue Fissures	Gingivitis	Average All Lesions
9.9	13.4	4.5	3.6	12.5	0.9	42.0	26.0	61.7	18.0
14.6	38.2	1.1	0	19.1	1.1	36.0	7.9	47.2	16.9
12.1	44.7	3.0	2.2	16.2	0.5	22.7	7.4	51.5	15.0

concentrations among female subjects in the Puerto Rican subgroup from ten to fourteen years of age (67 per cent, compared with 42 per cent, with at least 12.5 gm.).

Observations on the pregnant patients generally agree with those on the nonpregnant group\* (Tables III and IV, Fig. 2). Acne vulgaris is more common in white and Negro

subjects than in pregnant Puerto Rican subjects. Follicular hyperkeratosis is most com-

\* Among pregnant Puerto Rican women the frequency of acne vulgaris in patients of normal weight (16.9 per cent) was significantly greater ( $P < 0.05$ ) than in underweight subjects (4.7 per cent). The frequency of cheilosis in normal weight patients (16.0 per cent) was significantly lower ( $P < 0.05$ ) than in underweight subjects (30.2 per cent).



TABLE  
Frequency of Blood Hemoglobin Levels and Selected Tissue Changes in Nutrition Clinic Patients;

Subject	No. of Patients	Hemoglobin (gm.)				Acne Vulgaris	Acne Rosacea	Follicular Hyperkeratosis
		<7.5	7.5-10.0	10.0-12.4	>12.4			
White								
Primipara	17	0	23.5	70.6	5.9	35.3	5.9	29.4
Multipara	48	2.1	25.0	62.5	10.4	25.0	0	16.7
Total	65	1.5	24.6	64.6	9.2	27.7	1.5	20.0
Negro								
Primipara	8	0	37.5	62.5	0	12.5	0	0
Multipara	53	3.8	43.4	49.1	3.8	24.5	0	22.6
Total	61	3.3	42.6	50.8	3.3	23.0	0	19.7
Puerto Rican								
Primipara	62	0	23.0	62.3	14.7	27.4	0	9.7
Multipara	163	3.7	37.7	52.5	6.1	12.9	0.6	12.9
Total	225	2.7	33.6	55.2	8.5	16.9	0.4	12.0

mon in white subjects, least frequent in Puerto Rican subjects. Conjunctival thickening is most common in Puerto Rican subjects,\* least frequent in white subjects. Cheilosis is most common in Puerto Rican subjects, least common in white subjects. Tongue changes and gingivitis are most common in white patients.

Gestation, *per se*, may influence the occurrence of tissue changes. Compared with thirty one nonpregnant subjects, white prenatal patients (normal weight, twenty to twenty-nine year age group)† show a greater frequency of cheilosis, fissures of the tongue and gingivitis (the last significant at the 5 per cent level), and a lower frequency of acne vulgaris, follicular hyperkeratosis, xerosis and glossitis. Hemoglobin levels of pregnant women, consistently below those of nonpregnant peers, tend to be highest in white and lowest in Negro patients, but the differences are not significant among normal weight patients of all ages, among normal weight patients twenty to twenty-nine years of age, or among normal weight multipara in this subgroup. †

\* See footnote on p. 411.

† Negro and Puerto Rican patients and white nullipara in this specific category were too few for separate comparisons with respective pregnant subgroups.

Parity also seems associated with differences in frequencies of some tissue changes (Table iv). Among normal weight patients twenty to twenty-nine years of age, acne vulgaris is more common ( $P < 0.01$ ) in multipara than primipara in both Puerto Rican and white groups. Conjunctival thickening is significantly ( $P < 0.05$ ) more common in Puerto Rican primipara than multipara. In all three race groups both glossitis and tongue fissures occur more frequently (but not significantly at the 5 per cent level) among multipara.

#### COMMENTS

The limitations of this study, like those of the earlier report, relate chiefly to the nonrepresentativeness of the nutrition clinic clientele, to probable cultural and economic differences in food intake, to the nonspecificity of the tissue changes noted, and to the arbitrary device of equating lesions of varying severity and duration. The subgroups analyzed are neither typical of the general population nor wholly comparable in terms of dietary pattern or nutritional state. The pregnant subgroups are not matched for parity, frequency of pregnancy or state of gestation; criteria for referral from the prenatal clinic are neither universally

IV  
Pregnant Women, Aged Twenty to Twenty-nine Years, Normal Weight, by Race and Parity

Individual Tissue Change (%)									
Xerosis	Conjunctival Thickening	Marginal Blepharitis	Dyssebacea	Cheilosis	Angular Stomatitis	Glossitis	Tongue Fissures	Gingivitis	Average All Lesions
11.8	11.8	11.8	5.9	5.9	0	29.4	17.6	52.9	18.1
8.5	10.4	4.2	0	10.4	0	37.5	25.0	60.4	16.5
9.2	10.8	6.2	1.5	9.2	0	35.4	23.1	58.5	16.9
12.5	37.5	0	0	0	0	12.5	0	50.0	10.4
9.4	39.6	0	0	13.2	0	35.8	9.4	41.5	16.3
9.8	39.4	0	0	11.5	0	32.8	8.2	42.6	15.6
		0							
11.3	56.5	1.6	6.5	14.5	1.6	19.5	4.8	54.8	17.4
12.9	41.1	3.7	1.2	16.6	0.6	22.7	7.4	50.3	15.2
12.4	45.3	3.1	2.7	16.0	0.9	21.8	6.7	51.6	15.8

TABLE V  
Statistical Evaluation of Ethnic Differences in Frequency of Selected Tissue Changes

Tissue Change*	Sex, Age (yr.) and Weight Group	Ethnic Difference	Probability
<i>Nonpregnant Patients</i>			
Acne vulgaris	M, <20; all weights	W>N>P	<0.05
Acne vulgaris	F, <20; all weights	N>W>P	<0.001
Xerosis	M, <20; all weights	N>P>W	<0.001
Xerosis	F, <20; all weights	N>P>W	<0.001
Xerosis	F, 5-9; all weights	N>W	<0.01
Xerosis	F, 20-50; all weights	P>N>W	<0.05
Conjunctival thickening	M, <20; all weights	P>W	<0.001
Conjunctival thickening	F, <20; all weights	N>P>W	<0.001
Conjunctival thickening	F, 20-50; all weights	P>N>W	<0.001
Marginal blepharitis	M, <20; all weights	W>P>N	<0.01
Marginal blepharitis	F, <20; all weights	W>P>N	<0.001
Marginal blepharitis	F, 5-9; all weights	W>P>N	<0.05
Marginal blepharitis	F, 5-9; underweight	W>P	<0.01
Cheilosis	M, <20; all weights	P>N>W	<0.05
Cheilosis	F, <20; all weights	P>N>W	<0.05
Cheilosis	F, 20-50; all weights	P>N>W	<0.05
Tongue fissures	F, 20-50; all weights	W>N>P	<0.001
Gingivitis	M, 5-9; underweight	W>P	<0.05
<i>Pregnant Patients</i>			
Acne vulgaris	All ages; normal weight	W>N>P	<0.02
Follicular hyperkeratosis	All ages; normal weight	W>P	<0.05
Conjunctival thickening	All ages; normal weight	P>N>W	<0.001
Conjunctival thickening	20-29; normal weight	P>N>W	<0.001
Glossitis	All ages; normal weight	W>N>P	<0.01
Glossitis	20-29; normal weight	W>N>P	<0.05
Tongue fissures	All ages; normal weight	W>N>P	<0.001
Tongue fissures	20-29; normal weight	W>N>P	<0.01
Gingivitis	All ages; normal weight	W>N	<0.05

\* Statistically significant differences not observed among racial groups in respect to relative frequencies of lesions with low total frequencies (i.e., acne rosacea, dyssebacea, angular stomatitis), or in respect to follicular hyperkeratosis in nonpregnant patients.

TABLE VI  
Statistical Evaluation of Sex Differences in Frequency of Selected Tissue Changes

Tissue Change*	Race, Age (yr.) and Weight Group	Sex Difference	Probability
Acne vulgaris	W, <20, normal weight	F > M	<0.05
Acne vulgaris	W, <20, all weights	F > M	<0.001
Acne vulgaris	N, <20, all weights	F > M	<0.05
Acne vulgaris	P, <20, all weights	F > M	>0.05
Xerosis	W, 5-9, overweight	F > M	<0.05
Xerosis	W, 5-9, all weights	F > M	<0.01
Xerosis	W, 5-9, normal weight	F > M	<0.05
Xerosis	W, 20-50, all weights	F > M	<0.05
Marginal blepharitis	W, 20-50, all weights	M > F	<0.01
Cheilosis	W, 15-19, all weights	M > F	<0.01
Cheilosis	W, 5-9, overweight	F > M	>0.05
Angular stomatitis	W, <20, normal weight	M > F	0.05
Glossitis	W, 5-9, overweight	F > M	<0.01
Tongue fissures	W, <20, normal weight	F > M	<0.01
Tongue fissures	W, 5-9, normal weight	F > M	<0.001
Tongue fissures	W, <20, underweight	M > F	<0.01

\* Statistically significant differences not observed between sexes in respect to relative frequencies of acne rosacea, follicular hyperkeratosis, conjunctival thickening, dyssebacea and gingivitis.

accepted nor uniformly applied. So-called normal physical and laboratory standards, derived from observations of Caucasian subjects, may not be valid for non-Caucasians. The applicability of commonly employed height, weight and hemoglobin indices to Puerto Rican children in New York City has been especially debated. Tissue changes that, at best, are poorly understood may have different significance in different population groups. Moreover, some tissue changes, notably those of the skin, are diagnosed with greater difficulty in persons with greater pigmentation.

In general these observations suggest an association between the prevalence of selected tissue changes and major population characteristics. Race differences in the occurrence of xerosis, and sex differences in the frequency of acne vulgaris, xerosis and angular stomatitis are similar to those noted by Jolliffe et al.<sup>20</sup> in Cuban school children. Although some of the apparent relationships may be spurious, many would appear to be valid, especially those demonstrated in multiple, relatively large population subgroups. While unevaluated dietary factors cannot be discounted, they would seem an inadequate, single explanation for

these and previous findings, notably of sex and age related differences *within*, as well as between ethnic groups.

Whether an increased frequency of these local "lesions" indicates merely a greater propensity of a given, vulnerable tissue for aberration or reflects greater over-all, systemic susceptibility to adverse nutritional effects is not apparent. The evident, common occurrence of many of these tissue changes compounds the problem of assessing their clinical significance.

#### SUMMARY

The relationship of race and sex to the occurrence of twelve selected tissue changes commonly associated with malnutrition was assessed in 2,729 nonpregnant and 702 pregnant nutrition clinic patients.

Race and, to a lesser extent, sex appeared related to the frequency of individual tissue changes, although not of total lesions. These relationships varied with patient age and body weight.

Pregnancy was not associated with a significant difference in the over-all frequency of tissue changes, but may have been related to the occurrence of certain individual lesions.



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