

A Dietary Study of the Pima Indian

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DESPITE the popular conceptions of the high prevalence of multiple dietary deficiencies among certain Indian groups, there are few nutrition studies to support these ideas. As late as 1954, Kraus stated, "scientifically conducted surveys of nutritional status among Indian populations of the Southwest have been almost totally lacking."¹

Recently completed nutritional studies among Navaho Indians living in northern Arizona have shown little evidence of any nutritional disorders.² The difference in terrain, climatic conditions, availability of foods and the lack of cultural bonds between varying Indian groups have given rise to marked variations in dietary pattern; and no conclusion can be drawn about dietary habits of other Indian tribes from the study of the Navaho.

A recent two-year survey³ of the disease pattern of the Pima Indian of southern Arizona has shown a low incidence of arteriosclerotic heart disease and peptic ulcer, while the incidence of gallbladder disease is high. In a population of 4,668,⁵ which has completely accepted modern medicine making reporting fairly valid, only three cases of myocardial infarction were found; none of angina pectoris; none of peptic ulcer but there were 125 cases of gallbladder disease during a two-year period.

This disease pattern, especially the low incidence of arteriosclerotic heart disease among the Pima Indian, has indicated a need for a study of their diet to note any factor which may influence the incidence of disease. The diet of this particular Indian tribe has never been investigated.

Kraus states that the diet of the Papago

Indians, a southern neighbor of the Pima Indians, includes tortillas, beans, potatoes, coffee and some meat.¹ Vavick and associates⁴ have estimated that the Papagos have a low intake of animal proteins as compared to American standards. In view of these meager observations, I elected to survey the dietary habits of the Pima Indians during a two-year assignment as physician in the Public Health Service Indian hospital in Sacaton, Arizona.

BACKGROUND

The Pima Indian reservation is located south of Phoenix, Arizona, and covers 372,072 acres of desert and irrigated farmland. The population is 4,668⁵ although Kraus estimates that the population is closer to 10,000. Ninety-eight per cent of the Pimas speak English.¹ They live in small, but sturdy one or two room houses built of adobe brick, or in less sturdy prefabricated houses bought cheaply after World War II from nearby Japanese relocation centers. Only 2 per cent of the homes have plumbing, therefore, water must be hauled varying distances from government-built wells in larger reservations. About one-half of the homes have electricity. The people are primarily farmers, raising cotton and barley, but due to the unavailability of water, only a small portion of the land is irrigated, and the major portion of their earnings is from seasonal work in off-reservation cotton fields. Very little food is raised for home consumption, and there are no cattle that can be slaughtered for meat similar to the custom of the Navahos.

Most of the Pimas' food is bought at various trading posts on the reservation. These posts stock most of the foods found in any present-day grocery. Shopping trips, however, are made rather infrequently by those people who live in outlying areas, and even in urban areas very few homes have refrigerators or ice boxes

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to preserve perishable foods in the hot climate. This greatly limits the consumption of fresh milk, meat, fresh fruits and vegetables, and non-perishable foods constitute the bulk of the purchases.

There are no accurate figures available on the average income per family, but it is very low compared to American standards.

PLAN OF STUDY

This study describes the dietary pattern of fifty-one adults admitted at random to the U. S. Public Health Service Indian Hospital at Sacaton, Arizona. This hospital serves the entire Pima reservation and the northern part of the Papago reservation.* Forty-two of these patients lived on the reservation while nine lived immediately adjacent to the reservation in Indian camps established for those who work in off-reservation cotton fields.

Dietary histories were obtained by the recall method so that a consistent pattern was followed. Each person was asked what he usually ate for each meal, the size of the portion and the frequency with which the item was included in the diet. This was followed by a series of direct questions about foods usually included in the diet which he may have forgotten. The amount of lard used (the only source of fat in the diet) was estimated according to the amount and frequency with which lard was purchased and the number of portions into which it was divided. With this information, the average daily intake of lard per person was calculated, in order to quantitate the fat consumption more accurately. The average daily portion of other foods was obtained by adding the number of portions of an item consumed per day and dividing by the number of patients in the study. Portion sizes were estimated from intake by the patients studied and was the only method by which food intake could be quantitated.

Accurate measurements of food consumed in the Indian home cannot be accurately studied at the present time because cultural differences

* I worked for two years among the Pimas, as a physician, and my personal acquaintance with the people and their habits was a great help in obtaining more accurate information.

preclude invasion of the Indian homes for such a study.

Serum cholesterol was determined on a fasting blood specimen drawn from thirty-nine participants in the study. Cholesterol determinations were made by means of the Lieberman-Burchard reaction.

Although fifty-one patients constitute a small sample, the simplicity of the diet and the daily repetition are such that this small sample gives a generally accurate picture of the Pima diet.

FINDINGS

Beans, which are eaten at least twice daily by all members of the family, are the basic food of the Pima Indian. The type of bean varies—pinto, kidney, blackeyed or lima beans being used alternatively. They are cooked with the addition of about 1 teaspoonful of lard per serving, and are usually prepared in sufficient quantities so that they may be reheated or refried for the evening meal.

Tortillas are home-made from white flour, salt, soda and water—using nine cups of white flour and one-half cup of lard for approximately twenty 7-inch tortillas. The flour is almost exclusively of the non-enriched variety, and because it has a higher gluten content than enriched flour, it “makes better tortillas.” Little enriched flour is sold at the trading posts. Popovers, a type of fried tortilla, are made of the same ingredients as tortillas except that baking powder is added and the dough is then fried in lard. Lard, bought at the trading posts, is used almost exclusively, while butter and vegetable shortening are rarely used.

Another popular item on the daily menu (Table I) is chili peppers of various types, which are eaten in large quantities with other foods during each meal. Lettuce, tomatoes, onions and squash are the most commonly used vegetables. Stew meat and hamburger are the most popular types of meat, although steak, luncheon meat and pork are also popular. Stews are usually plain, using only potatoes and onions, while chili stews are reserved for special occasions. Fruit consumption varies with the seasons. During winter and spring, citrus fruits are usually obtained locally at a



TABLE I
Basic Meal Pattern of the Pima Indian

Breakfast	Lunch	Supper
Oatmeal	Beans	Beans
1 to 2 eggs	1 to 2 tortillas	1 to 2 tortillas
1 to 2 tortillas	1 to 2 chili peppers	1 to 2 chili peppers
1 to 2 chili peppers	Fried potatoes 2 to 3 times/week	Fried potatoes 2 to 3 times/week
Occasional beans or fried potatoes	Coffee	Meat 1 time/week
Coffee		Coffee

low price from off-reservation fruit orchards. During the summer months, melons and watermelons are frequently consumed. During autumn and early winter when no fruit is

available, more baking is done and cake is eaten in its place. This cake, mostly of the plain variety, is either purchased at the trading post or baked at home (Table II).

Longhorn cheese and cottage cheese are occasionally eaten, but their use is not extensive.

Coffee and tea are the most popular beverages during the meal, but a large amount of soft drinks of all types is consumed between meals. Since the use of soft drinks is greatly dependent on the weather and their use cannot be quantitated, they were omitted from this study. Milk used is entirely of the canned evaporated type.

In this study no attempt was made to investigate the diet of infants. The general impression is that a large majority of infants are breast-fed. Formulas use evaporated milk

TABLE II
Frequency Various Foods are Included in the Diet Each Week (Figures in percentage)

Foods	Breakfast				Lunch				Supper				Less than Once
	Daily	4-5 Times	2-3 Times	Once	Daily	4-5 Times	2-3 Times	Once	Daily	4-5 Times	2-3 Times	Once	
Beans	18	8	26	4	72	12	10	2	82	14	2	2	
Tortillas	68	6	8	2	80	4	8	0	82	10	2	0	
Bread	18	8	14	4	4	4	6	2	6	0	12	4	
Popovers	0	2	8	12	0	0	12	16	0	0	12	10	
Potatoes	14	6	40	8	4	2	34	10	14	2	32	8	
Vegetables	2	0	2	6	4	4	14	18	6	4	20	20	
Salads	0	0	0	0	6	0	2	2	2	0	6	6	
Cereals	34	6	34	10	0	0	0	0	0	0	0	0	
Meat	0	0	2	12	8	6	22	32	4	2	24	24	10
Eggs	32	10	48	10	0	0	2	0	0	0	0	0	
Cheese	0	0	0	0	2	0	16	28	2	2	12	20	
Bacon	10	2	28	10	0	0	0	0	0	0	0	0	
Soups	0	0	0	2	0	0	4	0	2	2	0	0	
Chili peppers	54	4	4	0	56	0	8	2	56	0	0	0	
Cakes (including pancakes)	0	4	8	20	0	0	26	30	2	0	10	12	
Fruits	4	2	4	6	4	4	10	20	4	0	10	16	
Coffee	86	2	4	0	54	2	2	0	48	0	0	0	
Tea	0	0	0	0	30	0	0	0	20	0	0	0	
Milk (including with cereal)	36	2	10	0	4	4	4	0	4	2	0	0	



almost exclusively. As the infant grows older he is fed some of the oatmeal used by the family, and beans, tortillas and other family foods are started soon thereafter. Proprietary baby food, although available at the trading post, is seldom used.

DIETARY ANALYSIS

The average Pima Indian consumes approximately 2,800 calories daily (Table III), which is approximately the caloric intake recommended by the National Research Council.⁸ The protein intake of 105.2 gm. is above the

normal recommended average of 55 to 65 gm. However, 84 per cent of the protein originates from plant sources (Table III).

Fats furnish about 24 per cent of the caloric intake. This is within the usual recommendation of 20 to 25 per cent, but below the 40 per cent figure supposedly consumed in the over-all American diet. About 87 per cent of the fat is of animal origin and is almost completely of the saturated variety.

The mineral content of the diet shows it to be above the recommended daily intake for iron, due mainly to the large consumption of

TABLE III
Analysis of Foods Eaten in Pima Diet⁶

Food	Unit	Average Daily Portion	Calories (gm.)	Carbohy- drate (gm.)	Protein (gm.)	Fat (gm.)	Choles- terol ⁷ (mg.)	Cal- cium (mg.)	Iron (mg.)	Vita- min A (I.U.)	Thia- mine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)	Ascor- bic Acid (as.)
Beans*	Bowl (1½ cups)	2.37	820	150	52.0	3.5	—	360	17.4	0	0.43	0.43	7.1	0
Tortillas*	7 inches each	4.69	855	180	24.8	2.3	—	39	1.9	—	0.14	0.09	2.3	—
Bread, white	1 slice	0.69	44	8.3	1.3	0.5	—	10	0.3	—	0.04	0.03	0.3	—
Popover*	7 inches each	0.23	47	8.9	1.2	0.1	—	2	0.1	—	0.01	0.01	0.1	—
Cereal) (oat.)	1 cup	0.53	78	13.8	2.9	1.5	—	11	0.9	—	0.12	0.03	0.2	—
Cake (cup.)	1 cupcake	0.18	29	5.6	0.5	0.6	—	10	—	9	—	0.01	—	—
Potatoes	2 med.	0.66	128	30.0	2.6	—	—	17	1.0	26	0.07	0.03	0.9	11
Vegetables	1 cup	0.30	14	2.8	0.7	0.2	—	8	0.4	600	0.04	0.02	0.5	10
Salad (lettuce and tomato)	1 cup	0.13	5	1.0	0.3	0.1	—	3.5	0.1	214	0.01	0.01	0.1	—
Chili peppers	1 pepper	3.79	16	3.6	0.8	0.1	—	7	0.3	400	0.02	0.04	0.2	77†
Meat (chuck)	3 oz. serving	0.32	85	—	7.3	6.1	48	3	0.8	—	0.01	0.05	1.1	—
Eggs	1 medium	0.81	67	0.2	5.0	4.5	275	21	1.0	440	0.03	0.1	—	—
Cheese (cheddar)	1 oz.	0.16	17	0.1	1.1	1.4	5	33	0.1	64	—	0.1	—	—
Bacon	1 strip	0.41	24	—	0.8	1.8	3.3	1	0.1	—	0.02	0.01	0.2	—
Coffee with milk	1 cup	2.10	21	2.1	1.0	1.0	—	42	—	50	0.1	0.02	0.1	—
Tea with sugar	1 cup	0.39	10	2.7	—	—	—	—	—	—	—	—	—	—
Milk	1 cup	0.20	33	2.2	1.6	2.0	6.6	63	—	78	0.02	0.05	0.1	—
Fruit	1 medium orange	0.39	27	6.8	0.5	0.1	—	20	0.2	113	—	0.02	0.2	30
Biscuit	One	0.10	13	2.0	0.4	0.3	—	8	—	—	—	—	—	—
Syrup	1 tbsp.	0.08	4	1.1	—	—	—	—	—	—	—	—	—	—
Macaroni	1 cup	0.02	4	0.8	0.1	—	—	—	—	—	—	—	—	—
Soup (vegetable)	1 cup	0.05	4	0.7	0.2	0.1	—	2	—	—	—	—	—	—
Juice	1 cup	0.11	10	2.5	0.1	—	—	2	—	2	0.01	—	0.1	11
Lard		47.5	426	—	—	47.5	52	—	—	—	—	—	—	—
Total average daily intake			2781	425.2	105.2	74.2	389.9	694	24.6	1996	1.07	0.96	13.5	140†
Recommended daily intake by National Research Council ⁸			2100-2900		65.0			1000	12.0	5000	1.0	1.4	10-16	70

* Lard used in preparation is included in lard column.

† Probably much less during winter months, due to ingestion of dried, canned or cooked chili peppers.



beans, but low in calcium. The diet is also low in vitamin A, furnishing approximately 2,000 I.U. The recommended daily allowance of 5,000 I.U. is approximately double the minimum requirement of 2,500 I.U.⁹ The main sources of vitamin A in the diet are vegetables, eggs and chili peppers. The vegetable source of vitamin A is, however, variable depending on the type of vegetable consumed. Since vegetables and salads are mainly consumed on weekends, the vitamin A intake is at best low and sporadic.

Thiamin and niacin intake is adequate and above the recommended daily allowances of the National Research Council. However, the riboflavin intake of 0.96 mg. is below the recommended allowance of 1.4 mg. This is mainly due to the general use of non-enriched flour.

Ascorbic acid intake is high, but very variable depending on the season. Fresh chili peppers and citrus fruits, the main source of ascorbic acid are eaten only in summer while dried, cooked or canned chili peppers whose ascorbic acid is destroyed is eaten during the rest of the year.

The serum cholesterol concentration of the thirty-nine patients tested showed an average of 205 mg. per 100 ml. with a standard deviation of ± 65.3 . No attempt was made to break this figure down according to age and sex since the sampling is too small to be statistically significant, but most subjects were between the ages of twenty-five and fifty. This measurement is in accord with the cholesterol studies in normal healthy men by Keys¹⁰ and falls into a range judged to be normal in this country.

COMMENTS

On the basis of this study, the Pima diet fulfills the standards recommended by the National Research Council except for an inadequate intake of calcium, vitamin A and riboflavin. The low level of consumption of carotene-containing foods is similar to findings among the Navaho where serum carotene measurements were low.² No evidence, however, of clinical vitamin A deficiency has been seen among the Navaho, and we have not seen

any overt manifestation of vitamin deficiency among the Pima.

Although the protein intake is more than adequate due to the large consumption of beans, only 16 per cent of the protein is of animal origin, supporting the original impression of Vavick.⁴ Its significance as far as the health of the Pima Indian is concerned can only be surmised at the present time.

It is of interest that with a comparatively low intake of fat, even though the fat is of a saturated type, the Pimas have an extremely low incidence of coronary atherosclerosis.⁸ Keys,¹⁰ who has shown a relationship between the percentage of calories consumed as fat and the incidence of "degenerative heart disease" among various population groups, points out that certain groups in Japan and Italy with low fat intakes also have a low incidence of coronary disease. The findings among the Pima Indians is consistent with Keys' observations among other ethnic groups.

Since the pathogenesis of the formation of gallstones has not been clearly elucidated, it cannot be said at this time that the Pima diet has any influence on the high incidence of cholelithiasis. However, the high rate of consumption of chili peppers, beans, and of fried foods which stimulate the production of cholecystokinin may do much to aggravate any existing chronic cholecystitis.

SUMMARY

The Pima Indians are a southern Arizona tribe which has readily acclimatized itself to Western civilization through fairly close proximity to off-reservation urban communities. Their food is bought in trading posts, but it is mostly non-perishable foods that are bought because of long distances traveled and lack of facilities for storage of perishable foods.

A dietary history of fifty-one Pima Indians shows the diet to consist mainly of beans, tortillas, chili peppers and coffee, while oatmeal and eggs are occasionally eaten for breakfast. Meat and vegetables are eaten only once or twice a week.

An analysis of their diet indicates that it fulfills the standards set by the Food and Nutrition Board of the National Research

Council, except that only 16 per cent of the protein consumed is of animal origin, and the intake of calcium, vitamin A and riboflavin is insufficient. No overt evidence of vitamin deficiency has been observed. Twenty-four per cent of the caloric intake is provided by fat which is completely of the saturated variety in the form of lard.

The average serum cholesterol level of 206 ± 65 mg. per cent in thirty-nine patients is within normal range.

The finding of a relatively low fat diet in relation to the low incidence of degenerative heart disease may be consistent with the reported findings in other population groups, except that the type of fat consumed is all of the saturated type.

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