A review of 519 consecutive cases of myocardial infarction reveals an unexpectedly high incidence in the Negro female. Not only does this catastrophe occur at an earlier age in the Negro woman, but also is less frequently associated with angina, pursues a more virulent course and is associated with a higher fatality rate than that recorded in the white race and in the Negro male. Comparative clinical features in the two sexes of the white and Negro races are presented.

A REVIEW of the current literature reflects the widespread and increasing interest in coronary artery disease. In spite of intensive investigation during the past 2 decades, its etiology is still unknown. Despite the encouraging observation that coronary atherosclerosis is a disease and not merely the result of aging, prevention or effective treatment cannot be anticipated until the pathogenesis of this condition is understood.

While such possibilities as heredity, diet, hypertension, obesity, diabetes and anatomic factors have been investigated, basic research dealing with atherosclerosis has been largely influenced by the striking difference in sex incidence. The greater frequency in males as compared to females has been reported to vary from 2:1 to 6:1. Perhaps the most significant ratio was reported by White in two separate groups of 100 patients, all under the age of 40 years, with coronary heart disease. In the first group were 96 males and 4 females; in the second, 97 males and 3 females. In attempting to clarify the cause of coronary atherosclerosis, Dock also emphasized the sex difference. Many investigators have suggested that an ovarian hormone may be responsible for the protection of women, especially those under the age of the menopause. In accord with this concept, Katz and his associates demonstrated the regression of coronary atherosclerosis in cholesterol-fed chicks following the administration of estrogen. Barr advanced the hormonal hypothesis still further by showing that the administration of estrogen to survivors of myocardial infarction can correct the lipid pattern in the plasma toward that observed in so-called normal individuals. However, an attempt by Oliver and Boyd to treat 10 men having coronary artery disease with estrogenic substances produced no decrease in the incidence and severity of effort pain or breathlessness. In addition, numerous untoward side effects were noted.

None of the investigations into the etiology of coronary artery disease and its occurrence in females has considered the Negro race separately. In a previous communication we reported the results of a study of 330 cases of proved myocardial infarctions; 162 were white and 168 were Negroid. While the Caucasian males outnumbered the females 3:1, there was no sex difference among the Negroes. In the present paper we expand the size of this series and attempt to analyze the cases in a more comprehensive manner.

Observations

The clinical records of 519 cases of proved myocardial infarction were reviewed. All of the patients receiving this diagnosis over an 8-year period (Jan. 1, 1947, through Dec. 1, 1954) in a large mid-southern university hospital were included. In each instance the diagnosis was established by the clinical findings and was substantiated by characteristic electrocardiographic changes or necropsy findings. The ratio of admissions to the hospital during this period

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was approximately 70 per cent Negro and 30 per cent white; the number of males and females within each race was essentially equal.

**Incidence**

Of the 519 patients hospitalized because of myocardial infarction, 233 were white and 286 were Negroes (fig. 1). The sex ratio in whites was 2.9:1 and in Negroes 1.2:1. The incidence of myocardial infarction among the Negroes was 52 per cent of that among the white patients.

**Age**

The average age at the time of the initial myocardial infarction was as follows: white males, 62 years; white females, 66.5 years; Negro males, 60.6 years; Negro females, 56 years. These findings are represented by decades in table 1. It is apparent that the Negro female was stricken at a significantly earlier age than any of the other three groups. This is in direct variance to the classical description of coronary atherosclerosis. Only 4 white females (6.6 per cent) suffered an infarction prior to the fiftieth year of life, whereas 43 (33.6 per cent) of the Negro females had been afflicted by the end of the fifth decade. Before the age of 60, only 13 (22 per cent) of white females were afflicted, as contrasted to 81 (63 per cent) of Negro females. No such pronounced difference was apparent among the males.

**Angina**

The history of each case was thoroughly reviewed as to the presence of angina pectoris prior to infarction. Chest pain that appeared two weeks or less before infarction was considered to be premonitory and was not included in the analysis. The results are recorded in figure 2. Angina occurred with considerably greater frequency among members of the white race. More than twice as many white females (57 per cent) as Negro females (26 per cent) experienced this distressing symptom and one and one-half times as many white as Negro males.

**Body Build**

A determination of body build was based on height, weight, and age, according to the method of Duncan. Females were inclined to

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**Table 1.** Incidence of 519 Myocardial Infarctions by Decades

<table>
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<th>Decades</th>
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**Fig. 1.** Race and sex distribution in 519 cases of myocardial infarction.

**Fig. 2.** History of angina by sex and race in 519 cases of myocardial infarction.
be obese, while males were of average size. There was no significant racial difference; 48 (28 per cent) of white males were obese; 91 (53 per cent) were average; 23 (13 per cent) were under weight, and no adequate record was available in 11 (6 per cent). A study of the white female cases revealed that 36 (60 per cent) were obese, 17 (28 per cent) were average, 4 (7 per cent) were under weight, and in 3 (5 per cent) there was no record in the chart. Among the Negro males, 42 (27 per cent) were obese, 91 (58 per cent) were average, 14 (8 per cent) were below average, and in 11 (7 per cent) no information concerning body build was available. Of the Negro females, 76 (59 per cent) were obese, 38 (30 per cent) were within average limits, 5 (4 per cent) were under average size, and in 9 (7 per cent) there was no adequate description.

**Blood Pressure**

No racial nor sex differences of significance were apparent on analysis on the history of hypertension, though the females of both races were somewhat more inclined to be hypertensive. A consideration of the white males disclosed that 83 (48 per cent) had a history of hypertension, 78 (45 per cent) were normotensive, and in 12 (7 per cent) there was no adequate record. Among the white females 40 (66 per cent) were hypertensive, 19 (32 per cent) were normotensive, and in 1 (2 per cent) this information was lacking. Of the Negro males, 93 (58 per cent) were hypertensive, 52 (33 per cent) were normotensive, and in 13 (9 per cent) this was not adequately recorded. In the group of Negro females, 85 (66 per cent) were hypertensive, 32 (25 per cent) were normotensive and in 11 cases (9 per cent) this information was not recorded.

**Family History of Cardiovascular Disease**

A history of significant cardiovascular disease in the immediate family was obtained with approximately the same degree of frequency in each sex and race. The large number of charts in which this was not adequately recorded tends to invalidate the importance of this clinical feature in the present study.

**Habits**

A detailed dietary history was not available in every case. However, all of the patients of both races came from a similar economic level, and in the over-all picture, dietary habits were believed to have no influence on occurrence rates. The role of alcohol and tobacco was considered. Although the use of these agents was not mentioned in a large percentage of records, the figures are of interest. Of the white males, 85 (49 per cent) used tobacco, 10 (6 per cent) were nonsmokers, and no information was obtainable for 78 (45 per cent). Among the white females, 7 (12 per cent) used tobacco, 13 (22 per cent) did not, and in 40 (66 per cent) cases this was not recorded. In the group of Negro males, 73 (46 per cent) used tobacco, 14 (8 per cent) did not, and in 71 (46 per cent) instances this was not known. The charts of the Negro females disclosed that 33 (26 per cent) used tobacco in some form, 23 (18 per cent) did not, and there were no records available in 72 (56 per cent).

With regard to the use of alcohol, the males predominated without a significant racial difference being observed. Among the white males, 20 (12 per cent) were heavy drinkers, 48 (28 per cent) were moderate drinkers, 34 (20 per cent) did not drink, and no adequate history was reported in 71 (40 per cent). A review of the histories of the white females revealed that 3 (5 per cent) used alcohol, 17 (28 per cent) were nondrinkers, and in 40 (67 per cent) this was unknown. In the series of Negro males, 11 (6 per cent) were heavy drinkers, 36 (23 per cent) used alcohol moderately, 26 (16 per cent) were nondrinkers, and in 85 (55 per cent) no adequate history was obtained. Of the Negro females, 17 (13 per cent) ingested alcohol in moderation, 39 (30 per cent) did not drink, while in 72 (57 per cent) this was unknown.

**Associated Disease**

No particular pattern of associated disease was found. Diabetes mellitus was much more common among the females of both races. The incidence in the women patients, both white
and Negro, was significantly greater than that usually reported in the general population. The appearance of malignancy, particularly that type involving the generative organs, was not found in predominance in either race or sex. Six (3.5 per cent) white males had diabetes and 5 (2.9 per cent) had malignancy; 9 (15 per cent) white females were diabetic, and 6 (10 per cent) had malignancy; 9 (5.1 per cent) Negro males had diabetes and 5 (3.2 per cent) had malignancy; of the Negro females, 20 (15.6 per cent) had diabetes and 5 (3.9 per cent) had malignancy.

**Multiple Infarctions**

The occurrence of more than one infarct did not explain the high mortality rate in this series of patients. Relatively few had a second infarction. The great majority died with, or as a result of, the first attack. Twenty-two (13 per cent) white males, 3 (5 per cent) white females, 8 (5 per cent) Negro males, and 7 (5 per cent) Negro females had two or more infarctions.

**Deaths**

The over-all mortality rate in this series of 519 cases of myocardial infarction was 67 per cent. A further analysis disclosed that of 173 white males 107 (62 per cent) died. Of 60 white females, 44 (73 per cent) died. Of 158 Negro males, 98 (62 per cent) expired and of 128 Negro females, 99 (77 per cent) died. The greatest percentage of deaths, therefore, occurred among the Negro females. This finding is definitely different from that recorded in the literature and in textbooks of medicine.

**Female Productivity**

Negro and white females had an almost identical history of productivity. Most had more than one child and about half had numerous children. Of the white females, 33 (53 per cent) had children with 20 having multiple pregnancies, 3 (5 per cent) had no children, and no history was recorded for 25 (42 per cent). Among the Negro females, 87 (55 per cent) had children with 55 having multiple pregnancies, 7 (4 per cent) were childless, and in 34 (41 per cent) this was unknown.

**Female Pelvic Disease and Surgery**

Of the 60 white females, 2 had been subjected to hysterectomy and 1 presented a history of bilateral oophorectomy during the child-bearing years. Of the 128 Negro females, 18 reported a hysterectomy; 4, a bilateral oophorectomy; 3, a unilateral oophorectomy; and 1, a radiation menopause during the child-bearing years. Three of the eight Negro females who suffered a myocardial infarction under the age of 40 years had a previous history of toxemia of pregnancy; this was true of the youngest Negro female (21 years of age) included in this study.

**Discussion**

Because of certain interesting observations on the incidence of myocardial infarction in Negroes reported in a previous paper, we decided to compare this disease in white and Negro patients. In a series of 330 cases no difference in sex incidence among Negroes was observed; indeed, myocardial infarction appeared to occur earlier and to be more severe among Negro females.

Therefore, it was decided to expand the size of this study and analyze each case in greater detail. In the present investigation 519 cases of proved myocardial infarction were reviewed. During the interval covered by this study 70 per cent of hospital admissions were Negro and 30 per cent were white. The number of males and females within each race was essentially equal. There were 233 white patients, of whom 173 were males and 60 were females. This represents a sex ratio of 2.9 to 1 and is in general accord with the figure accepted in the literature. Of 286 Negro cases, however, 158 were males and 128 were females. This ratio of males to females is only 1.2 to 1 and differs with high statistical significance from the sex ratio in whites. It is important to note that in the many studies dealing with the sex incidence of coronary artery disease the Negro race has never been specifically considered. In the present series the incidence of myocardial
infarction in the Negro was approximately 52 per cent of that in the Caucasian.

A review of the age of all patients at the time of initial infarction revealed a further striking deviation from the classical picture described in coronary artery disease. The rarity of myocardial infarction in females, and especially in those of the younger age groups has been regarded to be quite valuable in the differential diagnosis of chest pain. In a recent review of the literature, Thomas and Cohen found it generally accepted that myocardial infarction may occur in a few young men under the age of 40 but is extremely rare among young women of this age. They cited current reports confirming the following widely held views: (1) that there is a sharp increase in the incidence of coronary atherosclerosis between the ages of 30 and 49 in men and between the ages of 50 and 69 in women and (2), that the incidence of marked coronary atherosclerosis in necropsy studies reaches a maximum between 50 and 59 years of age in men, whereas in women, a plateau is reached after the seventh decade. Clinically, the initial appearance of myocardial infarction is said to occur most often between the ages of 56 and 60; in a recent study, however, 39 per cent of cases sustained the initial attack after the sixtieth year.

In the present study, only four white females (6.6 per cent) suffered an infarction prior to the fiftieth year of life, yet this occurred in 43 (33.6 per cent) of the Negro women. Before the age of 60, 81 Negro females (63 per cent) had suffered a myocardial infarction as contrasted to only 13 (22 per cent) of white females. While the observations in this series concerning white females, white males, and Negro males are in complete accord with those generally accepted, this is not true of the Negro females. Infarction actually occurred earlier in the Negro female than in any other category, even earlier than in the white male.

The 519 cases included in this study were analyzed with regard to the incidence of angina prior to infarction. It is generally stated that angina pectoris occurs with equal frequency in both sexes. In the present study this symptom occurred in similar proportions. A striking deviation from the accepted norm, however, was the fact that angina occurred more than twice as frequently in white as in Negro females. This unusual incidence remains to be explained.

The present investigation confirmed the observation that females having coronary artery disease tend to be more obese than do men afflicted with this condition. No significant racial difference was noted. Similarly, hypertension was found to occur more frequently in the females of both races than in the males. This has been well established, and no racial deviation was observed. An analysis of the frequency of a familial history of cardiovascular disease merely confirmed well-documented views. It was not possible to evaluate adequately the role of tobacco or alcohol in this study because of the large number of records not mentioning these agents. It became obvious, however, that all of the patients included in this series were from a similar economic level. No important differences in dietary habits were noted. Laboratory reports dealing with anemia were comparable in both races.

The incidence of diabetes mellitus was similar in the males and in the females of both races. This metabolic disease occurred in 3.5 per cent of white males, 5.1 per cent of Negro males, 15 per cent of white females, and 15.6 per cent of Negro females. The figures dealing with the males of both races are compatible with those usually accepted for the general population: 2.4 per cent among persons 45 to 64 years of age and 5.8 per cent among those 65 years and over. The surprisingly high incidence of diabetes among the females of both races is not readily explained. From the standpoint of the present paper, however, the remarkably close correlation between the white and Negro women eliminates this disease as a factor in the atypical picture of myocardial infarction in Negro females.

Because of the startling absence of the usual sex incidence of myocardial infarction in Negroes, it was considered that ovarian dysfunction might be involved. However, no significant difference in productivity was observed between white and Negro females. It should be noted that 42 per cent of the white
cases and 41 per cent of the Negroes could not be properly evaluated because of inadequate records. Of possible significance was the observation that pelvic surgery during the childbearing period was performed on 20.3 per cent of the Negro females as contrasted with only 5 per cent of the white cases, a ratio of 4:1. The importance of this finding remains to be determined.

The mortality rate in the present study was greatest among the Negro females. This again is a startling deviation from the classical description of myocardial infarction in women. It would almost appear that coronary atherosclerosis is a different disease in the Negro female as compared with that described in the literature. The explanation of this variation presents a definite challenge. Further extensive study of the Negro female is essential and may well afford an insight into the pathogenesis of coronary artery disease.

**SUMMARY AND CONCLUSIONS**

1. The records of 519 cases of proved myocardial infarction were reviewed. Of these patients 233 were white; 286 were Negro. The ratio of hospital admissions was 70:30 in favor of the Negro. The incidence of myocardial infarction in Negroes was 52 per cent of that in Caucasians.

2. The classical sex predominance of myocardial infarction in males was not present in the Negro patients. The ratio of Negro males to females was approximately 1:1 (1.2:1), while among the white patients it was 3:1 (2.9:1).

3. The average age at the time of initial myocardial infarction was 66.5 years for white females, 62 years for white males, 60.6 years for Negro males, and 56 years for Negro females. Infarction occurred, therefore, more than 10 years earlier among the Negro females than among white females. This is a significant difference.

4. A history of angina pectoris prior to myocardial infarction was obtained in 57 per cent of white females, 48 per cent of white males, 32 per cent of Negro males and 26 per cent of Negro females. Angina, therefore, occurred more than twice as frequently among white as among Negro females. This is a significant difference.

5. The highest mortality rate in the present study occurred among the Negro females (77 per cent).

6. Four times as many Negro as white females reported a history of pelvic surgery during the child-bearing years.

7. All cases were analyzed with regard to obesity, diabetes mellitus, hypertension, and family history of cardiovascular disease. No significant racial variation was observed.

8. Myocardial infarction in the Negro female deviated significantly from the classical description of this disease.

9. Further investigation of coronary artery disease in the Negro female is essential and may provide basic information concerning the pathogenesis of this disease.

**SUMMARIO IN INTERLINGUA**

Esseva revidite 519 casos consecutive de infarcimento myocardial. Le revista revela un inexpectatamente alte frequentia del morbo in femininas negre. Iste catastrofe occurre in femininas negre a un etate minus matur, e in plus illo es associate minus frequentemente con angina, sequu un curso plus virulente, e es associate con un plus alte mortalitate que illo observate in le racia blanc e in masculos negre. Es presentate comparationes del characteristicas clinic in le duo sexos e racias.

**REFERENCES**


A Comparative Study of Myocardial Infarction in the White and Negro Races
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