ANALYSIS OF RESULTS

TABLE (1): Shows the clinical data of control subjects (Group, I). They were 11 males and 9 females. Their age ranged 15-62, with a mean of 33.8 ±13.96 years (mean ± S.D.). Their height ranged 148-185, with a mean of 165.35 ± 10.55 cm. Their weight ranged 46-94, with a mean of 66.83 ± 13.06 kg. According to their age, sex and height, their desired weights ranged 45-83, with a mean of 64.1 ± 11.2 kg. Their weights were 97 to 113 percent from their desired weights.

The systolic blood pressure ranged 110-145,with a mean of 125.25 ± 9.52 mmHg., while their diastolic blood pressure ranged 70 - 90, with a mean of 83.75± 5.35 mmHg.

TABLE (2) : Presents the clinical data of patients with ischaemic heart diseases. They were all males(group, II).

Their age ranged 46-65 , with a mean of 54.6 ± 6.7 years, which is significantly higher ($P < 0.001$) than the mean age of control subjects.

Their height ranged 157-185, with a mean of

168.4 ± 9.17 cms., which is not significantly different ($P > 0.8$) from the mean height of control subjects.

Their weight ranged 52-98, with a mean of 73.9 ± 13.43 kg., which is not significantly different ($P > 0.1$) from the mean weight of control subjects.

Their weight ranged 81-117 per cent from their desired weight, only one patient (NO. 7) was abese.

According to their age , sex and height, the desired weight for them ranged 64-86 , with a mean of 71.85 ± 7.52 kg., which is significantly higher ($P < 0.05$) than the mean desired weight of control subjects.

Their systolic blood pressure ranged from 90 to 170 mm.Hg., with a mean of 130.3 ± 22.68 mmHg., which is not significantly different ($P > 0.1$) from the mean systolic blood pressure of controls.Their diastalic blood pressure ranged 70-100, with a mean of 87.5 ± 10.87 mmHg., which is also not significantly different ($P > 0.1$) from the mean diastolic blood pressure of controls.

Four of these patients have old myocardial infarction, inferior in three of them and anteroseptal

in the fourth patient. Also, four of these patients have recent myocardial infarction, anteroseptal in two patients, inferior in one and lateral in the fourth patient . The last two patients (of the 10) suffered cardiac ischaemia , lateral in one and anteroseptal in the other.

TABLE (3) : Shows the clinical data of diabetics with ischaemic heart diseases (group, III).

They are 9 males and one female.

Their age ranged 43-63, with a mean of 56.5 $\pm$ 6.28 years, which is significantly higher ($P < 0.001$) than the mean age of controls, but not significantly different ($P > 0.1$) from the mean age of patients with I.H.D. , but not diabetics (group, II).

Their height ranged 164-179, with a mean of 170.5 $\pm$ 4.58 cm, which is not significantly different from the mean height of both controls ($P > 0.05$)and I.H.D. patients without diabetes mellitus ($P > 0.1$).

Their weight ranged 68-77, with a mean of 71.6 $\pm$ 2.63 kg., which is not significantly different from the mean weight of both controls ($P > 0.1$) and I.H.D. patients but not diabetics ($P > 0.1$).

According to their age, sex and height,the disired

weight of these patients ranged 67-80,with a mean of 72.8 ± 4.02 kg., which is significantly higher ($P < 0.01$) than the mean desired weight of controls, but not significantly different ($P > 0.1$) from the mean desired weight of I.H.D. patients without diabetes mellitus.

Their weight ranged 90-106 per cent of their desired weight, thus none of them was obese.

Their systolic blood pressure ranged 140-170, with a mean of 157 ± 9.49 mmHg., which is significantly higher than the mean systolic blood pressure of controls ($P < 0.001$) and I.H.D. patients but who are not diabetics ($P < 0.01$).

Their diastolic blood pressure ranged 90-110, with a mean of 98 ± 5.87 mmHg., which is significantly higher than the mean diastolic blood pressure of both controls ($P < 0.001$) and I.H.D. patients without diabetes mellitus ($P < 0.02$).

Four of these patients had old myocardial infarction which was anterior in two patients and lateral in the other two. Two patients only suffered recent inferior infarction, and one patient suffered anteroseptal infarction. The last three

patients suffered isochaemia which was lateral in two and anterior in one patients.

TABLE (4): Presents the clinical data of diabetic patients without ischaemic heart deseases (group,IV).

They were 4 males and six females. Their age ranged 40-69, with a mean age of 54.1 $\pm$ 8.45 years, which is significantly more ($P < 0.001$) than the mean age of controls, but not significantly different from the mean age of I.H.D. patients without ($P > 0.1$) or with ($P > 0.1$) diabetes mellitus.

Their height ranged 155-178, with a mean of 165.7 $\pm$ 7.12 cm, which is not significantly different from the mean ages of groups I, II and III ($P > 0.1$, > 0.1, and > 0.05 respectively).

Their weight ranged 59-80, with a mean of 69.3 $\pm$ 8.33 kg., which is not significantly different from the means of body weights of groups I, II and III ($P > 0.1$ for each).

According to their age, height and sex, the desired weight of this group of patients ranged 59-79, with a mean of 67.8 $\pm$ 6.27 kg., which is not significantly different from the mean desired weights of

groups I & II ($P > 0.1$ for each), but significantly lower ($P < 0.05$) than the mean desired weight of I.H.D. patients who are diabetics (group,III).

Their weight ranged 92-136% of their desired weight, only one (NO. 6) of these patients was obese.

Their systolic blood pressure ranged 120-150, with a mean of 129 $\pm$ 8.43 mmHg., which is not significantly different from the mean systolic blood pressure of group, I ($P > 0.1$), group II ($P > 0.1$) but significantly lower ($P < 0.001$) than the mean of group III.

Their diastolic blood pressure ranged 80-90, with a mean of 83.5 $\pm$ 4.12 mmHg., which is not significantly different from the mean diastolic blood pressure of group I ($P > 0.1$), group II ($P > 0.1$), but significantly lower ($P < 0.001$) than the mean diastolic blood pressure of group III.

The E.C.G. of each of these patients was free.

TABLE (5) : Presents the plasma glucose levels during fasting and two hours after 75 g. glucose oral load,

as well as the serum levels of albumin and fructosamine in control subjects.

Fasting plasma glucose levels ranged 60-104 , with a mean of 80.4 ± 11.37 mg./dl.

The two hours plasma glucose levels ranged 66-118, with a mean of 87.55 ± 12.7 mg./dl.

Serum albumin ranged 3.85-5.11, with a mean of 4.488 ± 0.44 g./dl.

Serum fructosamine levels ranged 18-37,with a mean of 26.775 ± 6.01 mg./dl.

TABLE (6) : Presents the plasma glucose levels during fasting and two hours after 75 g. glucose oral load, as well as serum albumin and fructosamine in ischaemic heart disease (I.H.D.) patients (group, II).

The fasting plasma glucose ranged 75-105,with a mean of 89.1 ± 9.597 mg./dl., which is significantly higher ($P < 0.05$) than the mean fasting plasma glucose of controls (table,9 and figure, 1).

Two hours plasma glucose levels after 75 g. glucose oral load ranged 115-170 , with a mean of 135.8 ± 17.974 mg./dl., which is significantly higher

($P < 0.001$) than the corresponding mean of controls (table 9 and figure, 1).

Serum albumin levels ranged 3.8-5.22, with a mean of 4.363 $\pm$ 0.527 g./dl., which is not significantly different ($P > 0.1$) from the corresponding mean of controls (table, 9 and figure, 2).

Serum fructosamine levels ranged 23-38.5,with a mean of 29.7 $\pm$ 5.012 mg./dl., which is not significantly different ($P > 0.1$) from the corresponding mean of controls (table, 1 and figure, 3)

TABLE (7) : Presents the plasma glucose levels during fasting and two hours after 75 g. glucose oral load, as well as the serum levels of albumin and fructosamine in I.H.D. patients who are also diabetics (group, III).

Fasting plasma glucose levels ranged 101-170, with a mean of 132.6 $\pm$ 21.282 mg./dl., which is significantly higher than the corresponding means of controls ($P < 0.001$) and I.H.D. patients ($P < 0.001$) who are not diabetics (table, 9 and figure, 1).

Two hours after 75 g. glucose oral load,plasma glucose levels ranged 210-405, with a mean of 311.3 $\pm$ 62.336 mg./dl., which is significantly higher than the

corresponding mean of controls ($P < 0.001$) and I.H.D patients ($P < 0.001$) who are not diabetics (table,9 and figure 1).

Serum albumin levels ranged 3.19-5.64,with a mean of 4.362 ± 0.772 g./dl., which is not significantly different from the corresponding mean of controls ($P > 0.1$) and I.H.D. patients ($P > 0.1$) who are not diabetics (table, 9 and figure, 2).

Serum fructosamine levels ranged 34.5-55, with a mean of 46.75 ± 6.861 mg./dl., which is significantly higher than the corresponding mean of controls ($P < 0.001$) and the mean of I.H.D. patients ($P < 0.001$) who are not diabetics (table, 9 and figure, 3).

TABLE (8) : Presents the plasma glucose levels during fasting and two hours after 75 g. glucose oral load as well as the serum levels of albumin and fructosamine in diabetic patients without cardiac troubles (group, IV).

Fasting plasma glucose ranged, 130-321,with a mean of 223.1 ± 61.091 mg./dl., which is significantly higher than the corresponding means of groups I, II and III ($P < 0.001$ for each),table 9 and figure, 1.

Two hours after 75 g. glucose oral load plasma glucose ranged 217 - 490 , with amean of 360.2 ± 84.195 mg. / dl., which is signifi - cantly higher ($P < 0.001$ for each) than the corresponding mean of groups I and II, but not significantly different ($P > 0.1$) from the corresponding mean of I.H.D. patients (group, III) who are also diabetics (table, 9 and figure, 1).

Serum albumin levels ranged 3.52-5.10, with a mean of 4.407 ± 0.505 g./dl., which is not significantly different ($P > 0.1$ for each) from the corresponding means of groups I, II and III (table, 9 and figure,2).

Serum fructosamine levels ranged 38.5-63, with a mean of 50.8 ± 7.595 mg./dl., which is significantly higher than the corresponding means of groups I and II' ($P < 0.001$ for each), but not significantly different ($P > 0.1$) from the corresponding mean of group III who are I.H.D. patients and are also diabetics (table, 9 and figure, 3).

TABLE (9) : shows the plasma glucose levels during fasting and two hours after 75 g. glucose oral load, as well as the serum levels of albumin and fructosamine in the four investigated groups. The range, mean, S.D.,S.E.

and the results of comparing these parameters among the different groups and statistical analysis of the results are also shown.

Figure (4) : Illustrates a direct significant positive correlation ($r * 0.8063$, $P < 0.001$) between serum fructosamine levels and fasting plasma glucose levels in controls .

Figure (5) : Illustrates a direct significant positive correlation ($r = 0.7071$, $P < 0.001$) between the serum fructosamine levels and fasting plasma glucose levels in all the investigated patients.

D I S C U S S I O N

It is well established that diabetes mellitus increases the risk of coronary heart diseases (CHD) and other atherosclerotic vascular diseases, but the relationship of subclinical impairment of glucose tolerance to morbidity and mortality caused by atherosclerotic vascular diseases still remains controversial. (Pyorala et al., 1969). There is, also, extensive evidence for an increased prevalence of glucose intolerance among survivors of myocardial infarction(Opie and Stubbs, 1976).

Much of the confusion about the role of impaired glucose tolerance as a CHD risk factor may be due to the use of variable criteria for its definition and the failure to recognise that "diabetes mellitus" is a heterogenous disorder with regard to aetiology , genetic background, treatment and associated possible CHD risk factors such as serum lipoproteins.(Mattock et al., 1979), hypertension , obesity and smoking.

Glycosylation of proteins can occur as a non-enzymatic post-translational modification (Bunn et al., 1978) directly dependent upon prevailing glucose

concentration (Day et al., 1979). Consequently , diabetics tend to have elevated concentrations of glycosylproteins, and the degree of glycosylation of haemoglobin (Dunn et al., 1979 and Paisey et al.,1980) and serum proteins (Dolhofer et al., 1980) has been correlated with indices of glycaemia. Because glycosyl protein concentrations reflect an average of serum glucose level over a short period of time, their determination provides an attractive means of monitoring diabetic control. In practice, however, the methods available for estimation of glycosyl proteins are either cumber some (Dolhofer and Wieland, 1981) or require special equipments (Cole et al., 1978).

Recently,fructosamine test was introduced as a new colorimetric assay designed to measure serum glycosylated protein concentration (Johnson et al., (1983). The test, called the fructosamine test in recognition of the Amadori rearrangement product formed by the condensation of glucose and proteins , (Hodge; 1955). The test has the advantage of technical simplicity, low cost and ease of automation using standard laboratory equipment (Baker et al., 1983).

For these reasons serum fructosamine levels are

estimated in this study, in 10 patients with CHD, 10 diabetics with CHD , in 10 diabetic patients without CHD, in addition to 20 healthy persons as controls. Also, correlation between serum fructosamine and fasting blood glucose in these groups had been done.

In this study, the plasma glucose levels in CHD patients (group, II) during fasting and 2 hours after glucose load are significantly higher compaired to the corresponding levels of controls (Tables, 5, 6, and 9 and figure, I).

In the fasting state , only one of these 10 patients (10%) with CHD (NO. 3) showed a higher plasma glucose levels than the reported range of control in this study. However, two hours after glucose load , 9 of these 10 patients (90%) showed plasma glucose levels higher than the corresponding levels in controls in this study.

National Diabetes Data Group (1979) who ascribed glucose intolerance state to persons with plasma glucose levels, two hours after 75 g. glucose oral load ranging 140 - < 200 mg./dl. Applying the previous criteria , for the results of these patients shows that 3 (30%) of

these patients had glucose intolerance.

Glucose intolerance among patients with CHD has been detected by Opie and Stubbs (1976) who demonstrated increased prevalence of glucose intolerance among survivors of myocardial infarction.

The serum levels of albumin in these patients were not significantly different from the corresponding levels of control subjects. Serum albumin levels were estimated in this study, since it was reported by Johnson et al. (1983) and Seng and Staley (1986) that serum albumin levels of $<$ 3g./dl affect estimation of serum fructosamine.

Serum fructosamine levels in centrols , in this study, ranged 18 - 37 , with a mean of 26.775 $\pm$ 6.01 mg./dl (mean $\pm$ S.D.). Such range among healthy non-diabetic subjects is comparable to that reported by Hindle and Glenise (1985) and Hindle et al. (1985), who reported a range of 15 - 36, with a mean of 23.7 $\pm$ 7.5 mg./dl. Earlier studies, have reported higher levels of serum fructosamine in healthy persons (Johnson et al., 1983; Backer et al., 1984) however , this was attributed to the different carbonate buffer

they used (Bains, 1985).

In CHD patients, serum fructosamine levels ranged 23 - 38.5, with a mean of 29.7 $\pm$ 5.012 mg./dl., which is not significantly different from the corresponding mean of control subjects. Only one of these 10 (10%) patients with CHD showed serum fructosamine levels above the reported range for control subjects in this study.

This finding denotes that serum fructosamine test failed to detect the glucose intolerance in this group of CHD patient. However, the number of patients in this study is too small to allow the judgement and putting final conclusion about the ability of fructosamine test to dectect the glucose intolerance. Yet recently, Benein (1987) has demonstrated the failure of this fructosamine test to detect glucose intolerance in 24 subjects of obese subjects with impaired glucose tolerance.

In diabetics with chronic heart disease (group, III), the plasma glucose levels both during fasting and 2 hours after glucose load are significantly higher than the corresponding levels in controls and in

CHD patients but who are not diabetics. This finding is understandable since all of these diabetic patients were not controlled.

Serum albumin levels of these patients were, in all, above g./dl., so it has no effect on estimation of serum fructosamine levels (Johnson et al., 1983 ; Seng and Staley, 1986).

The mean serum fructosamine levels in this group of patients was significantly higher than the corresponding means of controls and CHD patients who are not diabetics. This higher fructosamine levels could be attributed in these CHD patients to the associated diabetes. Higher serum fructosamine levels in diabetics have been reported by Johnson et al. (1983), Seng and Staley, 1985 & 1986).

In diabetics without CHD (group, IV), serum fructosamine levels in all patients were above the reported range for controls in this study leading to a level which is significantly higher not only from the corresponding mean of controls, but also of CHD Patients without diabetes (group, II). However, this mean level is not significantly different from the

corresponding mean of diabetics with CHD, such finding implies that the increased higher mean serum fructosamine levels of the latter group of patients is due to the diabetic process itself.

Higher serum fructosamine levels in diabetics have been reported by many investegators (Baker et al., 1983 , 1984 & 1985 ; Johnson et al., 1983 ; Roberts et al., 1983 ; Roberts and Baker 1986 ; Hindle et al. 1985 ; San Gill et al. 1985 ; Seng and Staleby 1985 & 1986).

Recently, Henein (1987) has demonstrated increased serum fructosamine levels among Egyptian obese diabetics.

As a conclusion, glucose intolerance is detected in a group of CHD patients, and the fructosamine test failed to detect such intolerance. In diabetics with CHD the fructosamine serum levels were significantly higher , and this rise could be attributed to the associated diabetes.