

CORONARY RISK FACTORS ESTIMATION IN DIFFERENT REGIONS OF PAKISTAN

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SUMMARY

Ischemic heart disease is a leading cause of death all over the world. The major risk factors for atherosclerosis are hypertension, diabetes mellitus, smoking and hypercholesterolaemia. This study comprising 2201 subjects conducted in four cities of Pakistan showed 25% prevalence of smoking in males and 0.8% in females. In adults, the mean cholesterol in hypertensive and normotensive group was 192 ± 51.0 and 174 ± 54 mg% respectively. The mean cholesterol value of lower socioeconomic group was 172 ± 52.9 mg% and higher socioeconomic group was 191 ± 53.8 mg%. Value in children was found to be 146 ± 30.55 mg% among boys and 148 ± 31.91 mg% among girls. Mean cholesterol values vary in different cities. Large scale surveys are required to define the risk factors so that a well orchestrated drive can be planned accordingly.

INTRODUCTION

Atherosclerotic coronary artery disease (CAD) continues to be a leading cause of death in the developed countries of the West. Numerous epidemiologic studies conducted over the past several decades, have determined the multifactorial nature of the disease¹. The Framingham study elegantly established an association between smoking, hypertension, hypercholesterolaemia and the development of CAD; consequently, since then these factors have been referred to as risk factors.

CAD was thought to be nonexistent in countries like Pakistan even as late as the decade of the seventies². Several reports from within the country indicate that the percentage of admissions from CAD to general medical wards has increased over the last few decades. In a study reported from Mayo Hospital Lahore, the prevalence of CAD admission increased from 1.7 % in

1944-48 to 17.9 % in 1954-58; similarly in JPMC Karachi, total CAD admissions were 41.8 % in 1967 where as in 1981 they formed 75 % of male admissions and 51.8 % of female admissions³. In Peshawar over a six year period, 1966-72 the admissions of CAD increased from 2.3 % to 3.96 % in a medical unit⁴. Simultaneously the percentage of young males, below the age of 40 years, has increased to 20 %. There is no apparent reason for this increased prevalence.

Several studies have looked at the cholesterol values of hospitalised patients with CAD and controls. In the PMRC trial⁵ the values of cholesterol in the infarction patients varied between the various centres. The mean value was about 243 mg%. In another study from Lahore the value of cholesterol in CAD patients was 212 mg%^{6,7}. In addition cholesterol measurements in selected communities in Karachi, Rabwah and urban and rural Sindh^{8,9}

TABLE - I
MEAN CHOLESTROL. VALUES AT THE FOUR CENTRES IN MALES AND FEMALEES

CENTER	NO.	CHOL.	S.D	S.E.M	%
KARACHI	427 (57)	163 (168)	50.87 (41.47)	2.29 (3.30)	31 (24)
LAHORE	187 (271)	188 (184)	66.16 (61.62)	4.92 (3.36)	13 (51)
ISLAMABAD	393 (55)	180 (184)	56.64 (46.15)	2.73 (5.06)	27 (13)
PESHAWAR	430 (70)	188 (200)	45.72 (45.71)	2.10 (5.14)	29 (12)

Note:- Values given in () represent females.

performed in the sixties, reveal low values. Comparison of these values with those from U.S.A.¹¹, Finland¹¹ and other European countries¹² reveals that our values are much lower. These difference may reflect differences in diets as cholesterol levels are known to be dependent on ingestion of saturated fats, cholesterol, ratio of poly-unsaturated to saturated fats, besides other variables¹³.

We, therefore, decided to evaluate the prevalence of risk factors, in different regions of Pakistan, with a view to their relevance in our setting, as regards the observed increase in CAD, and subsequent development of awareness and interventional programmes if indicated.

MATERIAL AND METHODS

Four centers, one each in Karachi, Lahore, Islamabad and Peshawar were established. A uniform protocol for evaluation of the history, physical examination and blood cholesterol examination was instituted. Blood pressure measurements were performed in the sitting position after a rest of five minutes. Smoking status was ascertained at the time of examination. History of diabetes mellitus in the family and a history of diabetes in the individual was recorded. No blood sugar measurement was made. The present report deals with the cholesterol values only. Serum cholesterol was measured in a standardized fashion

using a commercially available Reflotron. The machine was calibrated and strict quality control was observed. Blood was obtained by finger prick using a mechanical gun. Values were reported in mg%.

Four different populations were targeted in the four areas. In Karachi bank employees of all grades were examined; in Lahore the staff of Farima Jinnah Medical College were evaluated; while at Islamabad and Peshawar secretariat workers and university employees were screened respectively. In addition male and female students between the age of 15-20 years were examined at each center for reference purpose.

A total of 1916 adults over the age of 21 years were screened; there were 1437 males and 478 females. In addition 137 boys and 148 girls student between the ages of 15-20 were screened.

The data was stored in a computer and analysis of the data was performed using standard statistical methods. The student test was used for values of significance at the 0.05 level.

RESULTS

The pooled data from the four centers revealed a mean cholesterol value in children of 146mg % \pm 30.55. The value for boys was 144 \pm 28.80 and for girls 148mg \pm 31.91. There was no statistical difference between the two groups. Breaking the data

TABLE - 2
COMPARISON OF CHOLESTEROL VALUES OF PRESENT STUDY WITH OTHER
PUBLISHED REPORTS FROM PAKISTAN IN MALES.

AGE IN YEARS	PRESENT STUDY	A.K.C.	RABWAH
21-30	159 ± 48.88	N.A.	N.A.
31-40	188 ± 54.53	182.8 ± 39.3	194 ± 49.6
41-50	195 ± 54.21	195.8 ± 40.4	207.8 ± 55.2
51-60	188 ± 59.15	189.8 ± 41.7	203 ± 51.9
61+	—	191.9 ± 41.5	202.7 ± 49.7

A.K.C. = Agha Khan Community Study, Karachi, 1966.

Rabwah Study, 1967-68. (Ref. 1)

N.A. = Not Available

up between the four centers the mean values ranged between 139-152 mg% in boys and 143-152 mg% in girls. There was no statistical difference between the values obtained at the four centers.

The mean cholesterol value obtained for the adult group was 180 mg% in men it was 178 mg% and in women 184 mg%. Table II and III list the mean values and standard deviations in the various age

groups in males and females. The mean values rise significantly between the third and fourth decades of life, thereafter there is no statistically significant change. In each decade the value for women is higher than that for men; these differences are statistically significant at the 0.05 level. The mean cholesterol value of the Karachi population was significantly lower than that of the other three centers, the highest value

TABLE - 3
COMPARISON OF CHOLESTEROL VALUES OF PRESENT STUDY WITH OTHER
PUBLISHED REPORTS FROM PAKISTAN IN FEMALE.

AGE IN YEARS	PRESENT STUDY	A.K.C.	RABWAH
21-30	165 ± 40.38	N.A.	N.A.
31-40	203 ± 65.68	177.9 ± 39.7	195.8 ± 49
41-50	211 ± 71.92	188.3 ± 43.8	206 ± 49.6
51-60	202 ± 55.51	201.9 ± 43.8	221.4 ± 46.9
61+	—	194.1 ± 39.7	225 ± 50.7

A.K.C. = Agha Khan Community Study, Karachi, 1966.

Rabwah Study, 1967-68 (Ref. 1).

N.A. = Not Available.

TABLE - 4
AGE DISTRIBUTION IN CHOLESTEROL VALUES GREATER THAN 200

AGE	T. NO	NO >200	%	% OF TOTAL
21-30	530 (259)	20 (6)	3 (2)	20 (27)
31-40	422 (108)	169 (48)	38.2 (44.4)	38 (34)
41-50	274 (74)	170 (34)	25.5 (48.50)	24 (24)
51-60	191 (42)	78 (21)	40.80 (50.0)	18 (15)

Note: Values given in () represent females.

being obtained from Peshawar. The differences in cholesterol values of the male and female population of each center is given in Table I. Again there is a very significant difference between Karachi and other centres amongst males. The number of female cases at Peshawar and Islamabad was small and hence may not adequately reflect the true values. However, there is still a very significant difference between the female population of Lahore and Karachi. Break-down of the cholesterol into the various categories, denoting risk as suggested by the consensus conference, in the United States figure II and III, we find that 56 % of the total population fall below 180 mg% and another 14.2 % in the 181-200 group. There are a total of 30 % who have elevated cholesterol i.e a value over 200 mg%. Even in this group 20 % are below 260mg % and only 8.1 % are over 260mg %; these values are significantly lower as compared to most values from the West.

Cholesterol values greater than 200 are given in Table II for males and females. As is apparent the percentage of abnormal values rises dramatically between the third and fourth decades, remaining constant thereafter.

Smoking and Cholesterol

There was no significant difference between the mean cholesterol of smokers

and non smokers in our population. The smoking figures indicated a prevalence of 25 % in the male population and only 0.8 % in the female population. The figures in females may not be accurate because of under reporting on social grounds.

Socio-Economic status and Cholesterol

We divided the population into two groups based on the National Pay Scale Grades. Lower Social Economic Group included persons in Grade-16 and below, where as those from Grade 17-22 were included in the upper group. The mean cholesterol value of the lower group was 172 mgs % \pm 52.9 and of the higher socio-economic group 191 mgs % \pm 53.8 ($p < 0001$). These differences remained highly significant in both males and females and in all age groups.

Hypertension and Cholesterol

The mean cholesterol in the hypertension group i.e with a blood pressure recording of greater than 140/90 was 192 \pm 51.0 SD and of the normotensive group was 174 \pm 54 SD ($p < .0002$). These differences were noted in all age groups and in both sexes when analyzed separately.

DISCUSSION

Prevalence figures of various heart diseases in Pakistan indicate that cardiovas-

TABLE - 5
 CHOLESTEROL VALUES IN CHILDREN AGED 15-20 YEARS

	NO	CHOL	S.D	S.E.M	%
MALE	137	145	28.80	2.42	47
FEMALE	153	149	31.91	2.55	53
TOTAL	290	147	30.55	1.77	

cular disorders afflict about 11 % of the total population.⁹ Amongst adults, hypertension affects 7.3 million, C.A.D. 0.96 million, rheumatic heart disease 0.25 million and congenital heart disease 0.7 million. Being based on small population surveys these figures may not be entirely reliable. However, they do highlight the point that cardiovascular disorders are common in Pakistan and that C.A.D may be more common than rheumatic heart disease. Life insurance figures also point to the fact that approximately 45% of deaths are cardiovascular in origin. The need for evaluation of CAD risk factors is therefore, self apparent.

Several studies done in different parts of Pakistan, looking at the prevalence of heart disease and cholesterol values have been reported. Cholesterol values reported in adults from rural and urban Sindh, Rawah and Agha Khan community in Karachi, done in the sixties are given in Table III, IV. These values are almost similar to the mean values we have obtained, indicating that the average cholesterol values have not changed significantly over the past two decades. Again comparison of our values with those published by Krishnaswami from India in 1989 indicate similar findings.¹⁴

Cholesterol values are very low at birth and gradually rise during childhood. In the sixteen country study,¹⁵ reported by Knudman et al in 1982, the lowest value reported in

children in the 7-8 year group was 101.5 ± 3.8 mgs.% from Nigeria whereas the highest level of 198.4 ± 5.7 mgs% was from Finland; the differences amongst the various countries showed an over all trend of lower values from under developed countries which probably reflects a lower intake of dairy products as they are more expensive. All the values reported were significantly lower than the atherogenic levels except the figures from Finland which were close to 200 mgs.%. The values in school children in our study are similar to the values obtained from Pakistan children in the above study.

Cholesterol levels in adults vary a great deal from one country to another and even between various parts of a country. Karelia in Finland, has much higher values than other regions of the same country and consequently have a much higher CAD prevalence.¹¹ That these high levels of cholesterol can be reduced by diet alteration with a resultant decrease in incidence of CAD, has been well documented.^{13,16}

The cholesterol values in adults in Pakistan are much lower than those reported from U.S.A, Finland, U.K and are similar to those reported from India. What is perplexing though is the relatively high incidence of C.A.D in Asians of Indo-Pakistan origin. In a study by Mckiegue et al from London¹⁷, the morbidity and mortality from C.A.D was higher in Asian immigrants as compared to the local white

population despite lower risk factor levels. The possibility of other factors, not well understood, contributing to this paradox exists.

Our findings highlight the point that cholesterol values may be different in the various areas of the country. The marked differences in dietary intake—meat is more frequently consumed in Peshawar, where as legumes form a higher percentage of dietary intake in Karachi may be contributing to the display.

Definition of socioeconomic status is hazardous in our country as pay scale grades may not accurately reflect the true values. However, they are a guide, albeit a poor one, to socioeconomic grouping. It is apparent that relative affluence may be contributing to higher cholesterol values either because of an increased saturated fat intake, greater caloric intake or lack of exercise. The underlying reasons for the differences in cholesterol levels require further evaluation.

Hypertensive patients have a higher cholesterol level as compared to normotensives. No satisfactory explanation is available for the above findings.

Recent investigations have revealed partial Insulin resistance in hypertensive and CAD patients. The fat distribution in both these conditions is predominantly in the upper body area also referred to as the male type. The biochemical changes resulting from the above abnormality may be the common factor. However appealing the concept may be, further investigations are required in this field.

The relationship of cholesterol to CAD has been suspected for several decades. Epidemiological studies have consistently pointed in this direction¹⁴. Recent studies have documented the decrease in incidence of CAD after reduction of cholesterol levels^{15,17}. On an average the reduction in CAD is about 2 % for each 1 % reduction

in cholesterol.

Also noted has been the recent documentation in the MRFIT study that the relationship of risk of CAD, to cholesterol is a continuum, there being no sharp cut off point. Based on the data from this study certain guidelines for optimal cholesterol levels, moderate risk and high risk levels have been formulated both in the U.S.A and Europe²². According to these values about 8% of our study population falls into the high risk category and another 21% in the moderate risk group. Though these figures are far lower than those in Western countries they need to be addressed urgently as a continuation of this trend may lead to an increase in CAD with its attendant high morbidity, mortality and adverse economic impact.

In conclusion cholesterol evaluation on a large scale is necessary so that adequate dietary programmes and other educational materials can be prepared. In addition health policy guidelines need to be developed to counter the menace of CAD.

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