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Demographic and Clinical Features of Young Population with Cardiac Conditions Presenting To Cardiology Unit of a Tertiary Care Hospital
Running title: Quantification of cardiac anomalies in a younger population

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ABSTRACT:
This study was conducted to quantify the demographic and clinical profile of younger patients with cardiac conditions presenting to a tertiary care hospital. Itwas a retrospective sub-analysis of previously conducted study data. There were 753 cases of cardiology in the parent study. We selected patients in two study categories i.e. young patients of up to 40 years of age and those more than 40 years. A total of 101 cases were enrolled in each study group. The primary aim was to quantify the demographic and clinical presentation of the younger population with various cardiac conditions. Administrative permission was taken from HOD for conducting this sub-analysis. SPSS software was used for statistical analysis. In both age groups male gender was dominant, however, cardiac diseases were more prevalent in the older than 40 years group compared to young age (69.3% versus 57.4%, p-value 0.08). Acute Coronary Syndrome was the most common cardiac condition in both groups (60.4% versus 59.4%). Within the younger age patients, males were found more affected by cardiac diseases whereas more females were found with the prevalence of Acute Coronary Syndrome (67.4% versus 51.7%). Stent patency was found more common in males than females (29.3% versus 11.6%, p-value 0.03). Young age males were found associated with the acute coronary syndrome, and they undergo more stenting procedures. CT angiography showed that females were more prone to cardiac anomalies of origin or termination than males.

Keywords; Young population, demographic profile, acute coronary syndrome, cardiac anomalies

I. INTRODUCTION:

In the last few decades, there have been a trend of high prevalence of risk factors for cardiovascular disease. WHO estimates that around 30% of the fatalities caused annually worldwide are due to cardiovascular diseases.[1]The evidence from Pakistan also shows even bleak picture with 30 to 40% of all deaths attributed to cardiac diseases. The epidemiological transition in the 20thcentury has placed CVD as the principal cause of global disability. According to the global health projections, it is going to remain the foremost cause of mortality in 2030.[2] CVD and its atherothrombotic complications develop as a consequence of lifestyle, environmental factors, and genetic susceptibility. In the South Asian region risk of acquiring CVD is approximately 10 years earlier and CVD-related mortality in people ≤70 years of age was 50% compared to 23% in the western population.[3]

Research into cardiovascular risk factors (CVRF) is one of the fields in epidemiology that need the greatest development. Various types of behaviors have been identified that contribute to the onset or reduction of CVD. Some of the modifiable risk factors are smoking,a sedentary lifestyle, a diet poor in fiber and rich in cholesterol and saturated fats, diabetes mellitus (DM), dyslipidemias, and hypertension.[4]Among younger adults (18-50 years of age), the incidence of cardiovascular diseases over the same time period has either been steady or has inflated, in contrast to the trend towards a lower incidence of cardiovascular disease in adults aged >50 years.[5]

Moreover, the rate of substance abuse (opioids, cocaine, electronic cigarettes, and anabolic steroids) is also on the rise in young adults

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due to various psychological, personal or work-related pressures.[6]The current observations might, therefore, be used to forecast a potential epidemic of non-communicable diseases such ascardiovascular disease in the near future in the younger group of the populations. The current status of CVD in the young population is very alarming.

This study was planned with the aim to highlight the disease burden in younger populations on risk for ischemic heart disease, heart failure, atrial fibrillation, and sudden cardiac death in young adults below 40 years of age. Furthermore, we discuss the prevalence according to gender as well to check the temporal trends of various cardiovascular diseases within the young segment of the population in Pakistan.

II. METHODOLOGY:

This was a retrospective sub-analysis of previously conducted study data. In the parent study, 753 cases of cardiology were enrolled. We selected patients in two study categories i.e. young patients of up to 40 years of age and those more than 40 years. A total of 101 cases were enrolled in each study group. The primary aim was to quantify the demographic and clinical presentation of the younger population presenting to cardiac departments with various cardiac conditions. The administrative permission was taken from the HOD for conducting the sub-analysis of departmental data.

The study information comprised of patient age, gender, clinical diagnosis, and disease confirmation on CT-Angiography. Patients presenting to the Cardiology Department of Pakistan Institute of Medical Sciences, Islamabad were screened for enrollment.

The adult patients were included in case they had cardiac conditions such as chest pain and evaluation of acute coronary syndrome, patients at risk of CAD, evaluation of LBBB, before non-coronary cardiac surgery, dilated cardiomyopathy, coronary venography, and pulmonary vein imaging for certain electrophysiology procedures, assess coronary stent patency and CABG patency, and evaluation of children with congenital heart disease. Patients were excluded from the study in case of heart rate greater than 60 or 70 beats/min despite the use of beta-blockers, irregular heart rhythms (atrial fibrillation), inability to sustain a breath-hold for at least 15 to 20 seconds, severe coronary calcification since image reconstruction artifacts related to radiodensematerial such ascalcium, patients with a history of allergy to iodinated contrast medium, patients with significant renal dysfunction (patients with diabetes and a serum creatinine concentration above 2.0 mg/dL [177 umol/L], contraindication to beta-blockers, and coronary bridging. For confirmation of any cardiac anomaly, CT Angiography was done usinga multi-slice CT scanner (MSCT) Somatom definition 64, Siemens, Germany. The gantry rotation time is 330 msec (corresponding to a temporal resolution of 165 msec) and allows an x-ray beam collimation of 0.4 mm. To facilitate scanning and optimize image quality, most patients undergoing CCTA received oral or intravenous beta-blockers or both to slow the heart rate to less than 60 to 70 beats/min. Sublingual nitroglycerins were sometimes given immediately before the scan to achieve vasodilation. Injection of iodinated contrast medium (60 to 120 mL) was given before MDCT coronary angiography. Data were analyzed in SPSS version 22.0. Various quantification techniques were applied, in the case of categorical variables simple counts and relative counts were generated. For continuous numerical variables mean and standard deviations were calculated. For the association of demographic and clinical parameters with younger age groups, the chi-square test was applied and a p-value of <0.05 was considered statistically significant.

III. RESULTS:

In this study, a total of 202 patients were selected according to age categories of up to 40 years and above 40 years. In both age groups male gender was dominant, however, it was found more prevalent in the older than 40 years group compared to the young age group (69.3% versus 57.4%, p-value 0.08). The average age was 35.5 years in up to 40 years group and 55.2 years in above 40 years age group and obviously was statistically different. (Table 1)

Furthermore, it was found out that the majority of patients in both young and older age groups had Acute Coronary Syndrome (60.4% versus 59.4%, respectively). Other frequent indications were LBBB and CABG patency as well as non-coronary cardiac surgery. It was noted that stent patency was evaluated in more patients in the younger age group i.e. up to 40 years than those above 40 years (19.8% versus 12.8%), however, this difference was not statistically proven (p-value, 0.18). (Table 2)

There were 6 (5.9%) patients in the younger (up to 40 years) age group with anomaly or origin/termination compared to 2 (2.0%) in the older (above 40 years) age group. Though cardiac anomalies were more prevalent in the young

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patients, this proportionate difference was not statistically significant (p-value, 0.14). (Figure I)

For this sub-analysis, younger age patient data was selected according to gender. Within the younger age patients, males were found more affected by cardiac diseases than females. No variation was found in the average age of patients between male and female patients (35.5 versus 35.6 years). In this age category, more females were found with the prevalence of Acute Coronary Syndrome (67.4% versus 51.7%). Stent patency was found more common in males than females (29.3% versus 11.6%, p-value 0.03), and this difference was statically found significant. (Table 3)

Table 1: Demographic characteristics of patients in two groups

	Up to 40 years (n=101)	Above 40 years (n=101)	p-value
Gender			
Male	58 (57.4%)	70 (69.3%)	0.08
Female	43 (42.6%)	31 (28.7%)	
Age			
Mean ± SD	35.5 ± 4.2	55.2 ± 9.5	<0.001

Table 2: Comparison of various cardiac diseases between two study groups

	Up to 40 years (n=101)	Above 40 years (n=101)	p-value
Cardiac conditions			
Acute Coronary Artery Syndrome	59 (58.4%)	60 (59.4%)	0.88
ACS plus LBBB and CABG patency	12 (11.9%)	16 (15.8%)	0.41
ACS plus Stent Patency	22 (21.7%)	13 (12.8%)	0.08
Non-Coronary Cardiac Surgery	5 (5.0%)	7 (6.9%)	0.55
Dilated Cardiomyopathy & known cardiac anomaly	0 (0.0%)	3 (3.0%)	0.24
Before Electrophysiological Procedures	3 (3.0%)	2 (2.0%)	1.0

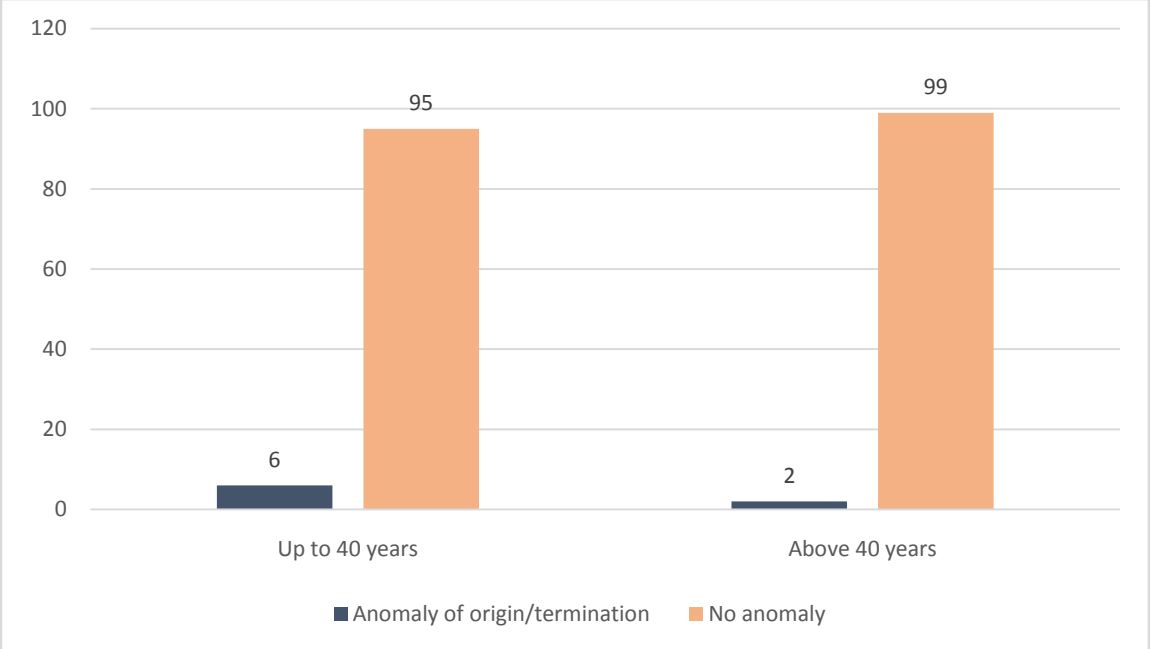

Figure I: Comparison of CT Angiography findings between two groups

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Table 3: Comparison of clinical condition and cardiac anomalies in younger population according to gender (n=101)

	Male (n=58)	Female (n=43)	p-value
Age (years)			
Mean ± SD	35.5 ± 4.0	35.6 ± 4.5	0.88
Cardiac conditions			
Acute Coronary Artery Syndrome	30 (51.7%)	29 (67.4%)	0.10
ACS plus LBBB and CABG patency	5 (8.5%)	7 (16.2%)	0.23
ACS plus Stent Patency	17 (29.3%)	5 (11.6%)	0.03
Non-Coronary Cardiac Surgery	3 (5.1%)	2 (4.6%)	1.0
Before Electrophysiological Procedures	3 (5.1%)	0 (0.0%)	0.25
Anomalies on CT angiography			
Anomaly of origin/termination	2 (3.4%)	4 (9.3%)	0.39
No Anomaly	56 (96.6%)	39 (90.7%)	

IV. DISCUSSION:

Populations around the globe are facing an epidemic of non-communicable diseases like heart disease.[2,3] The inappropriate eating and living styles of people have put them at risk of lipid and glycemic derangements in terms of high cholesterol, triglycerides, hypertension, and diabetes all significant indications of coronary artery diseases. This study highlighted the evidence of emerging cardiac conditions in the younger population. To our knowledge, this is one of the first few observations of the young population's demographic and clinical profile with cardiac conditions from Pakistan. This retrospective sub-analysis found out that more males had coronary syndromes and stent patency was also more significantly assessed in this young male group (p-value, 0.03). Overall, the cardiac anomaly was also found greater in the younger age group compared to the older age group, however, it was not statistically proven (p-value, 0.14). Many previous studies have also highlighted similar findings pertaining to younger communities as a special risk group for developing various cardiac conditions. A previous study by Matsis K and colleagues also reported that more males in the young age group developed MI when compared with the older age group.[7]This higher proportion of males in the young group in our study is not surprising given that coronary artery diseases occur 7 to 10 years earlier in men than women[8]and is consistent with the previous international literature examining younger groups with cardiac conditions.[9,10]

This study found that compared to the older age group, the younger age patients had more anomalies on CT angiography, while sub-quantifying anomalies it was witnessed that these were more common in females than males. Moreover, sent patency was assessed in more males than females. One study revealed that despite the absence of hypertension, diabetes and high cholesterol younger population had more MI, this could be genetic or may be due to the fact that the younger population takes the basic role of an earner in most societies, similarly, the early career has many pressures and uncertainty in one's life.[7]A previous study by Lloyd-Jones DM and colleagues on lifetime risks of cardiovascular diseases concluded that men were more likely to experience coronary heart disease at a younger age than women. They witnessed that in middle and older ages the risk of heart diseases was similar in both men and women in their study.[11]

The cardiovascular risk scoring algorithms and guidelines at current do not recommend only coronary heart disease as the outcome of interest but, consider the risk of stroke to identify patients at risk of cardiovascular disease.[12,13,14]Since stroke and MIs are related to lifetime dependability and lack of quality of life, thus, highlighting more intensive risk factor control at an early age.[15]

Pakistan being a lower-middle-income country with cash-strapped healthcare settings could not deal with the influx of cardiac conditions and dependencyin early life.[16]Younger populations which are thought to be the backbone of any family, community, or national economy if gets

seriously sick like catching the coronary disease, the impact is huge and multipronged. Evidence has proven that risk stratification is important in people with a positive family history of cardiovascular diseases. Moreover, following preventive guidelines and opting healthy lifestyle has a positive influence on the control and sustenance of the glycemic system.[17,18]

The strengths of this study include the generation of rare evidence on cardiac disease in the young population and quantification of their demographic and clinical profiles.

Limitations include lack of detailed risk factors estimation as this was a sub-analysis of existing data and besides age, gender and clinical information further details were not available for analysis.

V. CONCLUSION:

Proportion-wise young age males were found related to the acute coronary syndrome in this study. Young age males undergo more stent procedures. However, CT angiography showed that females were found to have more chances of cardiac anomalies of origin or termination. Risk estimation of cardiac diseases in younger ages could help in averting lifetime dependability and/or low quality of life. Lifestylemodification and healthy eating may have a positive effect on the risk and control of cardiac conditions such as MI, cardiovascular diseases, and acute coronary syndrome. More evidence on the topic with rigorous research methodsand of large scale is mandatory for the generalization of current study findings.

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