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Prevalence of the Modifiable Risk Factors of Cardiovascular Diseases in Young Adults of District Hyderabad Sindh Pakistan

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ABSTRACT

Cardiovascular diseases are the major cause of morbidity and mortality around the world. Numerous studies concluded that populations of the subcontinent are more prone to develop cardiovascular diseases including Pakistan as compared to other countries. **Objective:** To determine cardiovascular disease risk factors in the healthy population of the Hyderabad district, Sindh. **Methods:** The cross-sectional study was conducted from July 2023 to December 2023, in this study, apparently healthy young adults of not more than 40 years of age were included. A self-designed questionnaire was set for the collection of data. Blood pressure was taken using the standard method, a mercury sphygmomanometer. South Asian standards calculated BMI, and the blood sample was taken after 10 hours of fasting for lipid profile and fasting blood sugar. Collected data were analyzed by SPSS version 23.0. **Results:** In this study, one risk factor was found in 276 (76%) of the participants, and Obesity was found in 41 (17%) and 66 (52%) respectively in group I and group II participants. Central obesity was found to be higher in group II 92 (72%) than in group I 69 (29%). Group II participants were found to have higher blood pressure than group I 61 (48%) and 61 (26%) respectively. **Conclusions:** It was concluded that 3 risk factors were found higher in females, and 4 risk factors were found higher in males, thus making the male population more prone to be affected by cardiovascular diseases even at an early age.

INTRODUCTION

Traditionally, cardiovascular diseases affect the older population. Hence, it is well documented nowadays that the higher frequency of the younger population is also caused by cardiovascular diseases [1]. Early onset of these risk factors may lead to a longer duration of exposure, thereby increasing the chances of developing cardiovascular diseases in the latter half of life. Awareness of these trends in the young adult population is necessary to prevent cardiovascular diseases [2]. The frequency of overweight and obesity in young adults has been a rising trend that significantly contributes towards the development of increased blood pressure, dyslipidemia, and insulin resistance, these all are the risk factors for cardiovascular diseases [3]. Hypertension almost remained undiagnosed and untreated in the young population, and it is a major risk factor for cardiovascular diseases [4]. Timely detection and treatment are essential to avoid the long-term development of cardiovascular diseases [5]. Abnormal lipid concentrations, including higher concentrations of low-density lipoprotein (LDL), Triglycerides (TG), and

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decreased concentrations of high-density lipoprotein (HDL) are increasingly detected in younger populations. Improper diet patterns, physical inactivity, and genetic traits mainly cause dyslipidemia [6]. Cigarette smoking and tobacco use are also significant contributors to cardiovascular diseases. The new rising trend of vaping as an alternative to traditional smoking is also a bigger contributor, as the use of both causes endothelial dysfunction and the development of atherosclerosis [7]. Physical Inactivity prevalent among young adults, is linked to obesity, hypertension, and other cardiovascular risk factors. Promoting physical activity is crucial for cardiovascular health [8]. Consumption of unhealthy diets, like diets with increased saturated fats, increased sodium, and higher levels of sugar is linked with increased cardiovascular diseases. On the other hand, a diet rich in fruits, vegetables, whole grains, and lean proteins has protective effects against cardiovascular disease [9]. Therefore, early diagnosis and treatment of risk factors can prevent the development and progression of any type of cardiovascular disease [10]. Limiting the risk factors in the young population can lead to significant long-term health benefits, reducing the overall burden of cardiovascular diseases on the healthcare system [11]. Understanding these risk factors benefits in developing targeted health strategies among the young population, thus promoting healthier generations in the future [12]. Hence, the increasing frequency of cardiovascular disease risk factors among the young population is a public health concern that needs urgent consideration. This article was previously posted to the Research Square preprint server on 19 August 2024" in the last section of the introduction.

This study aims to find out the association of cardiovascular disease risk factors among the young healthy population.

METHODS

This comparative cross-sectional study was conducted in the Physiology Department of the University of Sindh Jamshoro. The Epi info software was used for sample size, with a 5% error margin and, a 95% confidence interval. The formula for sample size calculation was $n=Z^2.P.(1-P) / E^2$. Before enrollment, informed consent was taken from volunteers, inclusion criteria, residents of district Hyderabad, individuals aged between 20 to 40 years, individuals without cardiovascular disease, non-smokers, those without pregnancy, and no drug history. Exclusion criteria, non-residents of Hyderabad, individuals aged more than 40 years, individuals with any heart disease, individuals with pregnancy, active smokers, and drug addicts. All the procedures were carried out according to the guidelines and regulations of the University's research and ethical committee letter no: IRB/PHY1/=55. This study was conducted from July 2023 to December 2023. About 415 healthy participants were approached and finally, 363 (87.46%) participants agreed and provided the necessary data. A random sampling technique was used to collect data and participants were approached. Two sittings were done with all subjects in whom complete information was recorded in the pre-designed questionnaire and blood samples were taken under acceptable conditions using steroid syringes for fasting blood, and lipid profile in a fasting condition. The questionnaire included: sociodemographic characteristics, height, and weight measurements to calculate body mass index (BMI), questions about physical activities, and dietary habits, and questions to collect information about cardiovascular diseases. The BMI was calculated by standard method and South Asian scale was used for the measurement of BMI and blood pressure readings were taken by standard method. Blood pressure was measured by the mercury sphygmomanometer (Made in Shanghai, China). The chemistry analyzer (Micro lab 300) was used to fast blood sugar levels. Data were analyzed with a statistical package for the social sciences (SPSS Version 23.0). Statistical assumptions were tested before. Descriptive statistics, t-test and chi-square performed (mean, standard deviation, frequencies) were calculated for the baseline characteristics. Statistical significance was set at $p<0.05$.

RESULTS

The basic characteristics of the participants were divided into two groups according to their age. Group I includes participants aged 20 to 29, and Group II includes participants aged 30 to 40. Out of 363, 236 (65.01%) male belonged to age group I, while 127 (34.98%) belonged to age group II. In both groups, male participants were more numerous than female participants (Table 1).

Table 1: Sociodemographic Characteristics of the Participants

Variables	Frequency (%) (n=363)
Gender	
Male	236 (65.01%)
Female	127 (34.98%)
Age	
The Age Group I (20-29Years)	236 (65.01%)
Male	139 (58.89%)
Female	97 (41.10%)
Age Group II (30-39Years)	127 (34.98%)
Male	93 (73.22%)
Female	34 (26.77%)
Education	
Low	103 (28.37%)
High	260 (71.62%)
Social Status	
Low	98 (26.99%)
Middle	200 (55.09%)
High	65 (17.90%)

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A t-test performed between 2 groups, the overall age of the participants was 29.05 ± 1.01, while the mean age was higher in group II. The mean height was 1.6 ± 0.1 and no significant difference in both groups as well. The mean weight was 66.2 ± 13.4 and it is higher in group II. The mean BMI was 24.7 ± 4.2 and it increased in age group II. The mean Waist circumference was 86.0 ± 11.7 and it is increased in group II. The mean Systolic blood pressure was 122.4 ± 11.0 and it is higher in group II. The mean Diastolic blood pressure was 83.4 ± 9.4 and it is more in group II. The mean Total cholesterol was 140.9 ± 34.7 which is more in group II. The mean low-density lipoprotein was 91.6 ± 21.9 and it increased in group II. The mean Triglycerides was 140.8 ± 54.5 and it is higher in group II. The mean High-density lipoprotein was 50.5 ± 17.2 which is higher in group II. The mean blood sugar was 99.5 ± 26.8 which is higher in group II (Table 2).

Table 2: Mean and Standard Deviation of Variables in Age Groups I and II

Parameters	Group I (n=236)	Group II (n=127)	Total (n=363)
Age (Years)	25.7 ± 2.3	33.24 ± 3.3	29.05 ± 1.01
Height (cm)	1.63 ± 0.1	1.6 ± 0.1	1.6 ± 0.1
Weight (kg)	63.2 ± 10.5	71.9 ± 16.3	66.2 ± 13.4
BMI (kg/m2)	23.8 ± 3.1	26.5 ± 5.2	24.7 ± 4.2
WC (cm)	82.7 ± 10.3	92.3 ± 11.7	86.0 ± 11.7
SBP (mmHg)	120.4 ± 10.9	126 ± 10.4	122.4 ± 11.0
DBP (mmHg)	81.3 ± 9.1	87.2 ± 8.9	83.4 ± 9.4
TC (mg/dl)	135.9 ± 30.7	150.2 ± 40.1	140.9 ± 34.7
LDL (mg/dl)	91.2 ± 20.2	92.4 ± 25.2	91.6 ± 21.9
TG (mg/dl)	131.5 ± 54.3	157.96 ± 51.7	140.8 ± 54.5
HDL (mg/dl)	48.1 ± 7.7	54.8 ± 26.9	50.5 ± 17.2
FBS (mg/dl)	98.6 ± 26.4	101.2 ± 28.1	99.5 ± 26.8

WC=Waist Circumference, SBP=systolic Blood Pressure, DBP=Diastolic Blood Pressure, TC=Total Cholesterol, FBS=Fasting Blood Sugar

Almost all risk factors were prevalent in age group II, with central obesity being most prevalent with 92 (72.44%) of subjects having increased waist circumference (p=0.0001). Dyslipidemia was almost twice more frequent in age group II and results were statistically significant for all but one parameter, LDL. The same goes for hyperglycemia with 14 (11.023%) sufferers in group II, in comparison to 09 (3.81%) in group I. However statistical significance failed to reach (Table 3).

Table 3: Comparison of Individual Risk Factors between Age Groups

Age Group	Group I (n=236)	Group II (n=127)	p-value
Individual Risk Factors			
Obesity	40 (16.94%)	66 (51.96%)	<0.05
Central Obesity	69 (29.23%)	92 (72.44%)	<0.05
Hypertension	61 (25.84%)	61 (48.03%)	<0.05
Increased TC	09 (3.81%)	17 (13.8%)	<0.05
Increased LDL	10 (4.2%)	15 (11.81%)	>0.05
Increased TG	66 (27.96%)	61 (48.03%)	<0.05
Hyperglycemia	09 (3.81%)	14(11.02%)	>0.05
Less Than Required HDL	50 (21.18%)	47 (37.00%)	<0.05
Inactive Lifestyle	186 (78.81%)	83 (65.5%)	<0.05

Participants had one risk factor found in 276 (760.3%) of the study population. No risk factor was found in 24% of participants. Only 87 (23.96%) of the participants were found to have 2 risk factors, 40 (11.01%) of the participants were found to have 3 risk factors, and more than 3 risk factors were found in 66 (18.18%) of subjects (Table 4).

Table 4: Clustering of Risk Factors in Total Subjects

Frequency of Risk Factors	Prevalence (%) (n=363)
0 Factors	8 (23.96%)
1 Factor	83 (22.86%)
2 Factor	88 (24.24%)
3 Factors	40 (11.0%)
4 Factors	36 (9.91%)
5 Factors	22 (6.03%)
6 Factors	04 (1%)
7 Factors	03 (0.94%)

*0 Factor=Obesity,1 Factor=Central Obesity, 2 Factor= Hypertension, 3 Factor=Increased TC, 4 Factor =Increased LDL, 5 Factor=Increased TG, 6 Factor =Hyperglycemia, 7 Factor=Decreased HDL.

The difference was much higher in the frequency of risk factors when age group I was compared with age group II. Increasing age showed the increasing frequency of CVD risk factors. Subjects in the older age group (II) had risk factors more. A total of 78 (33.05%) of subjects of the age group I were free from CVD risk factors, while only 10 (7.87%) of subjects of age group II had no risk factor. A whopping percentage (92.15%) of subjects belonging to age group II had at least one risk factor (Table 5).

Table 5: Comparison of Clustering of Risk Factors between Age Groups

Age Group	Group I (20-29 Years)	Group II (30-40 Years)
Frequency of RF, n (%)		
0 Factors	78 (33.05%)	10 (7.87%)
1 Factors	66 (27.96%)	15 (11.81%)
2 Factors	57 (24.15%)	31 (24.40%)
3 Factors	26 (11.01%)	15 (11.81%)
4 Factors	00 (0.0%)	36 (28.34%)
5 Factors	05 (2.1%)	15 (11.81%)
6 Factors	00 (0.0%)	05 (3.93%)
7 Factors	05 (2.1%)	00 (0.0%)

The results for awareness of CVD risk factors were almost equal in both groups. Only 90 (24.79%) were aware of CVD risk factors; the rest of the 273 (75.20%) subjects did not know CVD risk factors and their effects (Table 6).

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Table 6: Awareness of Cardiovascular Risk Factors in Male and Female Subjects

Gender	Group I	Group II	Total
Awareness About CVD Risk Factors			
Yes	56 (23.73%)	34 (26.78%)	88 (25.25%)
No	180 (76.27%)	93 (73.22%)	275 (75.75%
Total	236 (100%)	127 (100%)	363 (100%)

DISCUSSION

At present, limited studies have been conducted to find out the frequency of diseases associated with cardiovascular and their risk factors in the young healthy population of Pakistan. In this study, we assessed the overall prevalence of risk factors in young adults (<40 years of age). The increase in the prevalence of risk factors with increasing age was also examined. The results achieved with this study are mostly in agreement with the majority of the literature available. More risk factors were available in male subjects, a fact widely accepted is that the male population is higher at risk for cardiovascular disease. A similar trend was found by Tran *et al.*, [13]. Another vital finding was the increase in the prevalence of risk factors with increasing age; which has been consistent time and again in other investigations, similarly Vasan *et al.*, conducted a Framingham study with a sample size of 317849 [14]. Thus, concluding that males are more at risk for developing CVDs and this risk becomes higher with increasing age. Obesity is one of the major CVD risk factors. Pakistan was ranked as the 9th most obese country in the world. In this study, obesity was found as one of the most prevalent CVD risk factors. 30% of all subjects were found to be overweight or obese according to BMI. The prevalence of obesity was less in males (29%) as compared to females (30%). The finding of this study is inconsistent with different Tran *et al.*, conducted cross-sectional population-based research from 2011 and 2017 found increased BMI major cause of CVD risk factor [13]. Dikaiou *et al.*, conducted a prospective study in Sweden and documented a slightly J-shaped association of BMI with CVD risk factors [15]. Studies were done in Pakistan that have found the prevalence of obesity in young adult Pakistanis in between 25 -35% by Sabiha *et al.*, and obesity as being more prevalent in female as compared to males with only a small margin of difference [16]. Later findings also match several studies which show a higher prevalence of obesity in female in comparison to male by Khan *et al.*, Asif *et al.*, [17, 18] and Ibrahim *et al.*, [19]. We found waist circumference as being more prevalent in females than in male subjects and there was an increase in waist circumference with increasing age. These results highly matched the investigation done by Gadekar *et al.*, who also observed higher waist circumferences in females which were found to increase with increasing age [20]. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure in their seventh report has emphasized that systolic more than diastolic Blood Pressure is strongly related to CVDs. The combined overall frequency of pre-hypertension and hypertension combined was 34%. These results were similar to a study done by Tran *et al.*, who found the prevalence of hypertension in people above 40 years of age to be 38% [13]. The difference in age group is sufficient to address this slight difference in prevalence. The incidence of hypertension was found higher in males as compared to female subjects at 22%; these results were in agreement with studies done by Mills *et al.*, and Riaz *et al.*, [21, 22]. Another important risk factor, dyslipidemia was prevalent in 35% of participants with increased triglycerides as the most prevalent of all cholesterol types. Similar results were achieved by Duran *et al.*, and Basit *et al.*, who diagnosed 31% of subjects with dyslipidemia and found impaired triglyceride levels as most prevalent [23, 24]. Diabetes not only directly affects the integrity of the vascular system, but also impacts other cardiovascular risk factors. A satisfying number of studies have revealed higher levels of Dyslipidemia in diabetics as compared to non-diabetics. The prevalence of hyperglycemia was 7% in total subjects with being higher prevalent in male subjects. No diabetics were found in this study, a possible explanation for this might be the limited sample size. Metro-ville Health Study (MHS) study by Dennis *et al.*, showed hyperglycemia in 8-10% of subjects [25]. A sedentary lifestyle leads to increased deposits of fat in the body causing obesity and subsequent risk factors. This risk factor was found to be prevalent in 74% of total subjects. Hayes *et al.*, compared activity levels among the Indian and Pakistani populations with that of Europe and found that Europeans were more physically active than Indians, Pakistanis, or Bangladeshis [26]. Their study showed that 52 per cent of European men did not meet the required levels of physical activity, compared to 71 per cent of Indians, 88 per cent of Pakistanis, and 87 per cent of Bangladeshis. Similar findings were documented for women. In conclusion, European men and women participated more frequently in moderate to intense sports and exercise activities as compared to Pakistani and Indians. Thus lack of exercise combined with inappropriate diet are responsible for the growing epidemic of obesity in Pakistan. Females were less active as compared to male subjects. Furthermore, awareness about cardiovascular risk factors was less in the majority of subjects. Only 24% of subjects were moderate to high level aware of cardiovascular risk factors. The remaining did not know whatsoever about cardiovascular risk factors and their destructive effects on health. The lack of awareness co-relates with the increased incidence of cardiovascular risk factors. The less a person is aware of risk factors, the more he will succumb.

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CONCLUSIONS

It was concluded that 76% had at least one risk factor. Such a high prevalence of cardiovascular risk factors in young adults is an alarming finding. Young adults with a lack of exercise, poor quality, high-fat diet, and lack of awareness about cardiovascular diseases and cardiovascular risk factors are moving towards the development of an unhealthy generation. These risk factors not only lead to cardiovascular diseases but also compromise the quality of life. Inactive lifestyle, Central obesity, Dyslipidemia, hypertension, and obesity were the most prevalent cardiovascular risk factors. Furthermore, 4 risk factors were more prevalent in male subjects; increased Triglycerides, Hypertension, Hyperglycemia, less than desired HDL, and increased LDL, as compared to female subjects. These results indicate male population is slightly more at risk for developing CVDs.

Authors Contribution

Conceptualization: SAS
Methodology: HS, HNR, SNS, ZAL, JW
Formal analysis: SFM, KRL
Writing review and editing: SAS

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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