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Original Research Article

Observation of cardiac profile among the adult population of Sreemangal

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ABSTRACT

Background: Cardiovascular diseases are a leading cause of morbidity and mortality worldwide. The prevalence and risk factors of CVDs vary across different populations and regions. This study aimed to observe the cardiac profile among the adult population of Sreemangal, Bangladesh, to identify the prevalence and risk factors of CVDs in this population.
Methods: This prospective observational study was conducted over a six-month period at a public health camp in Sreemangal, Bangladesh. A total of 137 adult participants were purposively selected. Data were collected through a structured questionnaire and physical examination, including measurements of blood pressure and laboratory analysis of blood samples.
Results: The study found that 44.53% of participants had elevated blood pressure, and 21.90% had stage 1 hypertension. Interestingly, 36.50% of participants were unaware of their hypertension status. Furthermore, 26.28% of participants had a known history of diabetes, but blood glucose level analysis revealed an additional 14.85% of participants were prediabetic, and 6.93% were diabetic based on fasting blood glucose levels. A statistically significant association was found between increasing age and the stage of hypertension ($p<0.001$), and between fasting and normal blood glucose levels and the stage of hypertension ($p<0.005$ and $p<0.05$, respectively).
Conclusions: The findings of this study underscore the need for targeted interventions to prevent and manage CVDs in the adult population of Sreemangal, Bangladesh. These interventions should include regular screening for CVD risk factors, health education to increase awareness of these risk factors, and strategies to promote healthy lifestyle behaviors.

Keywords: Cardiac, Hypertension, Diabetes, Systolic, Diastolic, Blood glucose

INTRODUCTION

Cardiovascular diseases (CVDs) have emerged as a global health crisis, posing a significant threat to human health and well-being. The World Health Organization (WHO) reports that CVDs are the leading cause of death worldwide, claiming an estimated 17.9 million lives each year, which represents 31% of all global deaths.[1] This group of disorders of the heart and blood vessels includes coronary heart disease, cerebrovascular disease, and rheumatic heart disease, among others.[2] The prevalence and impact of these diseases underscore the urgent need for comprehensive and targeted interventions to prevent and manage CVDs. The burden of chronic diseases, including CVDs, is immense. Chronic diseases not only lead to decreased quality of life for individuals but also place a significant economic burden on societies. They are responsible for increased healthcare costs and lost productivity, which can strain healthcare systems and hinder economic development.[3] The rise in chronic diseases is driven by several factors, including aging populations, urbanization, and lifestyle changes. These lifestyle changes encompass unhealthy diets, tobacco use, physical inactivity, and harmful use of alcohol, all of which contribute to the development of chronic diseases.[4] In the context of Asia, the burden of CVDs is particularly concerning. Asia, home to more than half of the world's population, is experiencing rapid economic growth, urbanization, and lifestyle changes. These factors have led to an epidemiological transition, with CVDs replacing infectious diseases as the leading cause of death.[5] Bangladesh, a country in South Asia, is no exception to this trend. CVDs account for 27% of total deaths in Bangladesh, making it a major public health concern.[6] The development of CVDs is influenced by a multitude of risk factors. These include modifiable risk factors such as hypertension, diabetes, hyperlipidemia, obesity, physical inactivity, unhealthy diet, and tobacco use. Non-modifiable risk factors like age, sex, and genetic predisposition also play a role.[7] The early identification and management of these risk factors are crucial in reducing the incidence and impact of CVDs. This approach can help prevent the onset of disease, reduce complications, and improve patient outcomes.[8] A comprehensive understanding of an individual's cardiac profile can play a pivotal role in the early identification of those at risk of CVDs. This profile, which includes information about the prevalence and distribution of risk factors, can provide valuable insights for healthcare providers. It can enable early intervention and management, particularly in areas where access to healthcare services may be limited, and routine health checks are not common.[9] The present study aims to observe the cardiac profile of the adult population in a select region. By examining the prevalence and distribution of various risk factors for CVDs in this population, the study can contribute to a better understanding of the local burden of these diseases. This information can be immensely helpful for healthcare providers and policymakers in planning and implementing targeted interventions to prevent and manage CVDs in this population.[10] The findings of this study could be instrumental in shaping public health policies and interventions, ultimately contributing to the prevention and management of CVDs in the region.[11]

METHODS

This prospective observational study was conducted at a public health camp, Sreemangal, Bangladesh. The study duration was 6 months, from June 2023 to December 2023, during which, a total of 137 adult participants were purposively selected for the present study. The selection criteria were designed to ensure a representative sample of the adult population in Sreemangal. Both men and women aged 18 years and above who were willing to participate were included in the study. Participants with a known history of CVDs or other chronic diseases were also included, as these individuals are at a higher risk of developing CVDs. Patients with extremely advanced CVDs and patients who did not give consent to participate in the study were excluded. Data collection was carried out through a structured questionnaire and physical examination. The questionnaire was designed to gather information about the participants' demographic characteristics, lifestyle habits, medical history, and family history of CVDs. The physical examination included measurements of blood pressure and other relevant clinical parameters. Blood samples were also collected from each participant for laboratory analysis. These tests included lipid profile, fasting and normal blood glucose levels, and other relevant biochemical parameters. The results of these tests provided valuable insights into the participants' cardiac health and risk factors for CVDs. All data were collected by trained healthcare professionals to ensure accuracy and reliability. The collected data were then entered into a database and analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize the data, and inferential statistics were used to identify relationships between variables. The study was conducted in accordance with the ethical principles for medical research involving human subjects as outlined in the Declaration of Helsinki. All participants provided informed consent before participating in the study. The study protocol was reviewed and approved by the appropriate ethical review board.

RESULTS

Table 1 provides a statistical description of the sociodemographic characteristics of the study participants. Regarding age distribution, the majority of participants fell within the age range of 31-60 years, with the highest percentage observed in the 41-50 and 51-60 age groups, both accounting for 22.63% of the total sample. The frequency of participants decreased as the age groups moved away from this range, with the lowest percentages seen in the <20 and >80 age categories, each representing only 0.73% of the sample. The mean age of

all participants was 49.58 years, with a standard deviation of 14.77.

Table 1: Sociodemographic characteristics of the participants (n=137).

Characteristics	N	%
Age (years)		
<20	1	0.73
21-30	15	10.95
31-40	27	19.71
41-50	31	22.63
51-60	31	22.63
61-70	27	19.71
71-80	4	2.92
>80	1	0.73
Mean age	49.58±14.77	
Gender		
Male	32	23.36
Female	105	76.64
Occupation		
Businessman	13	9.49
Farmer	16	11.68
Housewife	104	75.91
Office worker	1	0.73
Mowlana	1	0.73
student	2	1.46
Know hypertension		
Yes	87	63.50
No	50	36.50

In terms of gender, the study population was predominantly female, accounting for 76.64% of the participants. Males constituted a smaller proportion, comprising only 23.36% of the total sample. The occupation distribution revealed that the largest group of participants were housewives, constituting 75.91% of the sample. Farmers and businessmen accounted for 11.68% and 9.49% of the participants, respectively.

Table 2: Distribution of participants by systolic and diastolic blood pressure categories (n=137).

Variable	N	%
Systolic blood pressure		
Normal	23	16.79
Elevated	61	44.53
Stage 1 HTN	30	21.90
Stage 2 HTN	23	16.79
Diastolic blood pressure		
Normal	9	6.57
Stage 1 HTN	97	70.80
Stage 2 HTN	31	22.63

The remaining categories, including office workers, mowlana (cleric), and students, each represented a smaller proportion, with percentages ranging from 0.73% to 1.46%. Regarding the participants' knowledge of hypertension, the majority, 63.50%, reported being aware of their hypertension status, via previous hospital visits and diagnosis, unrelated to the present study. The remaining 36.50% indicated no knowledge of having hypertension.

Table 3: Distribution of known risk factors of cardiac disease among the participants (n=137).

Variables	N	%
Diabetes	36	26.28
Smoking	3	2.19
Family history of CVD	35	25.55

Table 2 presents the distribution of participants according to systolic and diastolic blood pressure values using predefined categories. Regarding systolic blood pressure, 16.79% of participants had normal readings. The majority of participants, accounting for 44.53%, fell into the elevated blood pressure category. Additionally, 21.90% were classified as having stage 1 hypertension, while another 16.79% had stage 2 hypertension. Analyzing diastolic blood pressure, only 6.57% of participants had normal readings. The majority, comprising 70.80% of the sample, fell into the stage 1 hypertension category. Furthermore, 22.63% of participants were classified as having stage 2 hypertension.

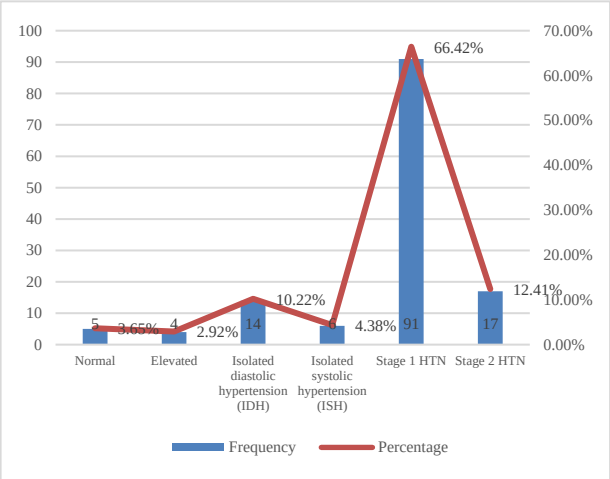

Figure 1: Distribution of participants by determined coronary profile (n=137).

Figure 1 illustrates the distribution of participants based on their determined coronary profile, using both the systolic and diastolic values. Among the participants, 3.65% were categorized as having a normal coronary profile, indicating that they did not have hypertension. A small proportion, accounting for 2.92%, fell into the elevated blood pressure category. Additionally, 10.22% were classified as having isolated diastolic hypertension (IDH), which suggests high diastolic blood pressure with normal systolic blood pressure. Another 4.38% of participants had isolated systolic hypertension (ISH), indicating high systolic blood pressure with normal diastolic blood pressure.

Table 4: Association between known diabetes and latest blood glucose level categorization (n=137).

Blood glucose categorization for diabetes	Diabetes				P value
	Yes (N=36)		No (N=101)		
	Frequency	%	Frequency	%	
Fasting blood glucose					
Very low	3	8.33	9	8.91	>0.05
Normal	25	69.44	70	69.31	
Prediabetic	4	11.11	15	14.85	
Diabetic	4	11.11	7	6.93	
Normal blood glucose					
Below normal	3	8.33	13	12.87	>0.05
Normal	27	75.00	77	76.24	
Prediabetic	2	5.56	3	2.97	
Diabetic	4	11.11	8	7.92	

Table 5: Association between age range distribution and diagnosed stage of hypertension (n=137).

Age groups	Stage of hypertension, Frequency (%)						P value
	Normal (N=5)	Elevated (N=4)	IDH (N=14)	ISH (N=6)	Stage 1 HTN (N=91)	Stage 2 HTN (N=17)	
<20	0 (0.0)	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
21-30	2 (40.0)	0 (0.0)	1 (7.1)	0 (0.0)	12 (13.2)	0 (0.0)	
31-40	1 (20.0)	2 (50.0)	2 (14.3)	1 (16.7)	19 (20.9)	2 (11.8)	
41-50	1 (20.0)	1 (25.0)	6 (42.9)	1 (16.7)	18 (19.8)	4 (23.5)	
51-60	1 (20.0)	0 (0.0)	2 (14.3)	1 (16.7)	21 (23.1)	6 (35.3)	
61-70	0 (0.0)	0 (0.0)	3 (21.4)	3 (50.0)	17 (18.7)	4 (23.5)	
71-80	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.3)	1 (5.9)	
>80	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)	

Table 6: Association between blood glucose categorization and diagnosed stage of hypertension (n=137).

Blood glucose	Stage of hypertension, Frequency (%)						P value
	Normal (N=5)	Elevated (N=4)	IDH (N=14)	ISH (N=6)	Stage 1 HTN (N=91)	Stage 2 HTN (N=17)	
Fasting blood glucose							
Very low	0 (0.0)	0 (0.0)	2 (14.3)	0 (0.0)	7 (7.7)	3 (17.6)	<0.005
Normal	3 (60.0)	2 (50)	6 (42.9)	6 (100.0)	72 (79.1)	6 (35.3)	
Prediabetic	2 (40.0)	2 (50)	4 (28.6)	0 (0.0)	8 (8.8)	3 (17.6)	
Diabetic	0 (0.0)	0 (0.0)	2 (14.3)	0 (0.0)	4 (4.4)	5 (29.4)	
Normal blood glucose							
Below normal	0 (0.0)	0 (0.0)	2 (14.3)	0 (0.0)	11 (12.1)	3 (17.6)	<0.05
Normal	3 (60.0)	4 (100.0)	10 (71.4)	6 (100.0)	74 (81.3)	7 (41.2)	
Prediabetic	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	3 (17.6)	
Diabetic	1 (20.0)	0 (0.0)	2 (14.3)	0 (0.0)	5 (5.5)	4 (23.5)	

The majority of participants, constituting 66.42%, were classified as having stage 1 hypertension. Lastly, 12.41% of participants had stage 2 hypertension, indicating a more severe level of hypertension.

Table 3 presents the distribution of known risk factors for cardiac disease among the participants. Regarding diabetes, 26.28% of participants had this risk factor, indicating that they were previously diagnosed with diabetes. In terms of smoking, only a small proportion of participants, accounting for 2.19%, reported being smokers. Furthermore, 25.55% of participants had a family history of cardiovascular disease (CVD), indicating that they had relatives with a history of CVD.

Table 4 displays the association between known diabetes and the categorization of diabetes derived from the latest blood glucose levels. For the fasting blood glucose categorization, among the participants with known diabetes (N=36), 8.33% had a very low fasting blood glucose level, 69.44% had a normal fasting blood glucose level, 11.11% were categorized as prediabetic, and another 11.11% were classified as diabetic. Among the

participants without diabetes (N=101), 8.91% had a very low fasting blood glucose level, 69.31% had a normal fasting blood glucose level, 14.85% were categorized as prediabetic, and 6.93% were classified as diabetic. There was no significant association between known diabetes and fasting blood glucose categorization. Considering the normal blood glucose categorization, among the participants with known diabetes, 8.33% had below normal blood glucose levels, 75.00% had normal blood glucose levels, 5.56% were categorized as prediabetic, and 11.11% were classified as diabetic. Among the participants without diabetes, 12.87% had below normal blood glucose levels, 76.24% had normal blood glucose levels, 2.97% were categorized as prediabetic, and 7.92% were classified as diabetic. Similar to the previous categorization, there was no significant association between known diabetes and normal blood glucose categorization.

Table 5 describes the distribution of different stages of hypertension diagnosis across various age groups. In the "Normal" hypertension category, participants were distributed across age groups 21-30, 31-40, 41-50, and 51-60 with equal proportions of 40%, 20%, 20%, and 20%, respectively. Notably, no participants under 20 or over 60 fell into the "normal" category. The "elevated" stage of hypertension was mostly observed in participants within the age groups of 31-40 and 41-50, accounting for 50% and 25% of the cases, respectively. Remarkably, there was a single case (25%) of "elevated" hypertension diagnosed in the age group of less than 20, but no cases were reported in participants over 50. "IDH" had a wider age range, with the majority of cases (42.9%) in the 41-50 age group, followed by 21.4% in the 61-70 age group. No IDH cases were identified in participants under 20 or over 70. "ISH" cases were predominantly observed in the 61-70 age group (50%), with the rest evenly distributed across age groups 31-40, 41-50, and 51-60. The most common stage of hypertension was "Stage 1 HTN", where the largest proportion of cases was found in the 51-60 age group (23.1%), followed by 21-30 (13.2%), 31-40 (20.9%), 41-50 (19.8%), and 61-70 (18.7%) age groups. Only a small number of cases (3.3%) were in the 71-80 age group, and a single case (1.1%) was in the over 80 group. Finally, in "Stage 2 HTN", the highest proportion of cases was seen in the 51-60 age group (35.3%), followed by the 41-50 and 61-70 age groups (both 23.5%). Only a small number of cases (5.9%) were in the 71-80 age group. The chi-squared test was conducted to assess the association between the age groups and stages of hypertension, and the p value of less than 0.001 indicates a statistically significant association between these variables.

Table 6 presents the association between blood glucose categorization and the diagnosed stage of hypertension. In terms of 'fasting blood glucose' categorization, the 'normal' level had the highest number of participants across all stages of hypertension except for 'very low' and 'diabetic'. For instance, 60% of 'normal' hypertension, 50% of 'elevated', 42.9% of 'IDH', 100% of 'ISH', 79.1% of 'stage 1 HTN', and 35.3% of 'stage 2 HTN' had 'normal' fasting blood glucose. The 'diabetic' level fasting blood glucose was primarily associated with 'Stage 2 HTN' (29.4%) and 'IDH' (14.3%). As for the 'normal blood glucose' categorization, the 'normal' level again had the most substantial association with all stages of hypertension, except for 'very low'/'below normal' and 'diabetic'. Specifically, 60% of 'normal' hypertension, 100% of 'elevated', 71.4% of 'IDH', 100% of 'ISH', 81.3% of 'stage 1 HTN', and 41.2% of 'stage 2 HTN' had 'Normal' blood glucose. The 'diabetic' level of normal blood glucose was majorly associated with 'stage 2 HTN' (23.5%) and 'IDH' (14.3%). A statistical test was conducted to verify the significance of the associations. For 'fasting blood glucose', the p value was less than 0.005, indicating a statistically significant association with the diagnosed stage of hypertension. Similarly, for 'normal blood glucose', the p value was less than 0.05, denoting a significant association.

DISCUSSION

The present study provides a comprehensive cardiac profile of the adult population in Sreemangal, Bangladesh, based on data collected over a six-month period. The age distribution of the study participants indicates that the majority of participants were between 31 and 60 years old. This age range is significant as it represents the working-age population, whose health status directly impacts the socio-economic development of the community. The predominance of females in the study population could be attributed to the fact that the majority of participants were housewives, as indicated by the occupation distribution. This demographic profile aligns with the global trend of a higher prevalence of CVDs among women, particularly in low- and middle-income countries.[7] One of the most striking findings of this study is the high prevalence of undiagnosed hypertension among the participants. The majority of participants had elevated blood pressure or stage 1 hypertension, despite a significant proportion of them being unaware of their hypertension status prior to the study. This finding is particularly concerning as it suggests a lack of awareness or understanding of hypertension among the participants, which could hinder the management of this condition and increase the risk of developing CVDs. Hypertension is a major risk factor for CVDs and is associated with an increased risk of heart attack, stroke, and heart failure.[1,12] The high prevalence of undiagnosed hypertension in this population underscores the need for regular blood pressure screening and management. The coronary profile of the participants, as illustrated in (Figure 1), further highlights the burden of hypertension in this population. The majority of participants were classified as having stage 1 hypertension, indicating a high risk of developing CVDs. This finding underscores the importance of early detection and management of hypertension to prevent the onset of CVDs. The distribution of known risk factors for

cardiac disease among the participants reveals a high prevalence of diabetes and a family history of CVDs. These risk factors are known to increase the risk of developing CVDs.[8] The low prevalence of smoking among the participants is a positive finding, as smoking is a major risk factor for CVDs.[1,13,14] The study also revealed a discrepancy between the participants' self-reported diabetes status and their actual blood glucose levels. A significant proportion of participants were categorized as prediabetic or diabetic based on their blood glucose levels, despite not being aware of having diabetes. This finding suggests a lack of awareness or understanding of diabetes among the participants, which could hinder the management of this condition and increase the risk of developing CVDs. Diabetes is a major risk factor for CVDs and is associated with an increased risk of heart attack, stroke, and heart failure.[15,16] The distribution of different stages of hypertension diagnosis across various age groups reveals a significant association between age and hypertension stage. This finding is consistent with previous studies that have reported an increased risk of hypertension with advancing age.[17] The risk of hypertension increases with age due to physiological changes that occur in the cardiovascular system, including increased arterial stiffness and alterations in the renin-angiotensin-aldosterone system.[17] This finding underscores the need for regular blood pressure monitoring and management in older adults. The association between blood glucose categorization and the diagnosed stage of hypertension indicates a significant association between these variables. This finding is consistent with previous studies that have reported an increased risk of hypertension among individuals with diabetes.[16,18] Hyperglycemia, a characteristic feature of diabetes, can lead to endothelial dysfunction and increased arterial stiffness, which can increase blood pressure and contribute to the development of hypertension.[19,20] This finding underscores the need for regular blood glucose monitoring and management in individuals with hypertension.

Limitations

Limitation was as the study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

The present study provides insights into the cardiac profile of adults in Sreemangal, Bangladesh. The high prevalence of undiagnosed hypertension, along with diabetes and a family history of CVDs, emphasizes the need for targeted interventions. Age was associated with hypertension stage, highlighting the importance of age-specific management. Participants were often unaware of their diabetes status despite elevated blood glucose levels, underscoring the need for education and screening. The association between blood glucose categorization and hypertension stage reinforces the importance of managing both conditions. Early detection, awareness, and management of hypertension and diabetes are crucial in preventing cardiovascular diseases. Targeted interventions addressing risk factors and promoting lifestyle modifications can improve cardiac health in Sreemangal. By addressing these factors, the burden of CVDs can be reduced and cardiovascular outcomes enhanced in this community.

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