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Impact of the COVID-19 Pandemic on Interventional Cardiology: A Retrospective Study

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Abstract

The recent COVID-19 outbreak has impacted the delivery of healthcare and interventional cardiology services worldwide. Several studies conducted in different countries have revealed that there was a significant reduction in performing percutaneous coronary intervention (PCI) procedures during the onset of the pandemic; however, the situation of such interventional practice n Bangladesh is not well documented. Hence, this study aims to investigate the changes in the volume of interventional cardiology services before and during the COVID-19 outbreak in a tertiary level healthcare facility of the country. This retrospective study based on record review involved 304 patients admitted into Mugda Medical College Hospital, Dhaka, Bangladesh, between April 2019 and April 2021. The patients were categorized as group A (pre-COVID; N=170) and group-B (COVID; N=134) patients. Data were obtained on patient demographics, risk factors, medical history, type of intervention, and readmission of the patient. The pandemic period had an increased number of patients aged ≥60 years (51.5% vs. 42.9%) and a significant shift in gender distribution (16.4% male vs. 78.2% pre-pandemic). The ST elevation myocardial infarction (STEMI) remains relatively stable between the two groups (60.0% vs. 59.7%; p>0.05). Rates remained stable (40.3% vs. 40.0%; p<0.001). Similarly, the number of non-ST elevation myocardial infarction (NSTEMI) cases also remains unchanged (40.0% vs. 40.3%; p>0.05). An increase in balloon angioplasty procedure was observed during the pandemic (49.41% vs. 62.69%; p<0.001). In contrast, there was a huge decrease in angioplasty with stent procedure (42.35% vs. 21.64%; p<0.001). Patient readmission rate slightly decreased (18.82% vs.16.42%; p>0.05). This study highlighted that the COVID-19 outbreak brought changes in the patient population and interventional procedures in interventional cardiology at Mugda Medical College Hospital, Dhaka, Bangladesh. These figures are rather stable in STEMI cases, contrary to the tendencies in other countries, whereas the transition to balloon angioplasty most likely tried to reduce the time of the procedure. Thus, they stress the imperativity of context-sensitive approaches to cardiovascular health management during epidemics and call for additional research on later consequences.

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Introduction

Cardiovascular disease continues to be ranked the number one cause of mortality and morbidity globally.[1] CAD is very common in Bangladesh, where the risk factor is increasing and there is a potential of becoming an epidemic in the near future.[2] Since the introduction of interventional cardiology, especially PCI, in 1977, the management of CAD has been greatly enhanced. As it has been earlier stated, the outbreak of the COVID-19 pandemic has impacted the delivery of health services worldwide, including interventional cardiology.[3] Bangladesh took actions to prevent COVID viral transmission in the country and its adaptation to any new measures, including in the healthcare sector.[4] To address this problem, the government introduced several measures for providing essential services

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with low infection risks, such as the development of telemedicine services and the opening of COVID-19-dedicated hospitals. Nevertheless, these changes that were deemed necessary, along with the growing public concern about the risk of getting infected with COVID in healthcare facilities, might have influenced the rates of patients accessing cardiac services.[5] While Bangladesh successfully managed to provide sufficient healthcare facilities for its people throughout the world, most of the hospitals were under tremendous pressure to both treat COVID patients and maintain adequate services for other major health issues.[4] The existing healthcare structures in the country were challenged and others more before the pandemic; what was available was pushed to the limit due to poor resource endowment and capacity. Research in different countries has indicated that there is a significant reduction in the number of PCIs done during the pandemic, including for patients with STEMI.[6] For instance, a study of nine large-volume cardiac catheterization centers in the United States observed a 38% decrease in ST elevation myocardial infarction (STEMI) activations.[7] Fewer health services were provided during the COVID-19 outbreak in Bangladesh, which led to a decline in cardiac procedures among patients in Bangladesh.[8] Although these studies help in assessing the epidemiology of the pandemic and its effects on interventional cardiology, there is often a lack of a comprehensive description of patient populations and their results.[9] However, the majority of the studies have concentrated on STEMI patients, with relatively little emphasis being placed on non-ST elevation myocardial infarction (NSTEMI) and overall PCI utilization.[10,11] Therefore, the present study is intended to evaluate the effect of the COVID-19 outbreak on interventional cardiology services at Mugda Medical College Hospital, Dhaka, Bangladesh. This study is expected to identify any care delivery gaps emerging due to the pandemic and the enforcement of measures to close these gaps in future emergencies.

Methods

This retrospective study based on record review was conducted at Mugda Medical College Hospital, Dhaka, Bangladesh, between April 2019 and April 2021. A total of 304 patients were included in this study. They were divided into two groups: group A consists of patients admitted between March 10, 2019 and February 29, 2020 (pre-COVID), and group B had patients admitted between May 5, 2020 and May 10, 2021 (during COVID). Only patients ≥18 years who arrived with acute coronary syndromes and/or underwent percutaneous coronary intervention were included. Data included patient age, gender, comorbidities, potential risk factors, type of intervention, and readmission rates. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 22.0 for Windows. Descriptive statistics were data expressed as proportions (frequencies or percentages) for nominal and ordinal variables, while those for interval or ratio variables were data expressed as mean±SD. The study was approved by the Institutional Review Board (IRB) of Mugda Medical College, Dhaka, Bangladesh.

Results

Our study included 304 patients; they were divided into two groups: group A (pre-pandemic, n=170) and group B (during pandemic, n=134).

We observed that group B had a higher proportion of individuals aged ≥60 years (51.5%) compared to group A (42.9%). There was a notable shift in gender distribution, with males comprising 78.2% of group A but only 16.4% of group B. Obesity (BMI ≥30) was more prevalent in group B (47.8%) compared to group A (42.9%). Additionally, group B had higher rates of surgical history (82.1% vs. 61.2%) and hypertension (77.6% vs. 65.9%), indicating a population with more significant health challenges in group B (Table-I). The number of STEMI patients remains relatively stable between the two groups (60.0% vs. 59.7%; p>0.05). The number of NSTEMI cases also remains unchanged (40.0% vs. 40.3%; p>0.05) (Table-II). An increase in balloon angioplasty procedure was observed during the pandemic (49.41% vs. 62.69%; p<0.001). Besides, there was a huge decrease in angioplasty with stent procedure (42.35% vs. 21.64%; p<0.001) (Table-III). Table-IV shows a slight decrease in patient readmission rate during the pandemic (18.82% vs.16.42%; p>0.05).

Table-I: Sociodemographic profile of the patients (N=304)

Variables		Group A (N = 170)		Group B (N = 134)	
		Frequency	Percentage	Frequency	Percentage
Age	30-40 years	12	7.1	11	8.2
	40-50 years	33	19.4	16	11.9
	50-60 years	52	30.6	38	28.4
	≥60 years	73	42.9	69	51.5
Sex	Female	37	21.8	112	83.6
	Male	133	78.2	22	16.4
BMI (Kg/m^2)	<18.5	3	1.8	2	1.5
	18.5-24.9	34	20.0	20	14.9
	25-29.9	60	35.3	48	35.8
	≥30	73	42.9	64	47.8
Smoker	Yes	68	40.0	53	39.6
	No	102	60.0	81	60.4
Surgical history	Yes	104	61.2	110	82.1
	No	66	38.8	24	17.9
Past medical history	Yes	92	54.1	36	26.9
	No	78	45.9	98	73.1
Family history	Yes	14	8.2	10	7.5
	No	156	91.8	124	92.5
Hypertension	Yes	112	65.9	104	77.6
	No	58	34.1	30	22.4
Dyslipidemia	Yes	110	64.7	82	61.2
	No	60	35.3	52	38.8
Chronic kidney disease	Yes	32	18.8	26	19.4
	No	140	82.4	108	80.6
Coronary heart disease	Yes	86	50.6	92	68.7
	No	84	49.4	42	31.3
Hypothyroidism	Yes	12	7.1	10	7.5
	No	158	92.9	124	92.5
Congestive heart disease	Yes	15	8.8	12	9.0
	No	155	91.2	122	91.0
Atrial fibrillation	Yes	12	7.1	10	7.5
	No	158	92.9	124	92.5

Table-II: Distribution of STEMI and NSTEMI patients

Variables		Group A (N=170)		Group B (N=134)		p-value
		Frequency	Percentage	Frequency	Percentage	
STEMI	Yes	102	60.0	80	59.7	>0.05
	No	68	40.0	54	40.3	
NSTEMI	Yes	68	40.0	54	40.3	>0.05
	No	102	60.0	80	59.7	

Table-III: Distribution of interventional procedures

Variables		Group A (N=170)		Group B (N=134)		p-value
		Frequency	Percentage	Frequency	Percentage	
Balloon angioplasty	Yes	84	49.41	84	62.69	<0.001
	No	86	50.59	50	37.31	
Angioplasty with stent	Yes	72	42.35	29	21.64	<0.001
	No	98	57.65	105	78.36	

Table-IV: Distribution of the patient readmission

Readmission	Group A		Group B		p-value
	Frequency	Percentage	Frequency	Percentage	
Yes	32	18.82	22	16.42	>0.05
No	138	81.18	112	83.58	

Discussion

This work aimed at understanding changes in interventional cardiology practices that occurred at a tertiary care center in Bangladesh due to the COVID-19 outbreak. The change in the patient characteristics was also noted as the COVID-19 pandemic period showed more patients 60 years of age. This is in concordance with studies from across the world that have found higher COVID-19 severity and mortality among the elderly, which may also translate to more utilization of health services amongst this age bracket for cardiac complaints. The notable reduction of male patients should be examined more closely because it is not aligned with gender norms in acute coronary syndrome (ACS). The proportion of patients presenting with a history of coronary heart disease has actually rose from 50.6% to 68.7%, and this points to the fact that individuals with cardiac conditions may have been more conscious of their health status during the pandemic and sought medical attention. This could be due to a proper public health campaign regarding increased vulnerability to COVID-19 for patients with comorbidities.[12] Surprisingly, this study did not reveal any difference in the occurrence of STEMI in either period, pre-pandemic or pandemic periods. This contrasts with several global studies that highlighted a reduced number of patients presenting with STEMI during the pandemic.[6] For instance, Garcia et al. reported on a 38% decrease in STEMI activations among different laboratories in the United States.[7] Similarly, Rodriguez-Leor *et al.* identified a 40% reduction in primary PCI for STEMI in Spain.[13] Our consistent STEMI rates could also mean variations in patients' presentation and prevention efforts in Bangladesh compared with developed nations. This was coupled with the increase in balloon angioplasty from 49.41% to 62.69% (p<0.001) and the decrease in angioplasty with stents from 42.35% to 21.64% (p<0.001) among study participants. This change in interventional

strategies could have been in an attempt to shorten the time of the procedure and reduce the intricacy of the procedure in order to minimize exposures to the virus. Nevertheless, the consequence of this shift in practice pattern needs to be closely examined in the long term for the impact it has on patient outcomes. There was slight decrease in readmission rates between pre-pandemic and pandemic periods (18.82% vs. 16.42%; p>0.05), which implies that the quality of the short-term follow-up of patients and the readmission rates were not compromised during the pandemic. This finding contrasts with some global studies; for instance, a study conducted in Saudi Arabia found higher readmission rates in the course of the pandemic due to a reduction in the duration of hospital stays to reduce transmission risks.[14] We have some limitations in our study; they are as follows: i) restricted sample size and data obtained from the patients were from at a single center, ii) cross-sectional study design. Those limit the generalizability of the findings as well as the ability to infer causality. The retrospective approach to the data collection also brings about the risk of bias in the study. Further, we are lacking information about the COVID-19 status of the patients themselves, which might have given more contexts to the alterations that occurred.

Conclusion

From this study, several changes were identified in interventional cardiology practice during the COVID-19 pandemic at Mugda Medical College Hospital, Dhaka, Bangladesh. Though the proportion was similar for overall STEMI, there was an observed rise in the NSTEMI category. The largest shift was in procedural decisions, specifically a rise in balloon angioplasty and a decline in stent procedures. The increase in female patients and the number of patients older than 60 indicate the changes in the behavior of people in choosing medical care during the pandemic. Higher comorbidities may therefore be indicative of higher-risk patients having access to care. The use of stents in balloon angioplasty may have been decreased to shorten the procedure, although the long-term outcomes should be researched further. These concerns may include restricted sample size arising from single-center data as well as procedural reasons that may require further elucidation. Therefore, due to the COVID-19 outbreak, the practice of interventional cardiology in our center has drastically changed. Consequently, further research is needed to identify the most effective strategies for providing cardiological care to patients in extraordinary conditions and ensuring their safety during pandemics.

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