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Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. Include in the Discussion section the implications of the findings and their limitations, including implications for future research. Relate the observations to other relevant studies. Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not completely supported by your data. Avoid claiming priority and alluding to work that has not been completed. State new hypotheses when warranted, but clearly label them as such. Recommendations, when appropriate, may be included.

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The Editor reserves the customary right to style and if necessary shortens the material accepted for publication and to determine the priority and time of publication. Editor assumes that work based on honest observations.

Editorial

National Professor Brig. (Rtd.) Abdul Malik
MBBS; MRCP; FCCP; FCPS; FRCP; FACC, PhD
Founder and President, National Heart Foundation of Bangladesh

In this third issue of volume twelve of Journal of National Heart Foundation of Bangladesh two review articles, four original articles and two case reports are published.

Chronic conditions, such as cardiovascular disease (CVD), are among the leading causes of global mortality. A promising avenue for reducing the risk of CVD through health promotion is the application of community engagement (CE) strategies. Aroua M et al. in their paper reviewed the dynamics of CE and its correlation with overall wellbeing and they also examine existing initiatives within the realm of CVD health promotion that leverage CE foundations to enhance their impact, sustainability, and outreach.

Although innovations in the field of cardiovascular healthcare have been noteworthy, obstacles still exist in translating research findings into practice. Newaz T et al. reviewed to provide an understanding of the basics of implementation science and implementation research as well as highlight examples of implementation science use-cases in cardiovascular disease-related interventions.

In addition to respiratory symptoms, extra-pulmonary symptoms have been overlooked, posing a threat to the people. It can lead to serious systemic consequences affecting GI tract. There has been delayed reorganization of gastrointestinal (GI) symptoms as symptoms of coronavirus disease (COVID-19). Malik F et al. studied to compare baseline and clinical characteristics and in-hospital outcome COVID-19 positive patients with or without GI symptoms.

Identification of the culprit lesion in non-ST-elevation myocardial infarction (NSTEMI) patients with multi-vessel coronary disease (MVD) is clinically important regarding choosing reperfusion strategy. Malik F et al. studied aimed to evaluate the ability to identify the culprit lesion by coronary angiogram (CAG) in patients with NSTEMI and MVD.

Bangladesh, undergoing an epidemiological transition highlighted by the Global Burden of Disease study, faces a considerable Non-Communicable Diseases (NCDs) burden, with Metabolic Syndrome (MetS) being a prominent contributor. Monower MM et al. studied to ascertain the prevalence of MetS and explore associated socio-demographic and lifestyle factors in an urban setting of Bangladesh.

Hypertension is an important public health problem worldwide. The Bangladeshi population is relatively homogeneous and consists of about 98% ethnic Bengali as well as various tribal groups. There are about 45 distinct indigenous communities in Bangladesh. Reliable, large-scale, population-based data on hypertension for Bangladeshi indigenous populations are limited. Jubayer S et al. studied to find out the prevalence of hypertension in Garo tribe, one of the indigenous populations of Bangladesh.

The decision to perform primary percutaneous coronary intervention (PPCI) in out of hospital cardiac arrest patient after prolonged cardiopulmonary resuscitation (CPR) is a challenging one. Ishraquzzaman M et al. presented a unique case of an out of hospital cardiac arrest (OHCA) patient who underwent PPCI after prolonged CPR according to the advanced life support guidelines.

A small aortic root can cause patient–prosthesis mismatch. A variety of aortic annulus enlargement techniques are reported to avoid patient-prosthesis mismatch. The Nicks procedure generally increases aortic annulus by one valve size. The Manouguian requires incising the mitral valve (MV) anterior leaflet and left atrium (LA), with risk of mitral regurgitation. Gofur MA et al. presented a case of a new surgical technique to enlarge the aortic annulus, Y incision at the aortomitral curtain and rectangular patch enlarged the aortic root.

I hope readers will get new interesting information regarding prevention and treatment of cardiovascular diseases.

Review Article

Fostering Heart Health: Cardiovascular Disease Risk Reduction through Community Engaged Health Promotion

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Abstract

Chronic conditions, such as cardiovascular disease (CVD), are among the leading causes of global mortality, influenced by social determinants of health. This underscores an imperative to intensify and tailor health promotion efforts in this domain, seeking innovative approaches to empower patients in controlling and preventing these diseases. A promising avenue for reducing the risk of CVD through health promotion is the application of community engagement (CE) strategies, a focal point of this concept paper. Utilizing theories like diffusion of innovation and the infinite game, we delve into the dynamics of CE and its correlation with overall wellbeing. Furthermore, the paper examines existing initiatives within the realm of CVD health promotion that leverage CE foundations to enhance their impact, sustainability, and outreach. The synergistic collaboration between CVD and CE warrants further exploration through diverse approaches, commencing with open discussion and dialogue.

Keywords: community engagement, health promotion, cardiovascular disease, social determinants of health, social innovation

(JNHFB 2023; 12 : 79-82)

Introduction

Social Narrative of Cardiovascular Disease

Many chronic conditions such as cardiovascular disease (CVD) are caused and exasperated by the social determinants of health- this includes factors such as literacy rates, income, food insecurity, and housing to name a few[1–3]. Determinants can begin their influence on the lives of individuals from a very early age, often before birth, and are multi-faceted in their arrangement and effect. These determinants are not always acknowledged in research, clinical care, nor program delivery, but can in fact provide much needed context in understanding patients and their conditions. Modern health has largely pivoted to addressing these chronic conditions, which are leading causes of death globally[4]. In fact, CVD account for 17.9 million deaths globally in 2019, a number that has only risen in recent years[4]. This underscores the need for health promotion in the field of CVD research, and perhaps highlights a need for that promotion to happen with more attention to larger disease-causing elements.

Understanding Disease and Health Promotion

Health promotion is a public health field concerned with helping individuals' control and improve their health, a process that overlaps with many different legal and medical jurisdictions[5]. Health promotion can function as a powerful tool to promote individual and collective health and can improve the ability of diagnostic tools to detect diseases early through awareness, reduce the burden of diseases after diagnosis, and even avoid disease altogether in the first place[3]. The World Health Organization (WHO) states in the preamble of its constitution the importance of health- but doesn't restrict the definition to just a lack of disease. This definition of wellbeing expresses the need for an overall state of social, physical, and mental wellbeing, and is often informed by social determinants of health[6]. Social determinants of health are described as conditions that people happen to live in, that are shaped by their political, geographical, and economic forces often beyond their control[7].

Tailoring Health Promotion through Meaningful Community Engagement

Barriers to health promotion have been captured in many interesting studies, and often involve a lack of interest, resources, and relevant staff, despite being evidence-informed[8]. This can be a challenge for researchers, clinicians, and program developers aiming to garner interest in often underfunded and understaffed health promotion campaigns. This gap between knowledge and practice may also be a result of culturally inappropriate messaging and mistrust of

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health providers and could be missing a large subgroup of our population. At the same time, there exists a plethora of literature highlighting the role of peer educators and health promotion conducted within community settings- as being effective factors for knowledge mobilization and program outcomes[9,10]. This evidence encouragingly points to the crucial importance of community participation, which is the main concept of this report, and could be an exciting solution to reducing the risk, burden, and incidence of CVD.

Dynamics of Community Engagement

Community engagement (CE) is a term commonly used to describe the process of collaborating (in various capacities) with a group of individuals on an issue that affects them[11]. This approach highlights trust and relationship building- which fosters and builds better foundations for research, educational, and health promotion activities. It is a strategic approach that can achieve many goals within in the sphere of social change, in a way that is sustainable and builds up a community's resources[12]. It is in fact an excellent tool in reducing health disparities, by building bridges between academia and community members[13]. At the core of CE are values such as solidarity, empathy, and understanding, which all in turn enhance the quality and sustainability of health research[14]. This in many cases determines how impactful a health promotion campaign is.

Models of CE Employing Diffusion of Innovation

It can be daunting to consider the process of building a relationship with a community in a meaningful way. There are some CE frameworks and models that can be used to imagine new innovations. The diffusion of innovation theory[15] was applied for the CE model in a community context[16]. This model extends the dynamics of how novel goods or concepts are accepted in a society or culture. An important feature of this paradigm is its recognition that communities may need some time to adjust to new health initiatives and activities, similar to how new breakthroughs are gradually accepted. Communities have a similar pattern to that of a normal distribution, where the majority of individuals (with the ability to interact) are concentrated around the common or average. Initiatives can draw in the enthusiastic participants at first, and eventually build momentum that may subsequently spread to include the other groups in the community. Through the lens of community engagement, this model provides a strategic tool for envisioning future collaborations for health promotion. It allows for the identification of distinct groups within a community, understanding engagement potential, and strategically directing efforts to encourage broader and more centralized participation in health promotion activities (Figure 1). This thoughtful approach aids in aligning community engagement strategies with the diverse dynamics and preferences present within the community, fostering a more inclusive and effective collaboration for health promotion.

Models of CE Employing Finite and Infinite Game

Another pragmatic approach for enhancing community engagement is through employing the concept of Finite and Infinite game[17]. This is a useful concept when approaching communities for longer term goals in mind. Through this approach, the finite activities should be planned to achieve the infinite goal of keeping the communities healthy (Figure 2)[17]. It is important to note that strong and meaningful community engagement community should be include members at all stages of the health promotion activities. In essence, the Finite and Infinite game concept provides a strategic lens through which community engagement activities are aligned with sustained health outcomes. It encourages a forward-looking perspective, where short-term initiatives are seamlessly integrated into a comprehensive, long-term strategy. By adopt-

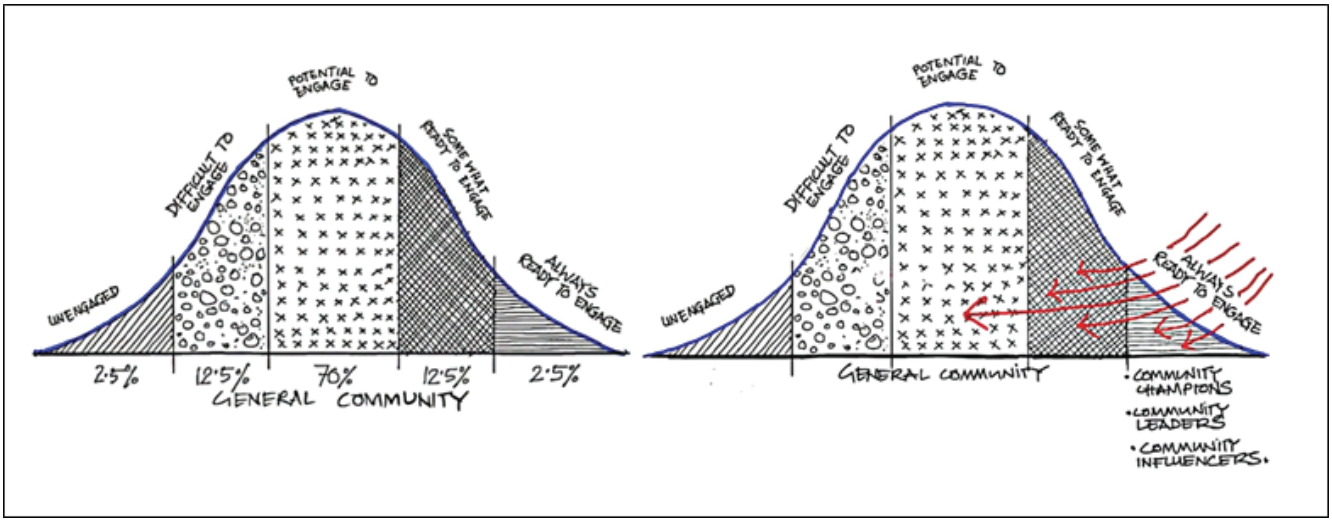

Figure 1: Models of CE utilizing diffusion of innovation theory [Re-used with permission from "Turin TC, et al. Employing Diffusion of Innovation Theory for "Not Missing the Mass" in Community Engaged Research. BMJ Open MJ Open 2023;13: e069680. doi: 10.1136/bmjopen-2022-069680"]

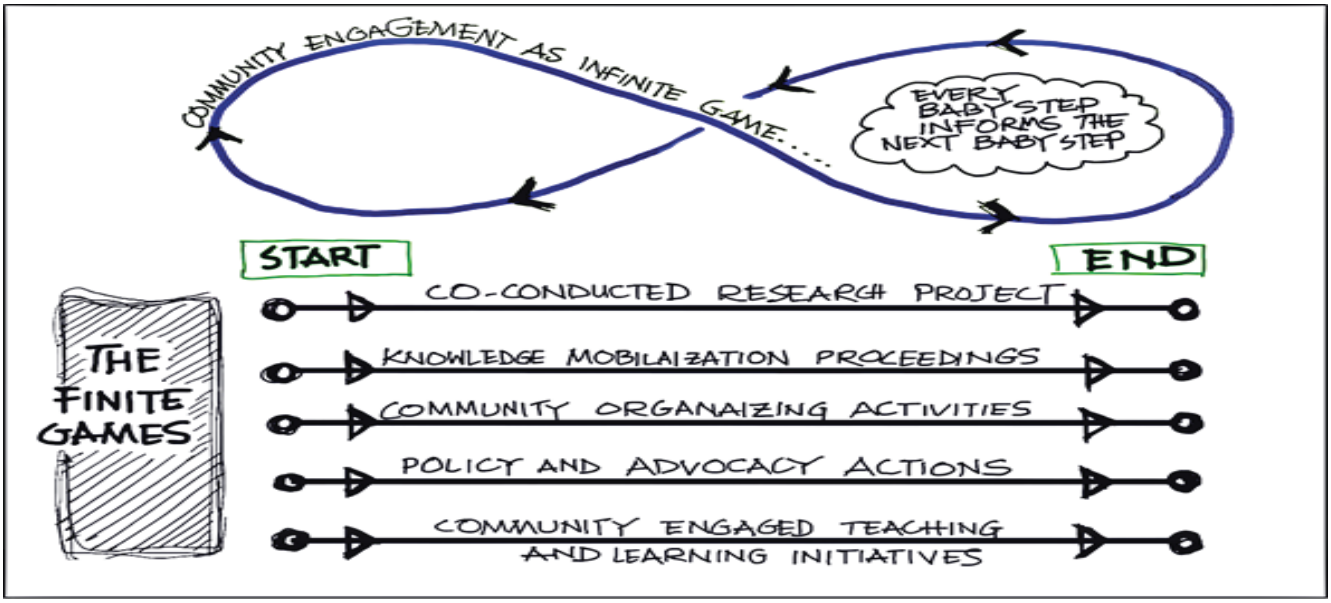

Figure 2: Models of CE utilizing finite and infinite game approach [Re-used under the terms of the Creative Commons CC BY license from "Turin TC, et al. Conceptualizing community engagement as an infinite game implemented through finite games of 'research', 'community organizing', and 'knowledge mobilization'. Health Expect. 2023; 26(5):1799-1805."]

ing this approach, practitioners and community leaders can cultivate a sense of continuity and purpose, reinforcing the notion that each community engagement effort is a valuable piece in the larger puzzle of community health. In summary, the Finite and Infinite game concept, when applied to community engaged health promotion, offers a strategic and visionary framework. It transforms finite activities into meaningful steps towards a lasting and infinite goal—sustaining the health and vitality of the community. Moreover, when coupled with inclusive community involvement, this approach lays the foundation for a holistic and enduring approach to health promotion, reflecting the Turin Infinite Game philosophy.

Community Health Promotion in Cardiovascular Disease

In the case of CVD, there is a disproportionate burden of disease and even disease prevalence across different groups[18,19]. These unique patterns across ethnicities, genders, and ages could be better informed using community engagement. For instance, there are well-studied gender differences in the identification and development of CVD, which has resulted in unique health promotion programs such as the Women's Cardiovascular Health Initiative in Alberta[20,21]. This program delves into concerns and challenges faced by women experiencing CVD, connecting women to clinicians and programs that they need, and recording patient experiences of CVD.

The Community Paramedic at Clinic program in Ontario also had a community-based initiative, which had a directive to implement chronic disease prevention education to its local South Asian population[22,23]. This approach was focused on personalizing healthcare solutions through workshops and one-on-one counselling, and by sending in health providers into communities, access immediacy improves.

Lastly, the Cardiovascular Health Awareness Program studied the role of peer program leaders among older adults living in social housing in Quebec, which found that factors such as proximity and relationships contributed to participation in health promotion interventions[24]. The interplay of emotional relevancy and health promotion delivery was recorded, and strategies to reconcile unattendance included a mention of 'opinion leaders', which may in this case refer to individuals able to influence community perceptions of programs.

Recommendations

Based on the brief research conducted for this concept paper, readers are encouraged to imagine their health promotion activities being fueled by engagement with communities during any and every phase of the project. This could look like discussion with communities on important CVD topics they already have interests in, inviting them to develop program material they see fit, and equipping them with the tools and knowledge to assess the success of health promotion activities through the lens of their lived experiences. They are encouraged to explore the literature on the impacts of CE and SDoH, and engage in discuss with communities, peers, and stakeholders on CE perspectives. Further research is encouraged in the form of systematic reviews, literature reviews, and case studies to name a few. The process of exploring CE within CVD itself can be a case study on innovation diffusion, where many researchers, clinicians, and program developers are left unengaged or difficult to engage, and these groups must not be forgotten.

Conclusion

Regardless of which communities exactly are being affected by chronic disease, it is important to know that the process of preventing and alleviating the symptoms of CVD is ultimately experienced by the same community members. The success and failure of health promotion comes at the cost of individuals within their communities, and as such communities should be viewed as pivotal and key stakeholders in the prevention of their own disease. Having researchers, clinicians, and program developers realize the endless possibilities of collaboration that exist through CE would unlock a world of personalized and efficient health promotion projects. In conclusion, taking on a community engaged approach to health promotion helps address social determinants of health, fosters an appreciation for the role of community in effecting change, and may enhance the quality of the health promotion tactic in question.

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Review Article

Bridging the Gap Between Research and Practice through Knowledge-to-Action: A Primer on Implementation Science

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Abstract

Cardiovascular diseases are a leading cause of mortality worldwide, with prevalence rates steadily increasing. Although innovations in the field of cardiovascular healthcare have been noteworthy, obstacles still exist in translating research findings into practice. Considering the significant inefficiencies in adopting novel policies and interventions as new standards of care, steps must be taken to enhance the process of mobilizing research findings from knowledge producers to knowledge users. Implementation science provides unique frameworks to enable for sustainable implementation of policies, practice, and innovations into routine care. At its core, implementation science aims to identify implementation barriers, provide strategies to surmount such barriers, and develop evaluation methods to ensure that implemented practices are sustainable and constantly improved upon. This article aims to (1) provide an understanding of the basics of implementation science and implementation research (2) explore the three overarching frameworks of implementation science, and (3) highlight examples of implementation science use-cases in cardiovascular disease-related interventions.

Keywords: Implementation Science, Cardiovascular Diseases, Knowledge Translation, Research Mobilization, Community Participation

(JNHFB 2023; 12 : 83-86)

Introduction

Cardiovascular diseases (CVD), which include disorders such as stroke, ischaemic heart disease, myocardial infarction, coronary artery disease, and congestive heart failure, continue to pose as a leading cause of mortality and morbidity worldwide[1-2]. Despite the significant strides taken in CVD research, the prevalence of both total CVD cases and CVD deaths has risen steadily since 1990[1], underscoring the persistent and growing impacts of CVD on public health and rising healthcare costs[3]. Notably, the lag between scientific discovery and implementation of such findings can be long, often taking anywhere between 9-17 years to adopt new policies and practices as the standard of care[4]. Additionally, estimates show that nearly 85% of health research is avoidably wasted[5], highlighting a significant problem in the translation and adoption of research into practice. Considering the many challenges in translating research findings into practice in the real world, addressing these issues systematically is imperative towards equipping healthcare providers with the necessary tools to improve patient outcomes.

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Bridging the gap between research and real-world application is a challenge which requires a deep understanding of the needs and opinions of all involved stakeholders[6]. As such, effective mobilization of research findings from knowledge producers to knowledge users such as clinicians, patients, and policymakers must be approached in a manner which promotes sustained adoption of research outputs. However, many barriers often prevent the effective translation of knowledge from knowledge producers to knowledge users. These barriers extend beyond just challenges in disseminating information; they often stem from the complex dynamics of the healthcare system and the lack of engagement with stakeholders throughout the entire research-to-practice process, among other factors[4]. However, the burgeoning field of implementation science offers us unique insights and frameworks for promoting the adoption of evidence-based practices in real-world, clinical, and public health settings[7]. Implementation science provides a structured methodology for understanding the processes involved in translating research findings into sustainable practices[6], thereby enabling us with a powerful tool towards improving the quality of cardiovascular care.

The purpose of this article is to (1) define implementation science and implementation research, (2) outline the estab-

lished frameworks of implementation research, and (3) highlight examples of successful application of implementation science in varying CVD interventions.

What is Implementation Science?

Implementation science is defined as "the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services and care"[8]. As such, implementation science does not concern itself with establishing the health impact of innovations, but instead aims to understand the factors involved in the process of sustainably establishing innovations as routine[9-10]. One strength of implementation science is its breadth of scope. Specifically, implementation science looks to understand the unique contexts of all stakeholders and organizations involved in an implementation process, including community, policy, and clinical contexts for both patients and care providers[11].

Implementation science encompasses three major aspects: implementation research, implementation strategies, and implementation outcomes[12]. Implementation research aims to understand how knowledge producers can most effectively help knowledge users use new interventions, practices, innovations, and policies[12]. Implementation strategies focus on the actions taken to help knowledge users use these new practices routinely and sustainably[12]. Implementation outcomes focus on determining the extent and the quality to which knowledge users are able to use new practices in a routine and sustainable manner[12]. Through this holistic approach, researchers are able to (1) identify barriers to the uptake of new practices and policies across all involved stakeholders and (2) develop strategies that surmount the identified barriers, thereby increasing the likelihood of adoption of new practices[10].

Implementation Research: Models, Theories, and Frameworks

In the context of implementation science, theories tend to provide predictive abilities to explain causal factors of implementation, models describe and guide the implementation process of practices, and frameworks are used to highlight factors found or thought to influence implementation outcomes[13]. Many theories, models, and frameworks exist to provide systematic methods of studying and implementing new practices[14]. Among them, however, exist three overarching aims: (1) describing the methods of translating research findings into real-world practice, (2) elucidating the factors that influence implementation outcomes, and (3) evaluating the outcomes of implementation[13].

Currently, implementation scientists focus heavily on frameworks due to their flexibility in application[14]. In 2015, Nilsen categorized published implementation frameworks into three distinct groups: Process frameworks, determinant frameworks, and evaluation frameworks[14].

Process Frameworks

The process frameworks are used to outline the steps throughout the process of translating research to practice in real-world settings[13]. The overarching goal of such frameworks is to provide guidance throughout the planning and execution process of implementation and to identify the mechanisms of change[14]. Many established process frameworks exist currently, such as the CIHR Model of Knowledge Translation[15] and the Knowledge-to-Action (K2A) Framework[16].

In the CIHR Model of Knowledge Translation[15], researchers can take one of two knowledge translation approaches. The "end of grant" approach requires researchers to disseminate and communicate research findings at the end of a research study. This can occur through conventional academic knowledge dissemination via conference presentations and peer-reviewed publications. Researchers may also partake in dissemination activities such as educational sessions with patients, healthcare practitioners and policymakers. Contrastingly, the "integrated" approach involves researchers engaging with the target knowledge users throughout the duration of the research study, thereby enabling for collaboration in deciding research questions, methods, data interpretation, and knowledge production.

The K2A Framework[16] aims to develop sustainable actions through a three-phase approach: research, translation, and institutionalization. In the initial research phase, a detailed analysis is conducted to determine the elements that can enhance the ability of organizations to plan, implement, evaluate, and sustain the research phase. Additionally, testing is done to determine whether the intended effects of the intervention are achievable under optimal- and real-world settings. In the translation phase, researchers begin the process of turning scientific findings and research about the knowledge user into programs, policies, and interventions. Here, researchers aim to engage with collaborators and stakeholders in order to mobilize resources and influence change within existing systems. Finally, the institutionalization phase aims to maintain an intervention as a routine activity and develop a systematic process of evaluating the effectiveness of the implemented intervention.

Determinant Frameworks

The determinant frameworks are described as frameworks which highlight variables that may influence processes and implementation outcomes. In other words, determinant frameworks help us understand potential moderating variables between interventions, implementation approaches and implementation outcomes[14]. A comprehensive understanding of the variables which can influence implementation outcomes may help knowledge producers develop more effective implementation strategies. Among a large number of determinant frameworks, the Consolidated Framework for Implementation Research (CFIR) is widely used and accepted. The CFIR is based on 39 constructs organized into

five domains (intervention characteristics, outer setting, inner setting, characteristics of individuals involved, and process factors), which are hypothesized to interact and influence implementation outcomes of interventions[14].

The following example using the CFIR aims to showcase the use of determinant frameworks to understand barriers and facilitators of implementation of a CVD intervention in Uganda[17]: Realizing the need for community approaches towards combatting the increased rates of CVD, Ndejjo and colleagues aimed to better understand the factors influencing the implementation of a community CVD programme led by community health workers (CHW). Throughout the intervention implementation process, a total of 20 CHWs across five parishes reported their experiences of the intervention implementation process, including any barriers and facilitators they faced in the process. Their CFIR findings have been outlined below in Box 1:

Box 1: Consolidated Framework for Implementation Research (CFIR) domains,

Intervention Characteristics:

1. CHWs faced challenges regarding the design, complexity, and adaptability of the intervention
2. Quality and supply of inputs (information) were generally deemed acceptable and understandable
3. Behaviour change was a gradual process among community members
4. Costs associated with fieldwork (reduced time to fulfill other responsibilities)

Outer Settings:

1. Barriers in intervention implementation due to resource availability
2. Intervention uptake levels influenced by prior CVD services accessibility and quality
3. Benefits of media-reinforced messages
4. Dissatisfaction and low motivation of CHWs due to existing policies and procedures for CHWs (i.e., CHWs were expected to volunteer their time without pay)

Inner Settings:

1. Training and learning environments instilled a sense of empowerment within CHWs
2. Community awareness and interest in CVD prevention activities influenced perceptions towards the intervention
3. Trust between community members, CHWs, and CHW activities impacted interactions
4. Culture and beliefs impacted intervention adoption
5. Demographic composition of households impacted cooperation with CHWs
6. Frequency of support, supervision and feedback provided to CHWs was imperative towards CHW performance

Characteristics of Individuals Involved:

1. Stage of change (motivation to change) impacted engagement
2. Competing demands of CHWs with other personal responsibilities limited their engagement during intervention delivery
3. CHW motivation and commitment had significant impacts on intervention implementation
4. CHW attributes (i.e., status in a village) influenced the likelihood of community members listening to them
5. CHW socio-demographic characteristics influenced intervention implementation

As outlined above, by leveraging the CFIR in the assessment of community CVD prevention programme implementations, a detailed understanding of both inhibitory and facilitating variables regarding intervention implementation was successfully achieved.

Evaluation Frameworks

Evaluation frameworks provide a mechanism for assessing the success of intervention implementations. Although many frameworks exist, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance)[18] and PRECEED-PROCEED (Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation-Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development)[19] frameworks are among the most commonly used. Both frameworks outline elements of an interventions implementation that should be assessed.

Box 2: RE-AIM framework

Reach: The ability of the program to attract a large and representative percentage of the target population

Effectiveness: Increasing the quality of life of patients while minimizing negative side effects

Adoption: Feasibility of running the program in real-world settings

Implementation: The ability to consistently deliver the program across different circumstances/situations (i.e., different times and staff members)

Maintenance: The ability for the program to be sustained long-term and have mechanisms for implementing improvements

The following example of the RE-AIM framework aims to showcase the use of evaluation frameworks to assess an implemented coronary heart disease (CHD) intervention program in women[20]: Toobert and colleagues aimed to evaluate the results of a multiple-behaviour-change program adapted for use in women with either CHD or type 2 diabetes.

The CHD intervention program entailed twice-weekly meetings to instill behavioural changes by promoting health diets, physical activity, smoking cessation, and social support. Results from two randomized clinical trials were assessed using the RE-AIM framework based on the following (Box 2):

The RE-AIM framework provided researchers with a nuanced understanding of the strengths of the implemented intervention. For instance, it was found that the intervention program successfully attracted a large and representative patient population, had high levels of adoption and acceptance within primary care settings, and resulted in consistent behavioural improvements. This framework also provided researchers with valuable information on potential areas for improvement. For example, it was found that although individual-level maintenance of behavioural changes was effective in the early stages of the study (6-12 months), some relapse was found at 24 months. Additionally, reflecting on the implementation process brought up new discussions on ways to reduce costs and further enhance implementation. Adding social media content to improve long-term participant-maintenance levels and incorporating mobile technologies in the program to help reduce costs and enhance implementation are examples of some key takeaways for future interventions.

Through the use of the RE-AIM framework, researchers were able to effectively evaluate both strengths and areas of improvement regarding the implementation of a novel CHD intervention program, thereby providing a means to efficiently improve future iterations of the intervention.

Conclusion

With the escalating burden of CVD globally, the need to translate research findings efficiently and effectively into practice is imperative for improving public health outcomes. Through implementation science, both knowledge producers and knowledge users can gain valuable insights into the barriers and facilitators in adopting evidence-based practices into routine care. Prior CVD interventions spanning from clinical trials to community-based health initiatives have proven to benefit significantly from leveraging implementation science frameworks. Overall, implementation science offers knowledge producers a unique toolset, thereby enabling the successful adoption of new practices, policies, and interventions and, in turn, improving the quality of patient care.

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Original Article

Comparison of Baseline, Clinical Characteristics and In-Hospital Outcome of Coronavirus Disease 2019 (COVID-19) Patients With or Without Gastrointestinal Symptoms

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Abstract

Objective: There has been delayed reorganization of gastrointestinal (GI) symptoms as symptoms of coronavirus disease (COVID-19). The purpose of this study was to compare baseline and clinical characteristics & in-hospital outcome COVID-19 positive patients with or without GI symptoms.

Method: This prospective observational study included all consecutive confirmed COVID-19 positive patients from March 8th 2020 to December 31st 2022 at the National Heart Foundation Hospital & Research Institute of Bangladesh. Asymptomaticconfirmed COVID-19 positive patients were excluded from the study. Patients were divided into two groups based on presence or absence of GI symptoms: Group I- patients with GI symptoms and group II- patients without GI symptoms. Baseline and clinical characteristics & in-hospital outcome of patients in both groups were evaluated for comparison.

Results: A total of 1772 patients were included in this study. Of whom 369 (20.8%) patients had GI symptoms (Group-I)& 1403 (79.2%) were without GI symptoms (Group-II). Patients with GI symptoms were younger (45.74 ±17.73 years vs52.38 ± 14.99 years) and had fewer co-morbidities (p= 0.001) than patients without GI symptoms. Healthcare personnel were affected by GI symptoms in 47.4% cases. Risk factors and comorbidities ware predominant in G-II patients than Group-I **Patients:** Hypertension (64.2% vs 48.2%; p=0.001); diabetes mellitus (46.2% vs 33.1%;p=0.001); smoking (35.2% vs 21.4%; p=0.001); dyslipidemia (29.9% vs 22.0%;p=0.003); cardiovascular disease (76.3% vs 47.4%;p=0.001) and chronic kidney disease (40.6% vs 29.5%;p=0.001). Fever (79.9% vs 70.1%), cough (73.7% vs 41.5%), fatigue (68.8% vs 31.7%), bodyache (58.3% vs 20.4%), and headache (40.4% vs 13.3%) were the most common findings in Group-I patients. Most of the patients with GI symptoms were treated either in home isolation or in institutional isolation (51.2% vs 48.8%) and most of the patients without GI symptoms were hospitalized (53.3% vs 46.7%).Patients with GI symptoms had favorable in-hospital outcome than patients without GI symptoms (Mortality rate- 4.1% vs 5.8%; p=0.18).

Conclusion: Patients with GI symptoms are usually younger, predominantly male, and have a less co-morbidity, a lower probability of hospitalization, and associated with favorable prognosis as compared with patients without GI symptoms.

Keywords: COVID-19, Demographics, Gastrointestinal Symptoms, In-Hospital Outcome

(JNHFB 2023; 12 : 87-92)

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing coronavirus disease (COVID-19) at first thought to be affect only respiratory system. But subsequently it was evident that COVID-19 also affects other systems including GI tract. In the United States, the very first COVID-19 patient had nausea and vomiting two days before admission, followed by diarrhea the next day.[1] Increasing reports from the China and emerging data from other international sites have reposted subgroups of COVID-19 patients with the following: a) concurrent gastrointestinal symptoms, notably diarrhea, anorexia, vomiting and nausea; b) onset of GI signs prior to respiratory symptoms; or c) only GI clinical signs with absence of respiratory symptoms.[2-16] GI symptoms are wide ranging and include anorexia or loss of appetite, diarrhea, nausea, vomiting, abdominal pain and altered taste. The pathogenesis of GI symptoms remains less clear in COVID-19. SARS-CoV-2 enters and replicates into cells by binding to its angiotensin converting enzyme type 2 (ACE2) receptor and it expression is abundant in epithelial cells throughout the GI tract and cholangiocytes.[17] Distribution of ACE2 staining positivity is mainly in the cytoplasm of the epithelial cells of the stomach and intestine and the cilia of glandular epithelial cells.[18] In about 50% of COVID-19 cases, the

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presence of SARS-CoV-2 in faecal samples and detection of virus in intestinal mucosa of infected patients suggest that enteric symptoms could be caused by invasion of ACE2 expressing enterocytes and the GI tract may be an alternative route of infection.[19] Possible modes of transmissions are "faecal-aerosol-mucosal" and "fecal-oral".[20] There is controversy whether GI symptoms reflect better or worst prognosis.[21] As SARS-CoV-2 can be transmitted through feces, the clinical characteristics and prognosis analysis of COVID-19 patients with GI symptoms are of great significance to prevent the spread of disease, and statistics on the epidemiology and clinical characteristics of COVID-19 patients with GI symptoms have been reported.[22] The purpose of our study was to compare baseline and clinical characteristics, and in-hospital outcome in COVID-19 positive patients presented with GI or without GI symptoms.

Materials and methods

Study design, setting, and population

This prospective observational study was carried-out in the non-COVID tertiary cardiac care hospital (National Heart Foundation Hospital & Research Institute, Dhaka, Bangladesh) from March 08, 2020 to December 31, 2022. All admitted patients, who subsequently got diagnosed as COVID positive and health care personnel of this hospital, who become COVID positive were included in this study. Asymptomatic patients were excluded from the study. The study was approved by the Ethics Review Committee of National Heart Foundation Hospital & Research Institute (N.H.F.H. & R.I./4-14/7/AD-1105) and written informed consent was obtained from all patients or patient's attendance.

Definition and variables

The definition of patients with GI symptoms requires that the patients have at least one of the following symptoms: anorexia, diarrhea, nausea, vomiting, abdominal pain and altered taste. The definition of diarrhoea was the passing of loose stools >3 times per day.[10] We studied all confirmed COVID-19 cases and analysed baseline variables, comorbidities, clinical presentation, treatment, and severity of COVID-19. Baseline information included gender, age, risk factors and co-morbidities (diabetes mellitus, hypertension, smoking, dyslipidemia, obesity, cardiovascular disease, chronic obstructive pulmonary disease /bronchial asthma (COPD/BA), chronic kidney disease). The degree of severity of COVID-19 were classified as mild, moderate, severe, and critical ill.[23,24]

Statistical analysis

Descriptive statistics were used to characterize the study population. Continuous variables are described using the mean and standard deviation (SD) and compared using unpaired student's 'T' test. Discrete variables are expressed as number of cases and percentage. Comparison between variables was performed using the two-sided chi-square tests for discrete variables, or Fisher's exact tests (expected frequency <5). A two-sided p value <0.05 was considered statistically significant. All analyses were performed using SPSS statistical software version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Over this period a total of 1772 patients were included. Of whom 369 (20.8%) patients were in Group-I (with GI symptoms)& 1403 (79.2%) were in group-II (without GI symptoms). The mean age of the patients in Group-I was 45.74 ±17.73 years and in Group-II was 52.38 ± 14.99 years. Male were predominant in both groups (52% vs 48% and 69.4% vs 30.6%). Healthcare personnel were affected by GI symptoms in 47.4% cases. Risk factors and comorbidities ware predominant in G-II patients than Group-I patients: Hypertension (64.2% vs 48.2%; p=0.001); diabetes mellitus (46.2% vs 33.1%;p=0.001); smoking (35.2% vs 21.4%; p=0.001); dyslipidemia (29.9% vs 22.0%;p=0.003); cardiovascular disease (76.3% vs 47.4%;p=0.001) and chronic kidney disease (40.6% vs 29.5%;p=0.001). Baseline characteristics of COVID-19 patients with and without GI symptoms are presented in Table 1.Most of the patients with GI symptoms (42.3% vs 14.1%) had no comorbidities (Figure 1). Among the patients (n=1772) anorexia (9.9%) was the most common GI symptoms followed by nausea (5.8%), altered taste (5.2%), diarrhea (5.2%), abdominal pain (2.9%) and vomiting (2.4%) (Figure2). Fever (79.9% vs 70.1%), cough (73.7% vs 41.5%), fatigue (68.8% vs 31.7%), body ache (58.3% vs 20.4%), and headache (40.4% vs 13.3%) were the most common findings in patients with GI symptoms. Coexisting COVID-19 related symptoms in patients with or without GI symptoms are presented further in Table 2. Patients were treated either in hospital or in isolation. Oxygen therapy (low flow, high flow) was given when required. Prone positioning was advised for all patients. Treatment outline is given in Table 3. Most of the patients with and without GI symptoms received ivermectin (133 [36.1%] & 574 [41.0%] respectively). Four patients (0.3%) without GI symptoms received hydroxy-chloroquine. Only 12 (3.3%) patients with GI symptoms & 33 (2.4%) patients without GI symptoms received favipiravir (1600 mg on day 1 followed by 600 mg 12 hourly from day 2 to day 10) and 30 (8.2%) patients with GI symptoms and 78 (5.7%) patients without GI symptoms received remdesivir (200 mg IV infusion [within 30 min-2 hours] on day 1 followed by 100 mg infusion within [30 min to 2 hours] from day 2 to day 5) (Table 3). Regarding antibiotic therapy, 233 (63.1%) patients with GI symptoms & 949 (67.6%) patients without GI symptoms were treated with a single antibiotic and 95 (25.7%) patients with GI symptoms & 260 (18.6%) patients without GI symptoms were given double antibiotic therapy (p=0.001).The antibiotics used generally covered common pathogens. The antibiotics used were doxycycline, azythromycin, cephalosporins, fluoroquinolones, carbapenems and β-lactamase inhibitors. Oral antibiotic therapy was given more in patients with GI symptoms than without GI symptoms (44.2% vs 39.4%). Most of the

patients received either ivermectin plus azithromycin or ivermectin plus doxycycline combination. The duration of antibiotic treatment was 5–10 days. Around 36 (9.8%) patients with GI symptoms & 101(7.4%) patients without GI symptoms were also treated with methylprednisolone and dexamethasone for 3–7 days. Low molecular weight heparin was used in most of the patients without GI symptoms than with GI symptoms (75.1% vs 49.9%) followed by newer oral anticoagulants (rivaroxaban 10 mg once daily for 1 month) [p=0.001]. We administered vitamin C, vitamin D3 and zinc to most of the patients. Most of the patients with GI symptoms were treated either in home isolation or in institutional isolation (51.2% vs 48.8%) and most of the patients without GI symptoms were hospitalized (53.3% vs 46.7%).In patients with GI symptoms- mild disease was 85.9% (317), moderate disease was 2.4% (9); severe disease was 11.7% (43) and there was no critical ill patient. In patients without GI symptoms-mild disease was 87.2% (1224), moderate disease was 3.3% (47); severe disease was 8.1% (114) and critical ill was 1.4% (18) (Table 4).Patients with GI symptoms had 4.1% mortality and patients without GI symptoms had 5.8% in-hospital mortality (p=0.18) (Table 4).

Table 1: Baseline characteristics of patients with COVID-19 with and without GI symptoms (n-1772)

Variables	Group-I(n=369) With GI symptoms Mean±SD/f(%)	Group-II(n=1403) Without GI symptoms Mean±SD/f(%)	P value
Age (Mean±SD) year	45.74 ±17.73	52.38 ± 14.99	0.001#
Gender			
• Male	192(52.0%)	974(69.4%)	0.001*
• Female	177(48.0%)	429(30.6%)	
Patient category			
• HCP	175(47.4%)	262(18.7%)	0.001*
• Non-HCP	194(52.6%)	1141(81.3%)	
Risk factors & comorbidities			
• HTN	178(48.2%)	901(64.2%)	0.001*
• DM	122(33.1%)	648(46.2%)	0.001*
• Smoking	79(21.4%)	494(35.2%)	0.001*
• Dyslipidemia	81(22.0%)	419(29.9%)	0.003*
• Cardiovascular disease	175(47.4%)	1070(76. 3%)	0.001*
• COPD/BA	26(7.0%)	98(7.0%)	0.96*
• Obesity	123(33.3%)	446(31.8%)	0.57*
• CKD	109(29.5%)	569(40.6%)	0.001*
Number of comorbidities			
• 0	85(23.0%)	140(10.0%)	0.001*
• 1	64(17.3%)	121(8.6%)	
• >1	220(59.7%)	1142(81.4%)	
Diagnosis			
• COVID-19 only	193(52.3%)	317(22.6%)	0.001*
• COVID-19 with heart disease	176(47.7%)	1086(77.4%)	

COVID-19: coronavirus disease 2019; GI: gastro-intestinal; HCP: healthcare personnel; non-HCP: non-healthcare personnel; SD: standard deviation; HTN: hypertension; DM: diabetes mellitus; COPD: chronic obstructive pulmonary disease; BA: Bronchial asthma; CKD: chronic kidney disease. *Chi square test was done to find out the significance; #Student's 't' test was done to find out the significance.

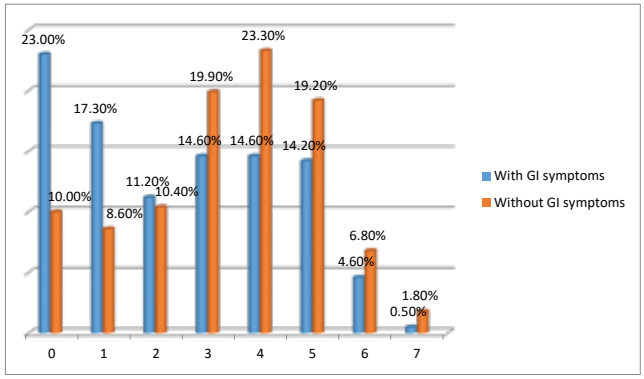

Figure 1: Bar diagram showing number of comorbidities among patients with COVID-19 positive with (n=369) or without GI symptoms (n=1403) COVID-19: coronavirus disease 2019; GI: gastro-intestinal.

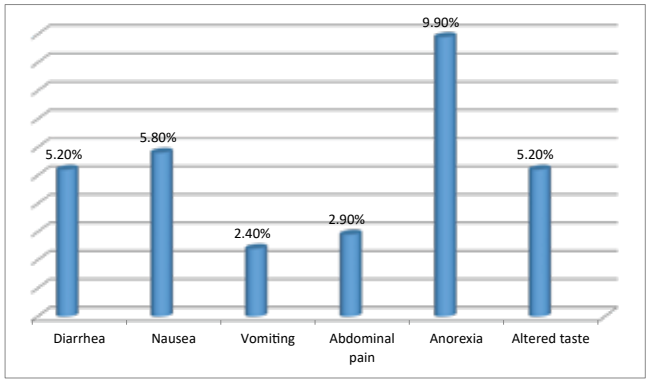

Figure 2: Frequency of GI symptoms in all patients (n=1772)

Table 2: Coexisting COVID-19 related symptoms in patients with or without GI symptoms (n=1772)

Symptoms	Group-I Patients with GI symptoms (n=369) f(%)	Group-II Patients without GI symptoms (n=1403) f(%)	P value*
• Fever	295(79.9%)	984(70.1%)	0.001
• Cough	272(73.7%)	582(41.5%)	0.001
• Sore throat	102(27.6%)	106(7.6%)	0.001
• Nasal congestion	54(14.6%)	15(1.1%)	0.001
• Rhinorrhea	61(16.5%)	25(1,8%)	0.001
• Shortness of breath	193(52.3%)	709(50.5%)	0.54
• Anosmia	95(25.7%)	103(7.3%)	0.001
• Fatigue	254(68.8%)	445(31.7%)	0.001
• Headache	149(40.4%)	187(13.3%)	0.001
• Bodyache	215(58.3%)	286(20.4%)	0.001
• Numbness	47(12.7%)	05(0.4%)	0.001
• Dizziness	137(37.1%)	122(8.7%)	0.001
• Generalized itching	27(7.3%)	34(2.4%)	0.001

COVID-19: coronavirus disease 2019;GI: gastro-intestinal.*Chi square test was done to find out the significance.

Table 3: Distribution of treatment of patients with COVID-19 with and without GI symptoms(n=1772)

Variables	Group-I	Group-II	P value*
	Patients with GI symptoms (n=369) f (%)	Patients without GI symptoms (n=1403) f (%)	
Antibiotics			
Received			0.27
• IV	146 (39.6%)	569 (40.6%)	
• Oral + IV	19 (5.1%)	87 (6.2%)	
• Oral	163 (44.2%)	553 (39.4%)	
Not received	41 (11.1%)	194 (13.8%)	
Antibiotics			
• Single	233 (63.1%)	949 (67.6%)	0.001
• Double	95 (25.7%)	260 (18.6%)	
• Not received	41 (11.2%)	194(13.8%)	
Steroids	36(9.8%)	101(7.4%)	0.12
Favipiravir	12(3.3%)	33 (2,4%)	0.36
Remdesivir	30(8.2%)	78(5.7%)	0.08
Ivermectin	133 (36.1%)	574(41.0%)	0.09
Hydroxy-chloroquine	0(0.0%)	4(0.3%)	0.29
Enoxaparine	184 (49.9%)	1054(75.1%)	0.001

COVID-19: coronavirus disease 2019; GI: gastro-intestinal; IV: intravenous. *Chi square test was done to find out the significance.

Table 4: In-Hospital outcome of patients with COVID-19 with and without GI symptoms (n=1772)

Variables	Group-I	Group-II	P value*
	Patients with GI symptoms (n=369) f (%)	Patients without GI symptoms (n=1403) f (%)	
Hospitalization	180 (48.8%)	748 (53.3%)	0.121
Home isolation	189 (51.2%)	655 (46.7%)	0.121
Disease severity			
• Mild	317(85.9%)	1224(87.2%)	0.49
• Moderate	09(2.4%)	47(3.3%)	0.37
• Severe	43(11.7%)	114(8.1%)	0.034
• Critical ill	00(0.0%)	18(1.4%)	0.029
Mortality	15 (4.1%)	82(5.8%)	0.18

COVID-19: coronavirus disease 2019. *Chi square test was done to find out the significance.

Discussion

Important findings of this study are: 1) Around 20.8% patients had GI symptoms; 2) Patients with GI symptoms are usually younger and had a less co-morbidity; 3) Patients with anosmia had a milder course, a lower probability of hospitalization; 4) GI symptoms in patients with COVID-19 are with favorable prognosis as compared with patients without GI symptoms.

SARS-CoV-2 seems to cause GI symptoms by several mechanisms.[14] First, SARS-CoV-2 indirectly or directly damages the GI system through an inflammatory response. The chain reaction of inflammatory factors and viremia may injure the GI system. Enteropathic viruses may directly damage the intestinal mucosa and cause GI symptoms.[14] Second, the intestinal flora is colonized in the human intestine, and their numbers are astonishing and diverse. The intestinal flora plays a variety of important physiological roles in the body, such as affecting the body's nutritional metabolism, regulating the development and maturation of the body's immune system, and antibacterial effects.[25] The virus itself may cause disorders of the intestinal flora, which could result in GI symptoms.[14] Third, SARS-CoV-2 is similar to SARS-CoV and can invade the human body by binding to the human ACE-2 receptor, which causes liver tissue injury by the upregulation of ACE-2 expression in liver tissue caused by compensatory proliferation of hepatocytes derived from bile duct epithelial cells.[26] Finally, the intestine is the largest immune organ in the body. Changes in the composition and function of the digestive tract flora affect the respiratory tract through the common mucosal immune system, and respiratory tract flora disorders also affect the GI tract through immune regulation. The effect is called the "gut-lung axis".[27-28], which may further explain why patients with COVID-19 pneumonia often have digestive symptoms.[14]

Increasing reports from the China and emerging data from other international sites have reposted that incidence of GI symptoms among COVID-19 patients ranged from 2% to 79.1%.2-16 Out of 1772 patients, 369 (20.8%) patients had GI symptoms & 1403 (79.2%) were without GI symptoms. Patients with GI symptoms were younger (45.74 ±17.73 years vs52.38 ± 14.99 years). A study from the Zhejiang province of China enrolled 651 patients and of them 74 (11.4%) patients presented with at least one GI symptom (nausea, vomiting or diarrhoea) and 577 (88.6%) patients presented without GI symptoms.[10] The study aimed to determine epidemiological, clinical and virological characteristics of patients with GI symptoms & compare them with their counterpart. The mean age of the patients with GI symptoms was 46.14±14.19 years and the male:female ratio was 1:1. Whereas, without GI symptoms the mean age was 45.09±14.45 years and the male: female ratio was 1:1. In patients with GI symptoms thirty-eight (51.35%) patients had a Wuhan exposure history and 32 (43.24%) patients had a history of contact with patients with COVID-19. In patients without GI symptoms 347 (60.14%) patients had a Wuhan exposure history and 230 (39.86%) patients had a history of contact with patients with COVID-19. Twenty-three (31.08%) patients with GI symptoms had family clustering, which was prominently higher than that in

patients without GI symptoms (20.45%, p=0.037). Twenty-nine (39.19%), twenty-three (31.08%), eight (10.81%) and sixteen (21.62%) patients with COVID-19 with GI symptoms had >38.5°C fever, fatigue, shortness of breath and headache, respectively, substantially higher than their respective counterparts without GI symptoms. More importantly, the rate of the severe/critical type was also markedly increased in patients with COVID-19 with GI symptoms than in those without GI symptoms (22.97% vs 8.14%, p<0.001). It was also noted that 5 (6.76%), 13 (17.57%) and 1 (1.35%) patient with COVID-19 with GI symptoms had complications of ARDS, liver injury and shock, respectively, where the former two were significantly higher than their counterparts of 2.08% and 8.84% in patients with COVID-19 without GI symptoms, respectively (p=0.034; p=0.035). Five (6.76%) patients with COVID-19 with GI symptoms were treated with mechanical ventilation and transferred to the ICU, which was a significantly higher rate than that of 2.08% in the patients with COVID-19 without GI symptoms (p=0.034).

The outcomes in COVID-19 patients with or without GI symptoms were compared in a single-center and retrospective cohort study from China.[11] The clinical characteristics of COVID-19 patients with GI symptoms were a significantly higher rate of fever, cough, chest tightness, dyspnoea, myalgia and fatigue, and had increased complication of acute respiratory distress syndrome (ARDS) and a higher tendency toward higher disease severity (rate of severe/critical type and mechanical ventilation) compared with COVID-19 patients without GI symptoms, which is consistent with a study reported previously.[10] Kaplan-Meier curves showed that there was no significant difference (p = 0.479) in mortality between COVID-19 patients with and without GI symptoms.

A retrospective cross-sectional study from Iran evaluated 507 patients with confirmed or highly probable COVID-19. Based on their symptoms, patients were categorized into four groups: with GI symptoms alone (GIA), with respiratory symptoms alone (RA), with both GI and respiratory symptoms (GIR), and without GI or respiratory symptoms (WGIR). Of the 507 COVID-19 patients, 47.9% had at least one GI symptom. Patients in the GIA group were significantly older than those in the RA (P = 0.041) and GRI (P = 0.004) groups (54.70 ±18.14 vs. 48.68±14.67 and 46.80±17.17 years, respectively). Noninvasive ventilation was performed less frequently on patients with GI symptoms (P = 0.016). Oxygen therapy was significantly higher in patients with GI symptoms and intensive care unit (ICU) admission in those without GI symptoms (P < 0.001 and P = 0.005, respectively). Finally, although mortality was lower in patients with GI symptoms (9.1%) in comparison with those without GI symptoms (13.3%), the difference was not statistically significant (P = 0.134).

Han et al.[13] included 206 COVID-19 patients with mild disease and one or more GI symptoms, with or without respiratory symptoms, and compared them with a group presenting solely with respiratory symptoms. Patients with GI symptoms presented for care later than those with respiratory symptoms (16.0±7.7 vs 11.6 ± 5.1 days, P < 0.001). Nevertheless, patients with GI symptoms had a longer duration between symptom onset and viral clearance (P<0.001) and were more likely to be fecal virus positive (73.3% vs 14.3%, P5 0.033) than those with respiratory symptoms.

A multicenter cross-sectional study from Hubei (China) enrolled 204 patients with COVID-19 and most of the patients presented to the hospital with fever or respiratory symptoms, of them103 patients (50.5%) reported a GI symptom, including anorexia (78.6%), diarrhea (34%), vomiting (3.9%), and abdominal pain (1.9%).[14] Patients with GI symptoms were younger than patients without GI symptoms (52.21± 15.92 yrs vs 53.61± 16.1 yrs) as in our study. In patients with GI symptoms, 53.39% patients were male and 46.61% were female & 51.48% patients were male and 48.52% were female in patients without GI symptoms. Patients with GI symptoms had a significantly longer time from onset to admission than those without GI symptoms, possibly because they did not initially exhibit typical respiratory symptoms and thus did not receive timely diagnoses and treatment for COVID-19. As the severity of the disease increases, GI symptoms become more pronounced. One possibility is that GI symptoms indicate viral load and replication within the gastrointestinal tract, which leads to more severe disease. Although mortality was higher in patients with GI symptoms (18.4%) in comparison with those without GI symptoms (16.83%), the difference was not statistically significant (P = 0.76).

Early data showed GI symptoms were associated with a worse disease course and prognosis.[29] A meta-analysis found higher rates of severe disease in patients with GI symptoms compared with patients without GI symptoms (17.1% vs 11.8%).4 A recent US retrospective study found that patients with digestive symptoms had a 4-fold increased risk of hospitalization compared with patients without GI symptoms.[30] However, Lin et al.[31] observed no difference in clinical outcomes, such as hospital stay, discharge, or mortality, in patients with or without GI symptoms, in a case series conducted in the Chinese city of Zhuhai.

Limitation

This study has several limitations. Firstly, study conducted in non-COVID-dedicated hospital. Secondly, COVID variants were not determined. Thirdly, stool test for detection of viral RNA was not done. Fourthly, appearance of GI symptoms in relation to other symptoms was not assessed. Finally, exposure history was not taken.

Conclusion

GI symptoms have become well-recognized symptoms of this current pandemic. Compared to COVID-19 patients without GI symptoms, they were younger, predominantly male, and had less comorbidity. Awareness of the time

course of GI symptoms is crucial because these symptoms may be one of the first signs of COVID-19 infection. The presence of early digestive symptoms may make the diagnosis of COVID-19 difficult because clinicians may be misled. However, these symptoms may provide early clues suggesting COVID-19 infection and precipitate follow-up testing and precautions.

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Original Article

Culprit Lesion Detection in Patients Presenting With Non-ST Elevation Myocardial Infraction and Multivessel Disease

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Abstract

Background: Identification of the culprit lesion in non-ST-elevation myocardial infarction (NSTEMI) patients with multi-vessel coronary disease (MVD) is clinically important regarding choosing reperfusion strategy. Otherwise, the operator may perform ad hoc complete revascularization in order to avoid leaving unstable plaques untreated and expose the patient to a continued risk of major adverse cardiac events. In our setting, there is no recent statistics regarding the issue of culprit lesion detection in NSTEMI and MVD. The ability to correctly identify the culprit lesion in MVD may affect clinical outcome in the context of a culprit-only or Multivessel revascularization strategy in patients of NSTEMI. So, this study aimed to evaluate the ability to identify the culprit lesion by coronary angiogram (CAG) in patients with NSTEMI and MVD.

Methods: This prospective study was conducted in the Department of Cardiology, National Heart Foundation Hospital and Research Institute, Dhaka, Bangladesh from September 2022 to August 2023. The study consecutively included 258 patients who presented with NSTEMI and were later diagnosed with MVD on CAG. CAG and ECG were analyzed for culprit lesion identification. Predictors of not identifiable culprit lesion were assessed in multivariate logistic regression analysis with the variables with p values of ≤0.10 in univariate analysis.

Results: Out of 258 patients, the culprit lesion was angiographically identified in 212 patients (82.2%), while no clear culprit lesion was found in 46 (17.8%) patients. The presence of three-vessel disease [Odds ratio (OR) 1.92, 95% confidence interval (CI): 1.01-4.13, p=0.046] and calcification (OR 2.76, 95% CI: 1.02-2.48, p=0.045) were associated with the inability to identify the culprit lesion. ECG analysis allowed to predict the location of the culprit vessel with low sensitivity (range 0% -69.2%).

Conclusion: The culprit lesion appeared unclear by coronary angiography in about 20% of patients with NSTEMI and MVD. Higher lesion complexity was associated with the inability to identify the culprit.

Keywords: Non-ST elevation myocardial infraction; Multivessel disease; Culprit lesion; Percutaneous coronary intervention.

(JNHFB 2023; 12 : 93-96)

Introduction

Acute Coronary Syndrome (ACS) remains the leading cause of death worldwide.[1] With effective prevention and treatment of ACS, recent analyses have shown that the incidence of ST-elevation (STE) ACS is in decline. However, the incidence of NSTE-ACS is increasing.[2] Furthermore, although STE-ACS is associated with higher in-hospital and 30-day mortality than NSTE-ACS, mortality beyond hospital discharge is greater for NSTE-ACS.[3] Treatment algorithms for ACS become more complex in the presence of MVD, which is common in patients with NSTE-ACS ranging between 40 and 80% of patients undergoing coronary angiography (CAG) and is also associated with worse clinical outcomes compared with single vessel disease.[4,5]

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The term culprit lesion is used to designate the coronary stenosis considered responsible for ACS, and its recognition enables appropriate treatment in patients with MVD.[6] This culprit lesion is often characterized by typical aspects of unstable plaque, such as intraluminal filling defects consistent with thrombus, plaque ulceration, plaque irregularity, dissection, and impaired flow.[7,8] The ability to correctly identify the culprit lesion in MVD may affect clinical outcomes in the context of a culprit-only or multivessel revascularization strategy. Otherwise, the operator may perform ad hoc complete revascularization to avoid leaving unstable plaques untreated and exposing the patient to a continued risk for early major adverse cardiac events. However, an accurate identification of the culprit lesion by CAG may be challenging in patients with NSTEMI and MVD.[9,10]

In our setting, there were no recent statistics regarding the issue of culprit lesions in NSTEMI and MVD. So, this study

aimed to evaluate the ability to identify the culprit lesion by CAG in patients with NSTEMI and MVD.

Materials and Methods

This cross-sectional study was carried out in Department of Cardiology, National Heart Foundation Hospital and Research Institute, Mirpur, Dhaka, Bangladesh from September 2022 to August 2023. Patients with NSTEMI aged above 18 years having MVD on CAG were included in this study. Patients presenting as NSTEMI with single vessel coronary artery disease, with creatinine clearance <30 mL/min, and history of previous PCI, CABG were excluded from the study.

Assuming that in 86% patients culprit lesions were identified, at 95% level of significance with 5% precision, the estimated sample size was 250.[10] Finally, a total of 258 patients were successfully selected considering the inclusion and exclusion criteria, and enrolled into the study. Data were collected using a structured questionnaire containing all the variables of interest.

Demographic variables (age and sex), risk factors (smoking, hypertension, diabetes mellitus, dyslipidemia, CKD, BMI, family history of CAD), ECG and echocardiographic parameters were collected. CAG procedure related variables were access site, number of vessels, bifurcation lesion, calcification, CTO lesion, culprit vessel identification, number of stents, total length of stents, and average diameter of the stents. Therapeutic information like, medical treatment, culprit only PCI, Ad hoc complete multivessel PCI, Ad hoc incomplete multivessel PCI.

Coronary angiographies were reviewed by two experienced cardiologists to assess the angiographic appearance of the lesion. In order to identify the potential culprit lesion site, information derived from angiographic images and ECGs were integrated as per common clinical practice.

Multivessel coronary disease was defined as the presence of a ≥ 50% diameter stenosis in at least two epicardial coronary arteries (>2.5 mm) as assessed by visual estimation.[11] A coronary lesion was deemed the culprit when at least two of the following angiographic findings suggestive of plaque rupture will be detected, according to ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation:[12]

1. Intraluminal filling defects consistent with thrombus, acute occlusion abruptly ending with a squared-off or convex upstream termination or an intraluminal filling defect in a patent vessel within or adjacent to a stenotic region with surrounding homogeneous contrast opacification,
2. Plaque ulceration described as presence of contrast and hazy contour beyond the vessel lumen,
3. Plaque irregularity characterized by irregular margins or overhanging edges,
4. Dissection,
5. Impaired flow.

Left bundle branch block (LBBB), right bundle, branch block (RBBB), diffuse ST/T wave changes were considered as non-specific ECG changes.

Ethical approval was obtained from the institutional ethical review committee. Written informed consent was obtained from the participants. Categorical variables were reported as either counts or percentages and compared using Person's Chi-square test. Continuous variables were expressed as mean ± standard deviation (SD) and compared by Student's t-test. Predictors of not identifiable culprit lesion were assessed in multivariate logistic regression analysis with the variables with p values of ≤0.10 in univariate analysis. A p-value < 0.05 was considered statistically significant and 95% confidence intervals (CI) were presented for all odds ratio (OR). Data were analyzed by Statistical Package for Social Science (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp).

Results

A total of 258 patients diagnosed with NSTEMI having MVD on CAG at the NHFH&RI from September 2022 to August 2023 were included in the study. Mean age was 54.2 ± 10.5 years and 79.1% were male. Culprit lesion was identified by coronary angiography in 212 patients (82.2%). Table 1 shows that, demographic, clinical, ECG, and echocardiographic characteristics were similar between patients with identified culprit lesion and those with no clear culprit lesion by angiography.

Table 1: Clinical, ECG, and echocardiographic characteristics between of the patients with and without identified culprit lesions

Characteristics	Total population (n=258)	Culprit lesion identified by angiography		P value
		Yes (n=212)	No (n=46)	
Age (years)	54.2 ± 10.5	54.2 ± 10.7	54.2 ± 9.8	0.986*
Male	204 (79.1)	167 (78.8)	37 (80.4)	0.802†
Smoking history	71 (27.5)	59 (27.8)	12 (26.1)	0.810†
Hypertension	177 (68.9)	146 (68.9)	31 (68.9)	0.998†
Diabetes mellitus	156 (60.7)	126 (59.7)	30 (65.2)	0.489†
Dyslipidemia	151 (58.5)	124 (58.5)	27 (58.7)	0.980†
Chronic kidney disease	31 (12.0)	27 (12.7)	4 (8.7)	0.445†
FH of IHD	88 (34.1)	73 (34.4)	15 (32.6)	0.813†
BMI, kg/m^2	24.7 ± 3.2	24.7 ± 3.2	23.9 ± 3.0	0.129*
Nonspecific ECG	48 (18.6)	36 (17.0)	12 (26.1)	0.150†
LVEF	47.7 ± 7.2	47.8 ± 7.1	47.1 ± 7.7	0.529*
RWMA	215 (83.3)	175 (82.5)	40 (87.0)	0.467†

Data were expressed as frequency (%) or mean ± SD; FH: Family history; IHD: Ischemic heart disease; BMI: Body mass index; LVEF: Left ventricular ejection fraction; RWMA: Regional wall motion abnormality; ECG: Electrocardiography; *Independent sample t test; †Chi-square test

Table 2 shows that, lesion complexity was higher when no culprit was identified. Three vessel disease and calcification was significantly more common in patients without culprit lesion identified than their counterpart. Similarly mean number of stents and average stent length was also significantly higher in patients without culprit lesion identified than their counterpart ($p < 0.05$).

Table 2: Angiographic characteristics between of the patients with and without identified culprit lesions

Characteristics	Total population (n=258)	Culprit lesion identified by angiography		P value
		Yes (n=212)	No (n=46)	
Femoral access	236 (91.5)	193 (91.0)	43 (93.5)	0.591†
2-vessel disease	101 (39.1)	90 (42.5)	11 (23.9)	0.020†
3-vessel disease	157 (60.9)	122 (57.5)	354 (76.1)	0.020†
Bifurcation lesion	75 (29.1)	57 (26.9)	18 (39.1)	0.097†
Calcification	20 (7.8)	12 (5.7)	8 (17.4)	0.007†
Left main lesion	57 (22.1)	42 (19.8)	15 (32.6)	0.058†
CTO lesion	38 (14.7)	27 (12.7)	11 (23.9)	0.052†
Medical treatment/CABG	148 (57.4)	113 (53.3)	35 (76.1)	0.005†
Culprit only PCI	33 (12.8)	33 (15.6)	0 (0)	0.004†
Ad hoc complete PCI	49 (19.0)	42 (19.8)	7 (15.2)	0.471†
Ad hoc incomplete PCI	28 (10.9)	24 (11.3)	4 (8.7)	0.604†
Stent used	109 (42.2)	98 (46.2)	11 (23.9)	0.005†
Total length of stent	56.2 ± 27.5	52.9 ± 25.8	85.4 ± 25.8	<0.001*
Diameter of stent	2.9 ± 0.3	2.9 ± 0.3	2.8 ± 0.3	0.515*
Number of stent	1.9 ± 0.8	1.8 ± 0.7	2.9 ± 0.7	<0.001*

Data were expressed as frequency (%) or mean ± SD; CTO: Chronic total occlusion; PCI: Percutaneous coronary intervention; coronary artery bypass grafting; *Independent sample t test; †Chi-square test

Results of the multivariate analysis using the 5 potential predictors of not identifiable culprit lesion with significant at $p \leq 0.10$ in the univariate analysis is shown in Table III. The presence of three-vessel disease and calcification were associated with inability to identify the culprit lesion (Table 3).

Table 3: Multivariate logistic regression analysis of prognostic factors for culprit lesion not identifiable by angiography

Variables	B	OR	95% CI for OR		P value
			Lower	Upper	
Triple vessel disease	0.653	1.921	1.012	4.138	0.046
Bifurcation lesion	0.126	1.134	0.522	2.467	0.750
Calcification	1.015	2.758	1.023	7.437	0.045
Left main lesion	0.462	1.587	0.713	3.530	0.258
Chronic total occlusion lesion	0.737	2.089	0.930	4.691	0.074

OR: Odds ratio; CI: Confidence interval.

Culprit lesion was located in the left anterior descending (LAD) in 103 (48.6%), in right coronary artery (RCA) in 39 (18.4%), in left circumflex artery (LCX) in 30 (14.2%), in first diagonal artery in 8 (3.8%), in first obtuse marginal artery in 8 (3.8%), in left main (LM) in 7 (3.3%), in posterior left ventricular in 7 (3.3%), in Posterior descending artery in 7 (3.3%) and in ramus intermediate, second obtuse marginal and second diagonal artery in 1 (0.5%) patients each. The sensitivity of ECG to detect culprit lesions ranged from 0% to 69.2% (Table 4). ECG changes correlated more in RCA (69.2%), left main (57.1%) and LAD (49.5%) culprit lesion.

Table 4: Location and of the culprit lesion and sensitivity of ECG to detect culprit lesions (n=212)

Name of coronary artery	Total		ECG change correspond to culprit lesion	
	n	%	n	%
Left anterior descending	103	48.6	51	49.5
Right coronary artery	39	18.4	27	69.2
Left circumflex artery	30	14.2	0	30.0
First diagonal artery	8	3.8	2	25.0
First obtuse marginal	8	3.8	0	0.0
Left main artery	7	3.3	4	57.1
Posterior left ventricular	7	3.3	0	0.0
Posterior descending artery	7	3.3	1	14.3
Second obtuse marginal	1	0.5	0	0.0
Second diagonal artery	1	0.5	0	0.0
Ramus intermediate	1	0.5	0	0.0

Discussion

The present study was one of the very few studies specifically evaluating culprit lesion identification in patients presenting with NSTEMI in the setting of MVD. The main findings of the study revealed that culprit lesion was not identified by angiography in about 17.8% of patients with NSTEMI and MVD, higher lesion complexity was associated with inability to identify the culprit, and ECG showed low sensitivity in the detection of culprit lesions. Culprit lesion identification can be challenging in patients with NSTEMI, with unclear culprit by angiography in up to one third of the cases and in particular in presence of MVD.[8,13] However, our findings were in line with a recent study, where the culprit lesion identification was relatively high (86%) compared with previous investigations.[10]

In our series lesion complexity including calcification and bifurcations made culprit lesion detection less evident, which agreed with the previous findings of Balbi et al.[10] Hypothetically, lesion complexity may mask unstable features especially in the absence of thrombus formation. Furthermore, patients with no clear culprit lesion required more stents, longer stent length, and smaller stent diameter in our series.

In patients with NSTEMI and MVD, the correlation between ECG and culprit location is less clear. The predictive value of the ECG to identify the culprit artery has not been systematically assessed in NSTEMI, moreover, previous studies showed normal ECG in a considerable percentage of patients ranging between 15% and 39%.[13-15] In our study, ECG had a low sensitivity (range 0%–69.2%) to detect the culprit artery. These findings are in line with previous studies that showed low sensitivity (30–90%) and good specificity (70–100%) in ACS.[10,14,16] Severe 3-vessel disease may be associated with diffuse ST depression, and wide QRS complex. ECG is a moderately sensitive but highly specific parameter in predicting LAD, LCX, RCA and LM/TVD as culprit vessels in NSTEMI. Double territory ECG changes have a poor association in predicting culprit vesse[l.9]

Limitations

This was a single center cross-sectional study with its inherent limitations of selection bias. ECG was recorded on admission and not necessarily during chest pain. Due to resource limitations, it was not possible to use other additional strategies like invasive imaging to enhance the diagnostic accuracy of culprit lesion detection.

Conclusion

From the findings of the study, it may be concluded that the culprit lesion appeared unclear by coronary angiography in 17.8% of patients with NSTEMI and MVD. Higher lesion complexity including the presence of three-vessel disease and calcification in associated with inability to identify culprit lesion. Mean number of stents and average stent length was also significantly higher in patients without culprit lesion identified than their counterpart. Electrocardiographic changes were not sensitive for culprit lesion detection. ECG changes correlated more when culprit lesion was located in RCA, left main or LAD territory. Whether culprit lesion helps to determine treatment strategy and affect clinical outcome in patients with NSTEMI and MVD requires further study in appropriately powered prospective (randomized) trials.

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Original Article

Association of Socio-demographic and Lifestyle Factors with Metabolic Syndrome: A Cross-Sectional Study in Urban Setting

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Abstract

Background: Bangladesh, undergoing an epidemiological transition highlighted by the Global Burden of Disease study, faces a considerable Non-Communicable Diseases (NCDs) burden, with Metabolic Syndrome (MetS) being a prominent contributor, accounting for 70% of total mortality in 2019. Urban environments are dynamic settings where lifestyle factors intertwine with socio-demographic variables, influencing health outcomes. This study aimed to ascertain the prevalence of MetS and explore associated socio-demographic and lifestyle factors in an urban setting of Bangladesh.

Methods: A cross-sectional study was conducted from July 2010 to June 2011 among residents of three government residential facilities in the Mirpur area of Dhaka city. A total of 347 participants of both sexes, aged between 30 and 74 years were selected by purposive sampling method. Information on socio-demographic, lifestyle, and medical history were collected by a pre-tested questionnaire. Additionally, anthropometric measurements were taken and blood pressure was measured. Fasting blood samples were collected to assess lipid profile and blood sugar from the extracted serum and plasma. MetS was defined according to the National Cholesterol Education Program's Adult Treatment Panel III (ATP III) and International Diabetes Federation (IDF) criteria.

Results: The overall prevalence of MetS was 43.2% (95% CI: 38.1-48.5) based on ATP III criteria and 42.9% (95% CI: 37.8-48.2) based on IDF criteria. Bivariate analysis demonstrated significant associations between MetS, as defined by IDF criteria, and age groups ($p<0.007$), gender ($p<0.001$), employment status ($p<0.001$), and BMI ($p<0.001$). Similarly, when defined by ATP III criteria, MetS had significant associations with employment ($p<0.005$) and BMI ($p<0.001$). Multivariate logistic regression indicated higher odds of MetS, defined by IDF criteria, among the 40-49 age group (AOR=2.5, 95% CI: 1.4-4.4), while for MetS defined by ATP III criteria, the 50-59 age group had higher odds (AOR=2.1, 95% CI: 1.0-4.1). MetS, defined by both criteria, had lower odds among the employed group (AOR=0.4, 95% CI: 0.2-0.9). Additionally, obesity exhibited the highest odds, particularly for MetS defined by IDF criteria (AOR=6.2, 95% CI: 2.5-15.1).

Conclusions: These findings lay the foundation for a comprehensive exploration of the intricate interplay between demographic characteristics, lifestyle factors, and metabolic syndrome in an urban setting.

Keywords: Metabolic syndrome, socio-demographic factors, lifestyle factors, urban, Bangladesh

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Introduction

Over the past three decades, global disease patterns have undergone notable transformations, marked by a surge in the prevalence of Non-Communicable Diseases (NCDs).[1] Metabolic Syndrome (MetS), characterized by abdominal obesity, insulin resistance, hypertension, and hyperlipidemia, has experienced a worldwide increase, impacting approximately 20-25% of the global population.[2] Particularly in South Asian countries such as India, Nepal, Pakistan, Sri Lanka, and Bangladesh, escalating rates of obesity, sedentary lifestyles, and dietary changes have contributed to a high MetS prevalence ranging from 20.7% to 35.5%.[3] Bangladesh, undergoing an epidemiological transition highlighted by the Global Burden of Disease study, faces a considerable NCDs burden, with MetS being a prominent contributor, accounting for 70% of total mortality in 2019.[4,5] The risk conferred by MetS extends beyond cardiovascular diseases and type 2 diabetes, encompassing an elevated risk of all-cause mortality.[6]

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In 2001, the National Cholesterol Education Program Adult Treatment Panel III (NCEP) laid the foundation for defining MetS, a framework later refined in 2005 by the American Heart Association/National Heart, Lung, and Blood Institute (Modified NCEP) and the International Diabetes Federation (IDF).[6-8] Despite these efforts, discrepancies in prevalence estimates persist due to the multitude of definitions, prompting the Joint Interim Statement (JIS) to seek harmonization.[9] Individuals with MetS face a five-fold increased risk of type 2 diabetes and a two-fold risk of cardiovascular diseases over the next 5 to 10 years, along with an elevated risk of stroke, myocardial infarction, and mortality.[10] Identifying and assessing those at risk of MetS becomes crucial for informing preventive actions.[11]

Urban environments are dynamic settings where lifestyle factors intertwine with socio-demographic variables, influencing health outcomes.[12] In Dhaka, where rapid urbanization is transforming traditional patterns of living, investigating the nexus between these factors and MetS becomes pivotal. The diverse socio-demographic landscape of Dhaka, encompassing variations in age, gender, education, occupation, and marital status, offers a unique opportunity to discern patterns and identify vulnerable subpopulations. In this regard our study focuses on the urban Mirpur population, aiming to ascertain the prevalence of metabolic syndrome based on both ATP III and IDF criteria, and explore associated socio-demographic and lifestyle factors. The findings are anticipated to enrich the existing body of knowledge, informing evidence-based public health initiatives aimed at mitigating the impact of MetS in rapidly urbanizing contexts.

Methodology

Study design, setting and participants

This cross-sectional population-based study was conducted from July 2010 to June 2011 in three government colonies located in the Mirpur area of Dhaka city. These colonies serve as residential areas for numerous families of government service holders from various districts. A total of 347 participants, encompassing both sexes and aged between 30 and 74 years, were recruited for the study by purposive sampling. Participants were residents of the flats who adhered to the study instructions, including a requirement for a 12-hour overnight fasting period.

Exclusions from the study comprised pregnant women and individuals with known cardiovascular disease (CVD) cases. Field assistants approached potential participants and obtained informed consent. Interviews and measurements were conducted at the household level. Each participant received a referral card and was requested to visit the Bangladesh Institute of Health Sciences (BIHS) hospital for blood sample collection on a pre-arranged date after a 12-hour overnight fast. Emphasis was placed on the importance of adhering to the fasting state for a minimum of 12 hours before the blood sample collection during the data collection phase. The methodology also described in another published article from this dataset.[13]

This approach ensured standardized conditions for assessing metabolic parameters and contributed to the overall reliability and validity of the study results.

Interview

Participants underwent face-to-face interviews, during which they provided general information and lifestyle data through a pre-tested questionnaire. The entire interview process, which included obtaining informed consent, blood pressure measurement, and collecting general baseline data, lasted a maximum of 30 to 40 minutes. During the interview, participants were queried about their smoking status and alcohol consumption. Additionally, participants were asked to provide information about their medical history, specifically regarding conditions such as diabetes and hypertension. The comprehensive nature of the interview allowed for a holistic understanding of both lifestyle factors and pre-existing health conditions, contributing to a more nuanced analysis of the data.

Anthropometric measurements

Weight, measured with a daily-calibrated digital weighing machine (TANITA LOT No. 890919), required participants to stand motionless with equal weight distribution on both legs and removal of shoes and excess clothing, with measurements recorded to the nearest 0.1 kg. Height was measured with a locally prepared wooden stadiometer to the nearest 0.1cm, ensuring participants stood in a specified posture with shoes off. Waist circumference was measured mid-way between the lowest rib margin and iliac crest, with participants standing erect, breathing normally, and measurements taken after expiration, recorded to the nearest centimeter. Hip circumference, measured at the level of the greatest protrusion of the gluteal muscles, involved participants standing with even weight distribution and legs slightly apart, with measurements also recorded to the nearest centimeter.

Blood pressure measurements

Blood pressure measurements were conducted with participants in a seated position, ensuring that the calf was positioned at the level of the heart. Following a 10-minute rest period, a second and third reading were taken. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were determined by noting Korotkoff sounds I (the first sound) and V (the disappearance of sound), respectively, in accordance with WHO-ISH guidelines, measured in millimeters of mercury (mmHg). The average of the second and third readings was calculated for blood pressure assessment.

Blood sample collection

On the pre-scheduled date and time at the laboratory of Bangladesh Institute of Health Sciences (BIHS), the participant's fasting state was confirmed, and 5cc of venous blood

was collected with aseptic precautions. After 20 minutes, the blood samples underwent centrifugation for 10 minutes at 6000 rpm to separate plasma and serum. The obtained plasma and serum were then preserved in a freezer at -27°C for future biochemical analysis. This meticulous process ensures the integrity of the biological samples and facilitates accurate biochemical assessments in subsequent analyses.

Laboratory Assays

The Biomedical Research Group (BMRG) at the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine, and Metabolic Disorders (BIRDEM) conducted the analysis of fasting, along with triglycerides and HDL cholesterol. For glucose measurements, the Glucose Oxidase (GOD-PAP) method (Randox Laboratories Ltd., UK), was employed. Serum triglyceride levels were estimated using an enzymatic colorimetric method (GOD-PAP) with reagents (Randox Laboratories, UK), and serum high-density lipoprotein (HDL-C) levels were measured using an enzymatic colorimetric method (cholesterol CHOD-PAP) (RANDOX Laboratories, UK). All biochemical estimations were performed on a Hitachi 704 autoanalyzer, ensuring standardized and precise results.

Data quality checking and processing

Following collection, the data underwent rigorous scrutiny for consistency and completeness. An initial check was performed on the day of collection to identify and rectify any errors, inconsistencies, or incompleteness. Subsequently, the data was entered into Microsoft Excel, categorized, and coded for accuracy and facilitate comprehensive analysis.

Outcome variable

Metabolic syndrome (NCEP ATP III criteria)[6,14]

Diagnosing MetS, as per NCEP ATP III criteria, involved identifying abdominal obesity through increased waist circumference, elevated triglycerides, decreased HDL, high blood pressure, and elevated plasma glucose. In this context, an individual was considered to have MetS if they exhibited any three of the following conditions:

1. Blood Pressure (BP): Systolic ≥130 mmHg or diastolic ≥85 mmHg or currently taking antihypertensive medication.
2. Fasting Blood Glucose (FBG): ≥100 mg/dl or currently taking medication.
3. Serum Triglycerides: ≥150 mg/dl or currently taking medication.
4. HDL cholesterol: <40 mg/dl (Male), <50 mg/dl (Female) or currently taking medication.
5. Waist circumference: >102 cm (Male), >88 cm (Female).

Metabolic syndrome [IDF criteria][8,14]

According to the IDF definition, individuals were classified as having MetS if they exhibited central adiposity along with two or more additional factors. In this context, the criteria included a waist circumference of ≥90 cm (Male) or ≥80 cm (Female), in addition to any two of the following four conditions:

1. Blood Pressure (BP): Systolic ≥130 mmHg or diastolic ≥85 mmHg or currently taking antihypertensive medication.
2. Fasting Blood Glucose (FBG): ≥100 mg/dl or currently taking medication.
3. Serum Triglycerides: ≥150 mg/dl or currently taking medication.
4. HDL cholesterol: <40 mg/dl (Male), <50 mg/dl (Female) or currently taking medication.

Statistical methods

The study employed statistical methods to analyze the proportional distributions of metabolic syndrome based on both ATP III and IDF criteria across various socio-demographic and lifestyle characteristics. Chi-square tests were utilized for categorical variables, examining associations with age, gender, education, employment, marital status, smoking habits, chewing tobacco, dietary patterns, physical activity, and body mass index. To assess the strength of association, multivariate logistic regression analysis was conducted, reporting odds ratios (OR) while adjusting for potential confounders. Results were presented as proportions with 95% confidence intervals, and statistical significance was set at $p<0.05$. These rigorous analyses were performed using STATA 17, aiming to provide a comprehensive understanding of the intricate relationships between demographic and lifestyle factors influencing metabolic syndrome within the urban population.

Ethical consideration

Study obtained ethical clearance from the Institutional Review Board of Bangladesh Institute of Health Sciences (BIHS). Before the interview and blood sample collection each participant provided informed written consent. Additionally, prior to commencing household visits, permission was obtained from the local committee of each colony block.

Results

Distributions of metabolic syndrome (MetS) across various socio-demographic characteristics in the urban Mirpur population of Dhaka, using both ATP III and IDF criteria are shown in Table 1. The overall prevalence of MetS was 43.2% (95% CI: 38.1-48.5) based on ATP III criteria and 42.9% (95% CI: 37.8-48.2) based on IDF criteria. When examining age groups, no significant differences were observed overall ($p=0.315$) under ATP III criteria. However, the 40-49 age group showed a notably higher proportion based on IDF criteria (43.6%, $p<0.007$). Gender differences were statistically significant, with females exhibiting a significantly higher proportion compared to males under both criteria (ATP III: 65.3%, IDF: 73.2%, $p=0.060$ and $p<0.001$, respectively). Educational attainment did not show significant associations overall. In terms of occupation, a significant difference emerged ($p<0.005$ and $p<0.001$)

between the unemployed and employed groups. Specifically, the proportion of MetS was higher among the unemployed (ATP III: 61.3%, IDF: 67.1%) compared to the employed group. Marital status did not display significant associations with MetS. These findings underscore the socio-demographic variations in the prevalence of MetS in the Mirpur urban population, emphasizing the notable influence of gender and occupational status on the observed patterns.

Table 1: Proportional distribution of metabolic syndrome stratified by socio-demographic characteristics

Variables	n (%)	ATP III Criteria n (%)	p-value	IDF Criteria n (%)	p-value
Overall		43.2 (95% CI: 38.1-48.5)		42.9 (95% CI: 37.8-48.2)	
Age groups					
30-39	154 (44.4)	40.0	p=0.315	36.9	p<0.007
40-49	116 (33.4)	33.3		43.6	
50-59	62 (17.9)	21.3		16.1	
≥60	15 (4.3)	5.4		3.4	
Gender					
Male	140 (40.3)	34.7	p=0.060	26.8	p<0.001
Female	207 (59.7)	65.3		73.2	
Education					
Primary	47 (13.5)	16.7	p=0.287	18.1	p=0.079
SSC	136 (39.2)	39.3		38.9	
HSC & above	164 (47.3)	44.0		42.9	
Employment					
Unemployed	182 (52.4)	92 (61.3)	p<0.005	100 (67.1)	p<0.001
Employed	165 (47.5)	58 (38.7)		49 (32.9)	
Marital status					
Unmarried	25 (7.2)	10 (6.7)	p=0.735	10 (6.7)	p=0.758
Married	322 (92.8)	140 (93.3)		139 (93.3)	

n = Sample size, % = percentage, 95% CI = 95% confidence interval
p<0.05= Significance level obtained by Pearson chi-square test

Table 2 presents the proportional distribution of MetS stratified by lifestyle characteristics in the urban Mirpur population of Dhaka, assessed using both ATP III and IDF criteria. For smoking habits, no significant association was observed overall, but under IDF criteria, a significant difference emerged (p<0.02). Specifically, individuals who never smoked exhibited a higher proportion of MetS (85.9%). Chewing tobacco did not demonstrate overall significant association. Insufficient fruit and vegetable intake showed no significant association with metabolic syndrome. Physical activity levels did not exhibit an overall significant association; however, individuals with an inactive lifestyle demonstrated a slightly higher proportion of MetS under both criteria. Waist-hip ratio exhibited a significant association with MetS under IDF criteria (p<0.041), indicating a higher proportion in individuals with an elevated waist-hip ratio (79.9%). Body Mass Index (BMI) categories displayed significant associations under both ATP III and IDF criteria (p<0.001). Specifically, individuals classified as overweight or obese showed a significantly higher proportion of MetS (ATP III: 40.0%, IDF: 45.6%). These findings underscore the importance of smoking habits, BMI, and waist-hip ratio in understanding the prevalence of MetS in the Mirpur urban population, emphasizing the need for lifestyle modifications in targeted public health interventions.

Table 2: Proportional distribution of metabolic syndrome stratified by life-style characteristics

Variables	n (%)	ATP III Criteria n (%)	p-value	IDF Criteria n (%)	p-value
Smoking					
Never	273 (78.7)	118 (78.7)	p=0.898	128 (85.9)	p<0.02
Current	64 (18.4)	27 (18.0)		18 (12.1)	
Past	10 (2.3)	5 (3.3)		3 (2.0)	
Chewing tobacco					
Never	304 (87.6)	126 (84.0)	p=0.075	127 (85.2)	p=0.244
Current/past	43 (12.4)	24 (16.0)		22 (14.8)	
Insufficient fruits and vegetable					
Yes	253 (72.9)	113 (75.3)	p=0.376	106 (71.1)	p=0.520
No	94 (27.1)	37 (24.7)		43 (28.9)	
Physical activity					
Inactive	152 (43.8)	66 (44.0)	p=0.949	62 (41.6)	p=0.475
Active	195 (56.2)	84 (56.0)		87 (58.4)	
BMI categories					
Normal/Under weight	192 (55.3)	67 (44.7)	p<0.001	55 (36.9)	p<0.001
Overweight	121 (34.9)	60 (40.0)		68 (45.6)	
Obese	34 (9.8)	23 (15.3)		26 (17.5)	

n = Sample size, % = percentage, 95% CI = 95% confidence interval
p<0.05= Significance level obtained by Pearson chi-square test

In the multivariate analysis (AOR) (Table 3), several key findings emerged. Notably, the age group of 40-49 exhibited a significantly higher odds ratio for MetS under IDF criteria, with adjusted odds ratios (AOR) of 2.5 (95% CI: 1.4-4.4). Similarly, under ATP III criteria, the age group 50-59 showed higher odds (AOR=2.1, 95% CI: 1.0-4.1) for metabolic syndrome. Additionally, employment status was associated with a lower risk, as employed individuals exhibited decreased odds of MetS (AOR=0.4, 95% CI: 0.2-0.9) based on both criteria.

Furthermore, lifestyle factors such as smoking and chewing tobacco did not show adjusted significant association. Similarly, we did not find association between insufficient fruits and vegetable intake, physical activity and MetS. Notably, BMI categories were strong indicators of MetS, with participants classified as obese exhibiting the highest odds, particularly under IDF criteria (AOR=6.2, 95% CI: 2.5-15.1). These findings highlight the multifactorial nature of metabolic syndrome and underscore the importance of addressing both demographic and lifestyle factors in its prevention and management.

Table 3: Univariate and multivariate analyses showing the factors associated with metabolic syndrome (n=347)

Variables	ATP III Criteria		IDF Criteria	
	COR (95% CI)	AOR **(95% CI)**	**COR (95% CI)**	AOR **(95% CI)**
Age groups				
30-39	**Ref**	**Ref**	**Ref**	**Ref**
40-49	1.2 (0.7-1.9)	1.1 (0.6-1.9)	**2.3 (1.4-3.7)**	**2.5 (1.4-4.4)**
50-59	1.7 (0.9-3.0)	**2.1 (1.0-4.1)**	1.1 (0.6-2.1)	1.8 (0.9-3.9)
≥60	1.8 (0.6-5.2)	1.8 (0.5-6.4)	0.9 (0.3-2.8)	0.9 (0.2-4.2)
Gender				
Male	**Ref**	**Ref**	**Ref**	**Ref**
Female	1.5 (1.0-2.3	1.1 (0.5-2.6)	**2.8 (1.8-4.4)**	1.7 (0.7-4.2)
Education				
Primary	**Ref**	**Ref**	**Ref**	**Ref**
SSC	0.7 (0.3-1.3)	1.0 (0.5-2.1)	0.6 (0.3-1.1)	0.7 (0.3-1.6)
HSC & above	0.6 (0.3-1.13	1.2 (0.5-2.7)	**0.5 (0.2-0.9)**	1.2 (0.5-2.9)
Employment				
Unemployed	**Ref**	**Ref**	**Ref**	**Ref**
Employed	**0.5 (0.3-0.8)**	**0.4 (0.2-0.9)**	**0.3 (0.2-0.5)**	**0.4 (0.2-0.9)**
Marital status				
Unmarried	**Ref**	**Ref**	**Ref**	**Ref**
Married	1.2 (0.5-2.6)	1.2 (0.5-3.1)	1.1 (0.5-2.6)	0.9 (0.4-2.4)
Smoking				
Never	**Ref**	**Ref**	**Ref**	**Ref**
Current	0.9 (0.5-1.7)	1.8 (0.9-3.9)	**0.4 (0.2-0.8)**	1.1 (0.5-2.6)
Past	1.3 (0.4-4.6)	1.3 (0.3-5.5)	0.5 (0.1-1.9)	1.0 (0.2-5.3)
Chewing tobacco				
Never	**Ref**	**Ref**	**Ref**	**Ref**
Current/past	1.8 (0.9-3.4)	1.7 (0.8 (3.6)	1.5 (0.8-2.8)	1.4 (0.6-3.1)
Insufficient fruits and vegetable				
Yes	**Ref**	**Ref**	**Ref**	**Ref**
No	0.8 (0.5-1.3)	0.7 (0.4-1.1)	1.2 (0.7-1.9)	0.9 (0.5-1.5)

COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio for each other; ATP III: Adult Treatment Panel III; IDF: International Diabetes Federation; Ref: Reference category, Values in bold represent statistically significant results ($p<0.05$)

Discussion

The findings of this cross-sectional study conducted in urban Dhaka yield crucial insights into the prevalence of individuals with metabolic syndrome (MetS) and its association with socio-demographic and lifestyle factors.

The influence of age on MetS was noteworthy, particularly in the 40-49 age group under IDF criteria and 50-59 age group under ATP III criteria, which demonstrated a significantly higher odds ratio. This aligns with previous research highlighting an increased risk of MetS with advancing age.[15] Though gender was significantly associated in the bivariate model under IDF criteria, it became nonsignificant when adjusted in the multivariate model for other cofounders. Many studies often report a higher prevalence of MetS in women[16] but our study did not exhibit such a trend.

Employment status played a crucial role in influencing the risk of metabolic syndrome. Employed individuals exhibited decreased odds for both ATP III and IDF criteria. This finding aligns with existing literature that has often linked unemployment or job insecurity to adverse health outcomes.[17,18] The workplace environment, when supportive and conducive to health, can serve as a facilitator for healthy lifestyle choices and overall well-being. In contrast, our study did not find any significant association between education levels, marital status, and MetS—a deviation from findings in other studies.[19,20] This unexpected result prompts further investigation into the complex interplay of socio-demographic factors in the context of metabolic health.

The study also delved into lifestyle factors, revealing intriguing associations with MetS. We did not find any significant association between smoking, chewing tobacco and MetS which is inconsistent with the previous literature.[21] It prompts further investigation into the potential confounding effects of other variables and the complex interplay between tobacco habits and metabolic health. Additionally, insufficient fruits and vegetable intake and physical activity levels did not exhibit an overall significant association with MetS which also contradicts with other studies[22-14] highlighting the complexity of the relationship between food habit, exercise and metabolic health.

However, BMI categories emerged as robust indicators of metabolic syndrome, consistently showing significant associations under both criteria. Participants classified as obese exhibited the highest odds, particularly under IDF criteria, aligning cohesively with findings from parallel studies.[25] These findings emphasize the importance of central obesity and overall adiposity in the development of MetS. The study contributes valuable evidence supporting the inclusion of waist-hip ratio and BMI assessments in routine screenings for MetS risk.

In conclusion, this cross-sectional study in the urban Mirpur area identified a notably elevated occurrence of metabolic syndrome, with rates of 43.2% and 42.9% according to ATP III and IDF criteria, respectively, showcasing substantial disparities across diverse demographic and lifestyle segments. Noteworthy patterns included higher odds among the 40-49 and 50-59 age groups and employed individuals. Furthermore, the study heightened risk associated with being overweight or obese. These findings lay the foundation for a comprehensive exploration of the intricate interplay between demographic characteristics, lifestyle factors, and metabolic syndrome in the urban setting.

This urban Dhaka cross-sectional study sheds light on significant factors associated with metabolic syndrome. The increased risk observed among middle-aged and older individuals which underscores the need for age sensitive health programs. Employment status emerges as a crucial determinant, emphasizing the potential impact of supportive workplace environments on metabolic health. While associations with smoking, chewing tobacco, insufficient fruit and vegetable intake, and physical activity levels were inconclusive, further research is needed to unravel their complex interplay with metabolic health. Importantly, the consistent correlations between BMI categories and MetS advocate for their incorporation into routine screenings, reinforcing their significance in public health strategies aimed at preventing and managing MetS in urban populations. These insights pave the way for targeted interventions to address the multifaceted determinants of metabolic syndrome in urban contexts.

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Original Article

Prevalence of Hypertension among the Garo Tribe in a Selected Area of Bangladesh

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Abstract

Background: Hypertension is an important public health problem worldwide. Among the general population of Bangladesh one in every five adults were hypertensive according to STEP survey 2018 and one four adults according to STEP survey 2022. In Bangladesh Tribal population consisted about 0.88% of total population and about 1.41 million people reported in the 2001 census. Present study conducted to find out the prevalence of hypertension in Garo tribe, one of the indigenous populations of Bangladesh.

Methods: This cross-sectional study was conducted among the Garo tribe in Jolshatra, Joloi, Gachanbari, and Jangalia union of Modhupur upazilla in Tangail district. A total of 546 respondents aged more than 25 years were randomly selected from their household. Data were collected with a a pre-design questionnaire. Blood pressure was measured by an aneroid sphygmomanometer. Hypertension was defined as blood pressure ≥140/90 mm of Hg and/or on antihypertensive medication. Statistical analysis was done for all relevant variables by using SPSS (version 16; SPSS Inc., Chicago, IL, USA).

Results: Mead±SD of age was 47.1±15.0 years. Among them 264 (48.3%) were male and 282 (51.6%) were female. Among the respondents 13.2% were hypertensive. Among the respondents 42.5% were smokers and 35.7% were smokeless tobacco users and 61.0% had the habit of regular alcohol intake. The mean age is significantly different between the respondents with hypertension and without hypertension (50.6±15.7 vs 46.6±14.8 years, $p < 0.05$). Other factors like gender, smoking status, smokeless tobacco use, combined tobacco use of both forms, and alcohol consumption did not show any significant difference between with and without hypertension in this population.

Conclusion: The present study found one in every eight adults in the Garo population aged 25 years and above were hypertensive. High prevalence of cardiovascular risk factors such as alcohol consumption, smoking and smokeless tobacco need to be addressed and comprehensive behavioral motivation campaign may prevent NCDs in this population.

Keywords: Hypertension, NCD Risk factors, Indigenous population, Garo tribe.

(JNHFB 2023; 12 : 104-107)

Introduction

Hypertension is an important public health problem worldwide.[1-8] Report on the global burden of hypertension indicates that nearly 1 billion adults had hypertension in 2000, and this is predicted to increase to 1.56 billion by 2025.[5,9]

The Bangladeshi population is relatively homogeneous and consists of about 98% ethnic Bengali as well as various tribal groups. There are about 45 distinct indigenous communities in Bangladesh. The Population Census of 1991 puts tribal/indigenous population at around 1.21 million, and the current estimate is around 2 million. The largest concentration is in the Chittagong Hill Tracts but other areas in which these communities live include Chittagong, greater Mymensingh, greater Rajshahi, greater Sylhet, Patuakhali and Barguna. Chakma, Garo, Manipuri, Marma, Munda, Oraon, Santal, Khasi, Kuki, Tripura, Mro, Hajong and Rakhain are some of the well-known adivasi/ethnic minority communities of Bangladesh.[10] Most of the tribal population lived in rural areas where many practiced shifting cultivations. With a distinctive Mongoloid feature, they differ in their social organization, food, language (speaks Tibeto-Burman), marriage and other social customs from the people of the rest of the country.

High blood pressure, cigarette smoking, diabetes mellitus, and lipid abnormalities are major modifiable risk factors for cardiovascular disease.[11] Among these, high BP is associated with the strongest evidence for causation and one of the most important risk factors for cardiovascular disease (CVD), which is the leading cause of mortality and has a high prevalence of exposure.[11-14] Person with hypertension is known to have a two-fold higher risk of developing coronary artery disease, four times higher risk of congestive

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heart failure and seven times higher risk of cerebrovascular disease and stroke compared to normotensive subjects.[15] Approximately 54% of strokes and 47% of coronary heart diseases, worldwide, are attributable to high BP.[6,12]

Reliable, large-scale, population-based data on hypertension for Bangladeshi indigenous populations are limited thus this study will enrich our knowledge about hypertension among the Garo Trible live in Tangail district of Bangladesh.

Materials and Methods

This was a cross sectional study conducted in January to June 2013 in four unions (Jolshatra, Joloi, Gachanbari, Jangalia) in Modhupur Upzilla, Tangail. One respondent male or female from each household was selected by simple random sampling method for face-to-face interview and samples were selected by using. Written consent obtained from every respondent. Total 546 respondents (264 male and 282 female) aged 25 years and above were selected as study participants. A predesign semi structured questionnaire was used for data collection, and after being checked for discrepancies, data was put into explanatory form using the statistical computer program SPSS version 16 under window program. The subject's privacy and confidentiality were maintained with data risk management strategies, use of code rather than the subject's name, limited access of research data and secure program files in the computer. Blood pressure was measured by an aneroid sphygmomanometer. Hypertension is defined as having systolic blood pressure ≥140 mm of Hg and/or diastolic blood pressure ≥90 mm of Hg or on anti-hypertensive medication.

Results

Mead±SD of age was 47.1±15.0 years. Among the respondents 264 (48.3%) were male and 282 (51.6%) were female. Among them 21.2%, 27.5%, 24.0%, 14.1% and 13.2% were in the age group of ≤34, 35-44, 45-54, 55-64 and ≥65 years respectively (Table 1). Mean (95% CI) of systolic and diastolic blood pressure of 1st reading were 119.3 (118.0-120.7) and 72.5 (71.5-73.4) mm of Hg respectively and 2nd reading were 117.5 (116.1-118.8) and 71.7 (70.8-72.7) mm of Hg respectively. Mean (95% CI) of both readings of systolic and diastolic blood pressure were 118.4 (117.1-119.8) and 72.1 (71.2-73.0) mm of Hg respectively (Table 2).

Systolic blood pressure ≤139 and ≥140 mm of Hg was 91.2% and 8.8% respectively and the diastolic blood pressure ≤89 and ≥90 mm of Hg was 90.1% and 8.1% respectively and among the respondents 13.2% had hypertension (Table 3). Among the respondents, 42.5% were smokers and 35.7% were smokeless tobacco users and 61.0% had the habit of drinking alcohol (Table 4).

The mean±SD of age of respondents with hypertension was 50.6±15.7 years compared to that of respondents without hypertension was 46.6±14.8 years. This difference is statistically significant ($p < 0.05$). In contrast, gender, smoking status, smokeless tobacco use, combined tobacco use of both form, and alcohol consumption no statistically significant differences between with and without hypertension (Table 5).

Table 1: Distribution of the respondents by gender and age group (n=546)

Variables	Frequency	Percentage
Gender		
Male	264	48.4
Female	282	51.6
Age Groups (yrs)		
≤34	116	21.2
35-44	150	27.5
45-54	131	24.0
55-64	77	14.1
≥65	72	13.2
Mean ± SD (25-104)	47.1 ± 15.0	

Table 2: Distribution of the respondents by measurement of blood pressure (n=546)

Variable	BP (mm of Hg)	Mean (95% CI)
1st reading	Systolic	119.3 (118.0-120.7)
	Diastolic	72.5 (71.5-73.4)
2nd reading	Systolic	117.5 (116.1-118.8)
	Diastolic	71.7 (70.8-72.7)
Mean of 1st & 2nd reading	Systolic	118.4 (117.1-119.8)
	Diastolic	72.1 (71.2-73.0)

BP: Blood pressure

Table 3: Distribution of the respondents by systolic and diastolic blood (n=546)

Variables	Frequency	Percentage
Blood pressure		
Systolic Blood Pressure		
• *≤139 (mm of Hg)*	498	91.2
• *≥140 (mm of Hg)*	48	8.8
Diastolic Blood Pressure		
• *≤89 (mm of Hg)*	502	91.9
• *≥90 (mm of Hg)*	44	8.1
Hypertension (BP≥140 and or 90 or on medication)	72	13.2

Table 4: Distribution of tobacco use and alcohol consumption status of the respondent (n=546)

Variables	Frequency	Percentage
Smoking tobacco users	232	42.5
Smokeless tobacco users	195	35.7
Alcohol consumption	333	61.0

Table 5: Distribution of the respondents according to demographic and risk factors of hypertension (n=546)

	No HTN	HTN	p value
Gender			0.069
○ Male	222 (84.1)	42 (15.9)	
○ Female	252 (89.4)	30 (10.6)	
Age (year)			0.036
○ Mean ± SD	46.6 ± 14.8	50.6 ± 15.7	
Smoking status			0.260
○ Smoker	197 (84.9)	35 (15.1)	
○ Non-smoker	277 (88.2)	37 (11.8)	
Smokeless tobacco			0.850
○ User	170 (87.2)	25 (12.8)	
○ Not-user	304 (86.6)	47 (13.4)	
Any type (smoke or smokeless)			0.369
○ Yes	324 (85.9)	53 (14.1)	
○ No	150 (88.8)	19 (11.2)	
Both (smoke and smokeless)			0.369
○ Yes	150 (88.8)	19 (11.2)	
○ No	324 (85.9)	53 (14.1)	
Alcohol consumption			0.289
○ Yes	285 (85.6)	48 (14.4)	
○ No	189 (88.7)	24 (11.3)	

HTN: Hypertension (BP≥140/90 and/or Medication)

Discussion

Present study addresses the prevalence of hypertension and several cardiovascular risk factors in one of the largest indigenous tribe, Garo Tribe in Bangladesh. Among the respondents, 264 (48.3%) were men and 282(51.6%) were women. Mead±SD of age was 47.1±15.0 years. Highest number of respondents in the age group of 35-44 years was 27.5% followed by 45-54, ≤34, 55-64 and ≥65 was 24.0%, 21.2%, 14.1% and 13.9% respectively (Table 1).

Mean (95% CI) of systolic and diastolic blood pressure of 1st reading were 119.3 (118.0-120.7) and 72.5 (71.5-73.4) mm of Hg respectively and 2nd reading were 117.5 (116.1-118.8) and 71.7 (70.8-72.7) mm of Hg respectively. Mean (95% CI) of both readings of systolic and diastolic blood pressure were 118.4 (117.1-119.8) and 72.1 (71.2-73.0) mm of Hg respectively (Table 2). Systolic blood pressure ≤139 and ≥140 mm of Hg was 91.2% and 8.8% respectively and the diastolic blood pressure ≤89 and ≥90 mm of Hg were 90.1% and 8.1% respectively by aneroid blood pressure machine. Among the respondents 13.2% had hypertension, blood pressure ≥140 and/or ≥90 or have had history of taking anti-hypertensive drug (Table 3). Among the study population 72 (13.2%) were hypertensive who have blood pressure ≥140 and/or ≥90 or have had history of taking anti-hypertensive drug. According to 2018 and 2022 National STEPS Survey of NCD Risk Factors in Bangladesh, 21% and 24% of adult respectively aged ≥18 years have hypertension.[16,17] Hypertension among the Bangladeshi population much higher than the indigenous population of Bangladesh. But prevalence reported by Wang et al. (2007)[18] in their study reported among Torres Strait Islander males was 34.1%, Aboriginal males 26.9%, Torres Strait Islander females 12.6% and Aboriginal females 13.0%. In 2011–13, Australian Bureau of Statistics[19] reported that one-quarter (25%) of Indigenous adults had high blood pressure, a higher rate than that for non-Indigenous adults (21%). They also reported that less than 7% of Indigenous people aged 18–24 had high blood pressure, increasing to more than one-third (36%) of Indigenous people aged 55 and over, the proportion of Indigenous people with high blood pressure increases by age group.

Among the respondents, 42.5% were smokers and 35.7% were smokeless tobacco users and 61.0% had the habit of drinking alcohol (Table 4). Australian Bureau of Statistics[19] reported that about 38.0% of the combined Aboriginal and Torres Strait Islander population aged 15 and over were daily smokers and they also reported the prevalence of daily smoking for people 18 years and over appeared to be similar among Aboriginal peoples (40.5%) and Torres Strait Islander people (40.6%). The proportion of Aboriginal and Torres Strait Islander peoples aged 15 years and over who smoked every day was about the same for males (39%) and females (36%).

The mean±SD of age of respondents with hypertension was 50.6±15.7 years compared to that of respondents without hypertension was 46.6±14.8 years. This difference is statistically significant ($p < 0.05$). In contrast, variations in sex distribution, smoking status, smokeless tobacco use, combined tobacco use of both form, and alcohol consumption show no statistically significant differences between with and without hypertension (Table 5). Mozaffarian et al. (2015)[20] reported that hypertension has greater prevalence among the elderly. Pinto, (2007)[21], Franklin, (1999)[22] and Borzecki et al. (2003)[23] also reported the higher prevalence of hypertension among the aged population.

Conclusion

This study found prevalence of hypertension among the Garo tribal less than that of Bangladeshi general population. Despite the lower hypertension rate, this tribal group exhibits elevated non-communicable disease risk factors, such as tobacco use and alcohol consumption. Increase awareness regarding hypertension treatment and reduction of risk factors requires comprehensive approach to this underprivileged indigenous communities in Bangladesh.

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Case Report

Out of Hospital Cardiac Arrest: Survival After Primary Percutaneous Coronary Intervention following Prolonged Cardiopulmonary Resuscitation

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Abstract

The decision to perform primary percutaneous coronary intervention (PPCI) in out of hospital cardiac arrest patient after prolonged cardiopulmonary resuscitation (CPR) is a challenging one. Beside the coronaries and cardiac outcome, the main concern is also the uncertainty in predicting prognosis of recovery after anoxic brain damage in a specific patient. We present a unique case of an out of hospital cardiac arrest (OHCA) patient who underwent PPCI after prolonged CPR according to the advanced life support guidelines. Following a long stay in coronary care unit the patient showed improvement with satisfactory neurological outcome and eventually he was successfully discharged.

(JNHFB 2023; 12 : 108-110)

Introduction

Out-of-hospital cardiac arrest is a global public health issue, a life threatening emergency that occurs in approximately 3.8 million people annually. In 2020 the American Heart Association (AHA) updated the total estimated annual burden of Out of Hospital Cardiac Arrest (OHCA)more than 347000 adults.[1] In Europe, more than 350,000 patients are affected every year. Data from e-MUST study in the greater Paris Area showed more than 1 of 20 STEMI presents prehospital sudden cardiac arrest (SCA).[2]

The incidence of OHCA ranges from 28.3 per 100 000 in Asia to 54.6 per 100000 population in North America.[3]

After arrival SCA occurrence is associated with ten-fold higher mortality at hospital discharge compared with STEMI without SCA. PCI is the strongest survival predictor, leading to a twice lower mortality.[4] Ten percent (range, 6%–22%) of people who experience OHCA can expect to survive with a favorable neurological outcome.[5]

Underlying non-perfusing arrhythmia associated with cardiac arrest are divided into two groups: shockable rhythms (ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) and non-shockable rhythms (asystole and pulseless electrical activity (PEA). The first monitored rhythm is ventricular fibrillation/pulseless ventricular tachycardia in approximately 20%, both for in-hospital and out-of-hospital cardiac arrests. VF/pVT is typically due to myocardial ischaemia or primary cardiac disease whereas pulseless electrical activity (PEA) (~50% total) or asystole (~25% total), usually is the result of prolonged hypoxia, hypotension or other severe metabolic derangement from non-cardiac disease.[6] Ventricular fibrillation (VF) and pulseless ventricular tachycardia (pVT) are amenable to defibrillation but deteriorate to non-shockable rhythms over time usually ends in death.[7] Herein we present a case of an OHCA patient who underwent PPCI after prolonged CPR and discharged successfully.

Case presentation

This case presents a 48-year-old gentleman, smoker, non-diabetic and normotensive, who felt chest pain at his workplace and was taken by his colleagues to the nearest clinic. But his chest pain did not subside and his colleagues decided to take him to tertiary cardiac hospital. It took quite a long time to reach the hospital because of heavy traffic. Ten minutes prior to reaching the hospital the patient collapsed. Unfortunately, his colleagues did not know how to provide basic life support. But they hurriedly brought the patient into the emergency department. After arrival at the emergency the patient was found unconscious pulseless with agonizing breathing, CPR initiated immediately by the emergency team. The airway was secured with rapid sequence endotracheal intubation. After 30 minutes of cardiopulmonary resuscitation, the patient had signs of return of spontaneous

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circulation (ROSC) but it did not last long as he developed varying rhythm between VT, VF and PEA. Patient was given six 200 joule of biphasic shock with three doses of adrenaline and 300 mg bolus of intravenous (IV) amiodarone. After 90 minutes of CPR, the patient had ROSC. He was put on inotropic support with IV noradrenaline and dopamine and maintenance dose of amiodarone. He was shifted to coronary care unit where he was put on mechanical ventilation. His ECG after ROSC showed "Shark fin" signs indicating extensive anterior myocardial infarction(Figure A,B). His arterial blood gas (ABG) showed pH: 7.23, PaO2: 79 mm of Hg; PaCo2: 62; lactic acid: 6.2 and base Excess: -6. Bed side Echo revealed left ventricular ejection fraction~35%. The size of the pupul was 5 mm and slightly reacting. The main concern was not only coronaries but also neurological outcomes.

The patient was taken to cath lab for PPCI after three hours from ROSC. The main reason behind for delay was consent. His next of kin (his wife) took time for it. Coronary angiogram showed an occluded proximal left anterior descending (LAD) coronary artery. LCX was also diseased. A drug eluting stent was implanted in culprit lesion (LAD) with good reperfusion (Figure C, D, E & F). The patient was kept in coronary care unit (CCU) with inotrope support and mechanical ventilation. ECG became stable after PPCI (Figure G) He was also commenced on IV antibiotics for suspected aspiration. Therapeutic hypothermia was not used in this patient, but the body temperature was kept in normal range. On the 5th day after admission, the patient was extubated. He maintained good hemodynamics with minimal inotrope support which gradually weaned off. Patient was recovering well with satisfactory improvement of neurological status. He was eventually discharged from hospital on the 12th day of admission.

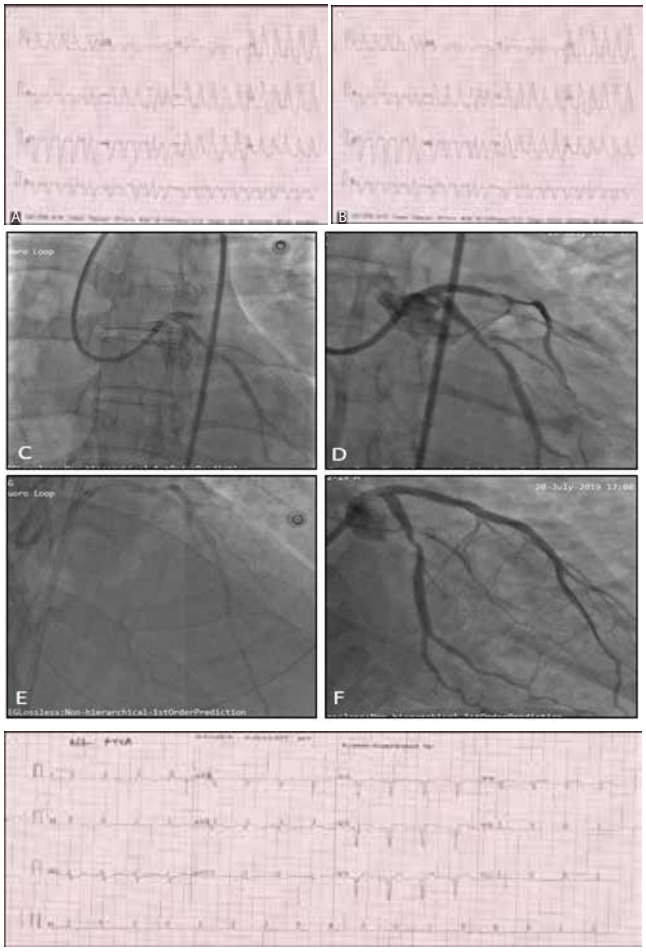

Figure A, B: ECG of the patient after return of spontaneous circulation (ROSC); ("Shark fin" sign). Figure C: culprit lesion in Proximal LAD; LCX has also significant lesion. Figure D: passing of wire through LAD. Figure E: Proximal LAD is stented with DES. Figure F: successful revascularization in LAD. Figure G: ECG showing successful revascularization after primary PCI.

Discussion

Out of hospital cardiac arrest is a major health problem globally. The probability of survival after OHCA can be markedly increased if immediate CPR is provided and an automated external defibrillator (AED) is used.[8,9] The success of resuscitation depends on many factors: well-organized health care, organization of outpatient emergency services, but primarily when it comes to OHCA, education of the population on basic life support, and early Cardiopulmonary resuscitation and use of AED (automated external defibrillator) are important.

Protocols for cardiopulmonary resuscitation that have been used are the guidelines of the European resuscitation Council (ERC) and the American Heart Association (AHA). Starting a survival chain is invaluable and increases the chances of successful resuscitation, with minimal deficits.[10, 11]

The 'chain of survival' concept was approved by the American Heart Association (AHA) in 1990 and is used internationally to describe the series of resuscitation interventions required to restore consciousness or other signs of life in an OHCA patient. It includes four key 'links', namely (i) early recognition of OHCA and immediate activation of the Emergency Medical Services (EMS), (ii) immediate, high-quality CPR, (iii) Rapid defibrillation within minutes of collapse, and (iv) effective advanced EMS and post-resuscitation care. The probability of survival after OHCA can be markedly increased if immediate CPR is provided and an AEDis used. Successful resuscitation is considered to be the return of temporarily lost vital functions, primarily cardiac ROSC.

In high-income countries survival from OHCA has been reported to be between 4.3% and 11%.The incidence of OHCA ranges from 28.3 per 100 000 in Asia to 54.6 per 100 000 population in North America.

In the low to middle income countries the chain of survival for OHCA is not well organized and often death occurs before reaching hospital as victims do not get basic life support. The data are sparse, but show worse survival rate in OHCA where chains of care are immature or absent, and under resourced. A 2020 scoping review on OHCA in low-resource settings reported survival to discharge rates of between 1% and 16.7%, and rates of favourable neurological outcome of between 1% and 9.3%.[5]

Neurological outcome after prolonged cardiac arrest may depend on arrest time, including CPR duration[7]. Major indicators for increased survival rate have not changed: younger age, VF/VT as initial rhythm, witnessed cardiac arrest, by stander CPR, and time lapsed to ROSC, acute myocardial infarction as underlying etiology of cardiac arrest, and low lactate level on admission are also the best predictors of favorable outcome.[7,8]

Neurological outcome is unpredictable in OHCA patients who remain comatose. Targeted temperature management is now being practiced in many countries for satisfactory neurological outcome.[9] But many centers have moved from the concept of mild hypothermia to targeting normothermia, in other words, strict prevention of fever. In ESC guideline temperature control (i.e. continuous monitoring of core temperature and active prevention of fever [i.e. >37.7°C]) is recommended after either out-of-hospital or in-hospital cardiac arrest for adults who remain unresponsive after return of spontaneous circulation.

Patients with ROSC and persistent ST-segment elevation should, in general, undergo a primary percutaneous coronary intervention (PPCI) strategy (immediate coronary angiogram and PCI if indicated), based on the overall clinical situation and a reasonable benefit/risk ratio. A PPCI strategy is recommended in patients with resuscitated cardiac arrest and an ECG with persistent ST-segment elevation (or equivalents).[4]

In this case the patient was brought in by bystanders(his colleagues). Cardiac arrest was witnessed but he did not get basic life support before reaching hospital. Important points in the management of this patient in emergency department: the importance of the chain of survival—CPR done by Emergency Medical team immediately after the arrival of collapsed patient, persistent CPR despite refractory VF, early defibrillation, rapid sequence intubation of the patient ensuring oxygenation, continuing advanced cardiac life support followed by excellent PCI treatments after ROSC and continuing critical care management.

The outcome from this case was clearly unexpected given the patient had prolonged nature of resuscitation, particularly given the significant morbidity and mortality associated with OHCA. There were numerous favourable factors for survival in this case, such as young age, minimal patient co-morbidity, witnessed collapse and shockable initial rhythm and consideration of early intervention with PPCI as STEMI was found after ROSC.

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Case Report

Aortic Root Enlargement by using Y-Incision: A Case Report

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Abstract

In the surgery of aortic valve replacement is always attempted, as much as possible, to implant the larger prosthesis with the mains goals to enhance the potential benefits, to minimise transvalvular gradient, decrease left ventricular size and avoid the phenomenon of patient-prosthesis mismatch. Implantation of an ideal prosthesis often it is not possible, due to a small aortic annulus. A variety of aortic annulus enlargement techniques is reported to avoid patient-prosthesis mismatch. The current techniques of aortic root enlargement used by adult cardiac surgeons are the Nicks1 and Manouguian2 procedures. The Nicks procedure generally increases aortic annulus by one valve size. The Manouguian requires incising the mitral valve (MV) anterior leaflet and left atrium (LA), with risk of mitral regurgitation. Y incision at the aortomitral curtain and rectangular patch enlarged the aortic root is a new surgical technique to enlarge the aortic annulus by 3 valve sizes without violating the LA or MV.

Keywords: Small aortic root, Patient-prothetisis mismatch, Aortic annulus

(JNHFB 2023; 12 : 111-113)

Introduction

A small aortic root can cause patient–prosthesis mismatch. Our concept is similar to the Nicks and Manouguian procedures—to enlarge the fibrous portion of the root and subsequently the aortic annulus. The difference is our technique radically enlarges the fibrous portion of the aortic root by replacing the entire aortomitral curtain with a rectangular patch to accommodate an increase of 3 valve sizes from the initial assessment without violating the LA or MV. Once the aortic annulus was incised, a large patch to repair the aortomitral curtain significantly enlarged the aortic annulus to allow a bigger prosthetic valve. Sewing the patch to the mitral and aortic annulus is more secure compared with the Nicks and Manouguian procedures, which sew the patch to the aortomitral curtain—a thin layer of fibrous tissue. We recommended a "Y" incision instead of a "T" incision to avoid accidental incising the LA or MV since sometimes it is difficult to differentiate the aortomitral curtain, mitral annulus, and MV. The "Y" incision could be easily extended below the nadirs of aortic annulus from aortomitral curtain without requiring dissecting out of aortic root but should not pass the fibrous tissue under nadirs of both left and noncoronary sinuses. The rectangular patch could push on the left coronary sinus with a potential of distortion of left coronary artery. However, the transverse sinus behind the rectangular patch allows the patch and left coronary sinus to expand posteriorly without significant distortion of left coronary artery. Because of this potential risk, we do not recommend anything larger than the rectangular patch. In summary, our enlargement technique is simple and effective for avoiding patient–prosthesis mismatches.

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Case Report

In the case study that follows, 61 years old female patient presented with complaints of chest pain on exertion. On echocardiogram patient had a tri-leaflet aortic valve and severe aortic stenosis (AS). The patient had a body height of 170 cm (5'6"), weight of 79 kg (174 pounds), BMI of 27.5 kg/m², and body surface area of 1.95 m². She had symptomatic severe aortic stenosis with a peak gradient of 95 mmHg and a mean gradient of 58 mmHg, aortic annulus was17 mm and an estimated valve area of 0.72 cm². The aortic annulus was enlarged 3 sizes, from 17 mm to 23 mm to avoid Patient-prothetisis mismatch and give optimum benefit.

Operative Steps

1. After the heart was arrested, a partial transverse aortotomy from L-R commissure post to L-Non commissure post was made 1.5 cm above the sinotubular junction, leaving the aorta above the left coronary sinus intact.

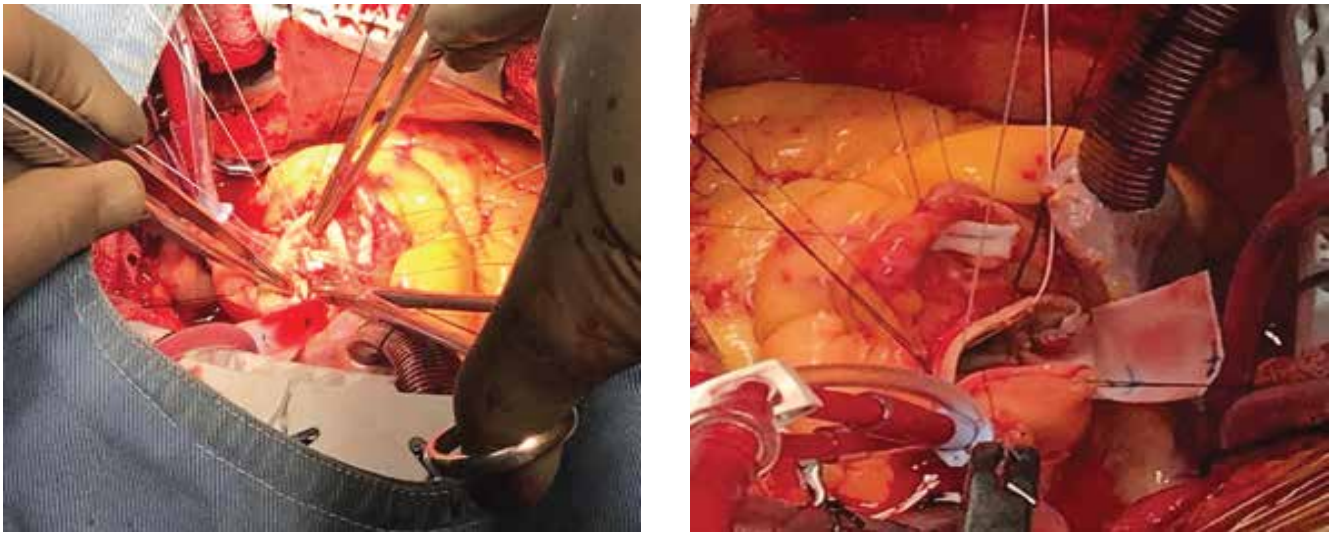

Figure 1: Peroperative picture

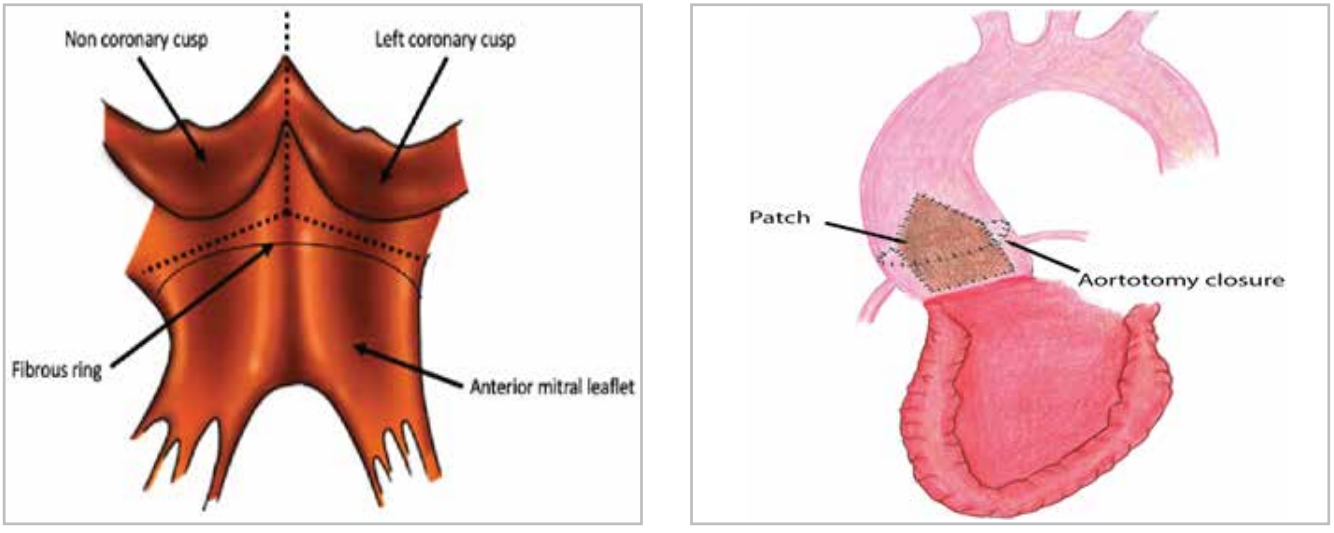

Figure 2: Diagramtic enlargement of annulus

2. The aortic valve was then resected, and the annulus was debrided. The annulus was sized to be 17 mm.
3. Starting from the posterior end of the transverse aortotomy, a Y-incision was made through the left-non commissure into the aorto-mitral curtain. The Y-incision was extended underneath the left and noncoronary aortic annulus to their respective nadir into the left and right fibrous trigone but did not reach the muscular portion on the left or the membranous septum on the right side.
4. A rectangular shaped Dacron patch was trimmed to 3.5 cm in width and was first anchored to the left fibrous trigone and then sewn to the aorto-mitral curtain/mitral annulus from the left to the right fibrous trigone with running 4-0 Prolene suture. The suture line was transitioned to the undermined aortic annulus at the nadir of both the left and noncoronary sinuses and then was sutured along the longitudinal length of the patch up to the level of the transverse aortotomy incision and secured.
5. The position of the sizer on the patch was marked to guide the placement of valve sutures.
6. The non-pledgetted 2-0 Ethibond sutures were placed along the native aortic annulus in a noneverting fashion, starting from the right coronary sinus side and from outside in on the patch.
7. The mechanical valve was placed with the ends of the two discs facing the left-right commissural post, which ensured that the left and right coronary ostia were at the sides of the discs. Then all the valve stitches were passed through the sewing ring.
8. The sutures at the nadirs of noncoronary and left coronary sinuses, which were the lowest points of the aortic annulus, were tied first to seat the valve well and to prevent paravalvular leak. A portion of the patch beneath the mechanical valve became the new aorto-mitral curtain.

9. The patch, approximately 2 cm above the mechanical valve, was trimmed into a triangular shape, like a roof.
10. An additional longitudinal aortotomy was made vertically at the posterior side of the ascending aorta from the posterior end of the transverse aortotomy so that it matched both sides of the triangular shaped patch.
11. The aortotomy was then closed with the triangular-shaped patch inserted into the longitudinal aortotomy of the proximal ascending aorta with a 4-0 Prolene suture.

Discussion

Rahimtola et al.[3] presented for the first time since 1978 the issue of prosthesis - patient mismatch which is defined as a condition in which the effective surface of the prosthesis is less than that of the normal patient valve.

The most accurate and used parameter to define patient - prosthesis mismatch (PPM) actually is the indexed prosthetic effective orifice area (iEOA) that is the ratio of the orifice area of the prosthesis (EOA) with the patient's body surface area (BSA). Based on these values EOAi ≤ 0.85 cm^2/m^2 is regarded as the threshold for the occurrence of PPM to continue with moderate PPM when iEOA value is between 0.65 cm^2/m^2-0.85 cm^2/m^2 and severe when iEOA < 0.65 cm^2/m^2. The patient-prosthesis mismatch is common phenomenon during aortic valve replacement. The reported incidence varies 2-11 %.[4,5,6]

There are four ways to resolve the problem of mismatch: implantation of the stentless prosthesis, homograft, autograft and aortic annulus enlargement (AAE).

The first three are associated with an increased operative mortality and morbidity. Aortic annulus enlargement remains the more simple and reproducible surgical procedure to avoid this phenomenon.

Aortic annulus enlargement is an additional surgical procedure and it is performed in an anatomical area with high risk of bleeding. These facts have provoked the debate about the impact of this procedure on the early results of aortic valve surgery. Aortic annulus enlargement procedure does not affect negatively early results of aortic valve surgery in terms of hospital mortality and morbidity. Even while, due to the complexity of the procedure, cross-clamping and cardiopulmonary bypass times are relatively longer than in standard aortic valve replacement. In this context Coutinho et al recommend strongly the necessity to involve the aortic annulus enlargement procedure as part of operating strategy whenever is necessary during aortic valve replacement in patients with small aortic annulus. These suggestions are supported by other authors with a smaller contingent of patients operated that have realized aortic annulus enlargement. There are authors that analysing their results report higher mortality and morbidity in the group with AAE. They criticise the routine use of the aortic annulus enlargement and recommend being careful in the management of patient –prosthesis mismatch.

Mayo Clinic presented one of the largest studies where are involved 2366 patients in which 10.5 % of patients have been the subject of aortic annulus enlargement during aortic valve replacement. This study shows that the small number of a prosthesis implanted is an independent important risk factor in the early operative results while the aortic annulus enlargement procedure does not influence perioperative mortality and morbidity.

In our case, the aortic cross-clamping and cardiopulmonary bypass time were longer in comparison with standard aortic valve replacement but the patient did very good in postoperative period. We had no excessive bleeding and unusual respiratory assistance, intensive care unit and postoperative hospital stay in comparison with standard aortic valve replacement. The early postoperative period was very good. The patient is in very good health after hospital discharge. She is in NYHA class I and does normal life for her age.

In conclusion, aortic annulus enlargement during aortic valve replacement according to Y incision at the aortomitral curtain and rectangular patch enlarged the aortic root is a safe technique that solves the problem of patient- prosthesis mismatch.

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