Original Article

Cardiologists' View and Management of Coronary Microvascular Disease in Clinical Practice in Saudi Arabia

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Abstract

Background: Coronary microvascular disease (CMD) affects the structure and function of the coronary microcirculation, presents highly in patients with cardiovascular risk factors, and is often associated with adverse effects. **Objective:** The aim of the study was to assess the opinion of Saudi cardiologists on CMD, its management in clinical practice, and the need for comprehensive guidelines for the management of the condition. **Methods:** We adopted a cross-sectional study through self-administered questionnaire survey among cardiologists in Middle and Eastern Saudi Arabia. A formal questionnaire was developed and distributed to the participants of the study in the morning just before they could start their daily activities. The respondents were recruited through convenience sampling method. Our survey was divided into three sections: demographics, clinical practice, and opinion of cardiologists on diagnosis, prognosis and CMD as a disease entity. **Results:** Demographic results indicated that 62% of the respondents were cardiologists in practice while 38% of the respondents were cardiologist in training, 47% of the respondents were female while 53% were male. Practice setting comprised of 67% of respondents from academic hospital and 33% from non-academic hospital. Equally, 47% of the respondents had sub-specialized in cardiology while 53% did not have specialization in cardiology. The most applied treatment in this case was lifestyle intervention (23%), nitrates (22%) and calcium channel blockers (22%) were equally used by the cardiologists. The findings show that 42.6% and 31.5% of the male and female respondents believe that coronary microvascular disease exists as a separate-entity. Of the participants, 48.1% of the female respondents and 42.6% of the male respondents believe coronary microvascular disease do not exist as separate-entity (p=0.435). These findings are consistent with previous studies that have indicated that significant differences do not exist on the perception of CMD among the various gender groups of cardiologists.

Keywords: Coronary microvascular disease, ischemia, macro-circulation

Introduction

Since the 1990s, cardiovascular diseases have accounted for the highest proportion of disease-related deaths in the developed world [1]. Angina and dyspnea have remained largely common presenting symptoms. Clinical evidence indicates that patients suffering from CMD also show macro-vessel atherosclerosis, which is highly implicative for its prognosis and management [2-4]. Other scholars believe that CMD affects the walls and linings of the tiny coronary artery blood vessels [2, 5-7].

The prevalence of CMD is higher in young women as compared to other population. Contemporary evidence also indicates that men and women who have coronary MVD often have a high risk profiles of chronic conditions such as diabetes mellitus, hypertension or familial history of cardiomyopathy [8]. Diagnosis of coronary MVD is challenging to doctors, as standard tests used for the diagnosis of coronary heart diseases fail to capture coronary MVD. More research is needed to find the best diagnostic tests and treatments for MVD [9-12].

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Contrary to the epicardial coronary vasculature, coronary microcirculation has largely remained elusive to conventional imaging techniques. Possibly, for this reason, the clinical implications and significance of coronary microvascular dysfunction (CMVD) has not received considerable attention as much as pericardial artery disease (CAD) [10]. In the literature, a condition known as 'chest pain with normal coronary arteries' or 'cardiac syndrome X' (CSX) has been a puzzle to physicians over the years and continues to be a clinical mystery for clinical practice [11]. However, some clinical evidence indicates that the linkage between myocardial ischemia (MI) and obstructive atherosclerosis of the epicardial coronary arteries is conventional to the extant literature, and coronary angiography has shown a relationship between the severity and extent of coronary artery disease (CAD) and survival [12]. Studies in the last decade have demonstrated that abnormalities in the functionality and structure of the coronary microcirculation occur in clinical conditions, represent epiphenomena or could represent markers to the risk or even contribute to the pathogenesis of myocardial ischemia [3, 4, 8, 11].

While previously it was thought that CMD had benign prognosis, recent evidence has shown an increased mortality for patients suffering from coronary microvascular disease as compared to patients without the condition [13]. In some instances, the condition predisposes severe symptoms, leading to diminished quality of life. In spite of the continuing evidence of the large prevalence of CMD in clinical practice, the condition remains underdiagnosed, since primary focus on ischemic heart conditions is still on coronary artery stenosis. Consequently, coronary microvascular disease patients are required to undergo (invasive) diagnostic tests and hospitals admissions with high healthcare costs [8]. Various entities such as the European Society for Cardiology and the American Heart Association have provided clinical recommendations and guidelines on stable artery disease; however, such guidelines remain elusive. Existential guidelines have limited guidance on the diagnosis and treatment of patients in clinical practice and disproportionately concentrate on symptom management [13].

Despite efforts to understand CMD, confusion surrounding several factors, including prognosis and pathogenesis remains. First, there is the challenge of nomenclature. The condition was previously described in the literature as the coronary syndrome X; however, it risks will be meaningless if it is not objectively diagnosed. Additionally, the condition is minute to be imaged directly in vivo in patients. And, the pathology of microcirculation is intricately linked to macro-circulation, both through direct and humoral factors. A strong contemporary evidence indicates that CMD co-exists with atherosclerosis in many of the affected patients, and this is an indicator for what could constitute appropriate therapeutic strategies in CMD [1-4, 8, 12, 13].

Ischemic heart disease may frequently occur in the absence of significant coronary atherosclerosis, especially in women. Clinical evidence indicates that for these patients, chest pain is associated with coronary microvascular disease (CMD), with the condition being suggested to be frequent after a relief of significant atherosclerosis. Coronary microvascular disease (CMD) often expresses in broad categories in clinical practice, and three broad categories related to abnormalities in coronary microcirculation occur, with the first condition referred to as the occurrence of ischemic heart diseases without angiographically significant coronary atherosclerosis [8]. The latter could result from inflammation or abnormalities in vasomotor regulation through endothelial-dependent and independent pathways. However, it is considered that normal or near-normal angiography does not rule out the presence of larger 'hidden' atherosclerotic burden [3].

In practice, there is lack of data on the view of Saudi cardiologists on the management of Coronary microvascular disease (CMD). Moreover, it is largely unknown whether developing guidelines on CMD would be welcomed by Saudi cardiologists. Therefore, our aim in this study is to assess the opinion of Saudi cardiologists on CMD, its management in clinical practice in Saudi Arabia, and the need for comprehensive guidelines for the management of the condition.

Materials and Methods

We adopted a cross-sectional study design through self-administered questionnaire survey among cardiologists in Saudi Arabia. A formal questionnaire was developed and distributed to the participants of the study in the morning just before they could disperse for their daily activities. The questionnaire was adapted from a previous research that assessed the view about the management of CMD in clinical practice among cardiologists in Netherlands. However, our questionnaire was modified to reflect the local conditions in Saudi Arabia. The questionnaire assessed the participants on a number of critical indicators related to the management of CMD; including clinical practice, cardiologist views, knowledge of CMD, questions regarding the need for guidelines related to CMD, and demographic items used to characterize the study population. More specifically, our survey was divided into three sections: demographics, clinical practice, and opinion of cardiologists on diagnosis, prognosis and CMD as a disease entity. On demographics, the study assed the participants on various indicators, including their profession (cardiologists, cardiologist in training, or physician assistant cardiologist), sex, practice area, and area of specialization.

In the second domain (clinical practice), the respondents were assessed on their views on CMD, their clinical experience with the condition, and treatment options they have often considered for practice. The last segment of the questionnaire assessed the opinion of the cardiologist in the diagnosis, prognosis and on CMD as an entity. To ensure that valid information was collected from the participants, our questionnaire was extensively reviewed by experts and

validated by a representative individual of the target population among cardiologists in Middle and Eastern Saudi Arabia. The questionnaire was distributed to the participants on a face-to-face basis to make our intentions known and to increase the response rate of the study participants. The expertise in cardiology is reduced in the Kingdom of Saudi Arabia, and therefore, getting a higher response rate was necessary to ensure that our study provides a highly comprehensive view of the cardiologists and professionals dealing with CMD. The participants could complete the questionnaire between 04/08/2019 to 24/09/2019. The respondents were expected to give their feedback within the 50 days provided by the study.

Participants

This study evaluated view of Saudi cardiologists (Eastern and Middle region) on the management of CMD, recruiting the participants through convenience sampling method. The inclusion criteria were: the individual had to be a medical practitioner with specialization in cardiology and or has worked with patients requiring heart treatments. The study was localized to Middle and Eastern Region of Saudi Arabia. It was figured out that getting information from a large sample size i.e. the whole Kingdom of Saudi Arabia would have required additional resources, and not just completely feasible. However, the study size is comparatively bigger which increases the chances of generalizability. The responses were collected and transferred to an excel sheet, the data was then cleaned, and computed in SPSS version 10 software.

Results and Discussion

Demographic Information

The table below shows the demographic data of the participants which includes information on profession, gender, practice settings, and specialization.

Table 1. The demographic data of the participants

Profession	Frequency	Percentage
Cardiologist	71	62%
Cardiologist in training	44	38%
Grand Total	115	100%
Gender	**Frequency**	**Percentage**
Female	54	47%
Male	61	53%
Grand Total	115	100%
Practice settings	**Frequency**	**Percentage**
Academic hospital	77	67%
Non-academic hospital	38	33%
Grand Total	115	100%
Sub-specialization in cardiology	**Frequency**	**Percentage**
No	61	53%

The questionnaire captured data from cardiologists and cardiologists in training. From the data, 62% of the respondents were cardiologists in practice; while, 38% of the respondents were cardiologist in training. The results of the study further indicate that 47% of the respondents were female; while, 53% were male. Practice setting comprised of 67% of respondents from academic hospital and 33% from non-academic hospital. Equally, 47% of the respondents had sub-specialized in cardiology; while, 53% did not have specialization in cardiology.

Opinion on diagnostic, microvascular disease and CMD for cardiologist

The table below gives the opinion of the respondents on CMD and the need for specific guidelines for practice.

Table 2. Opinions on diagnostic, microvascular disease and CMD

Evidence-based diagnostic modalities to diagnose CMD do not exist	Frequency	Percentage
Agree	41	36%
Disagree	53	46%
don't Know	21	18%
Grand Total	115	100%
Coronary microvascular disease leads to a higher risk for cardiovascular disease and mortality	**Frequency**	**Percentage**
Agree	45	39%
Disagree	50	43%
don't Know	20	17%
Grand Total	115	100%
There is a need for a specific guideline on CMD for cardiologist	**Frequency**	**Percentage**
Agree	48	0.417391304
Disagree	46	0.4
Neutral	21	0.182608696
Grand Total	115	1

Table 2 provides findings which are based on several aspects. The data shows that 46% of the respondents believe that evidence-based diagnostic modalities to diagnose CMD do

not exist; while, 36% believe they do exist. Equally, 39% of the respondents believe that coronary microvascular disease leads to a higher risk for cardiovascular disease and mortality; while, 43% disagree with such assertions, indicating that a significant majority of cardiologists in Eastern and Middle Saudi Arabia believe that CMD is not associated with higher cardiovascular diseases and mortality.

Equally, as shown in Table 2, a significant majority of the cardiologists indicate that there is a need for specific guidelines on CMD for cardiologists. Other studies have also indicated that cardiologists have registered increased concerns for more specific guidelines on CMD for cardiologists [2, 6, 8]. In a study conducted to understand the views of Dutch cardiologists on CMD management, 82% indicated that guidelines for CD is needed, and even a higher proportion (91%) indicated that they would be ready to receive the guidelines once adopted [11]. For our study, cardiologists practicing in non-academic hospitals indicated that there is a need for specific guidelines on CMD (58%), and compared to those academic in academic hospitals (42%; p=0.01). Our study is consistent with the study conducted in Netherlands, which indicated that cardiologists in non-hospital settings as compared to those practicing in academic hospitals (64%, vs 87%, respectively; p=0.01) express a high need for practice guidelines on the condition [11]. However, our study did not capture the gender differences in response to the need for guidelines for CMD.

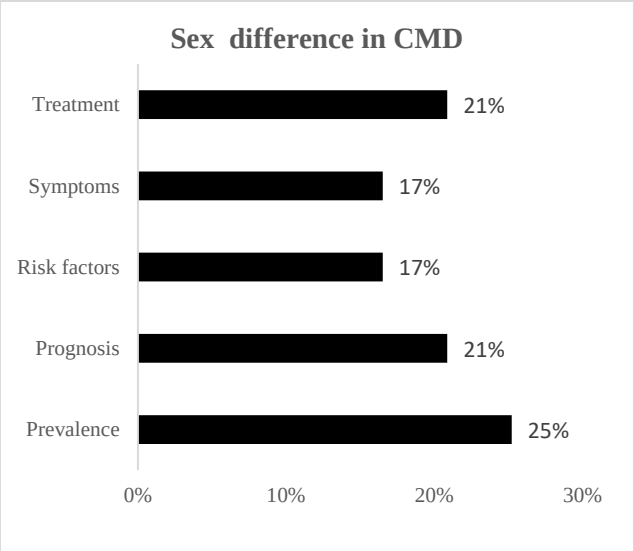

Figure 1. Sex Differences in CMD

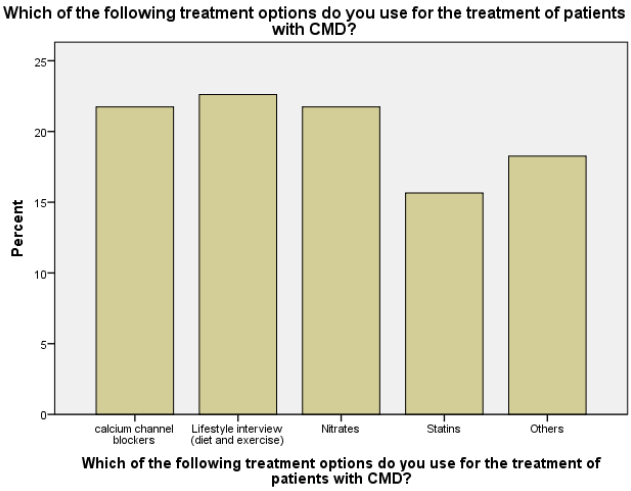

Figure 2. Treatment Options for CMD

The most applied treatment in this case was lifestyle intervention (23%). Nitrates (22%) and calcium channel blockers (22%) were equally used by the cardiologists. However, a study conducted to understand the perception of Dutch cardiologists on managing CMD, indicated that the most frequent treatment options used for managing the condition were calcium channel blockers, nitrates, statins, and lifestyles interventions, prescribed by 93%, 91%, 79% and 92% of the respondents, respectively [11]. Unlike Saudi cardiologists, a higher proportion of Dutch cardiologists preferred calcium channel blockers to lifestyle intervention.

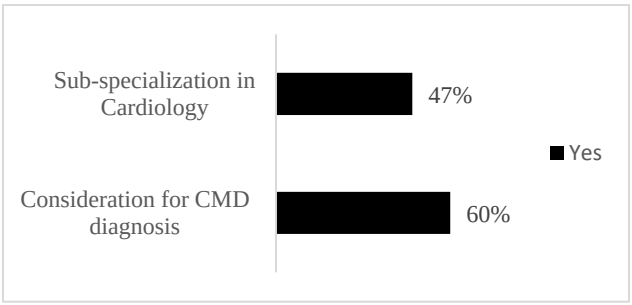

Figure 3. Sub-specialization in Cardiology and Consideration for CMD diagnosis

The findings of the data indicate that 47% of the respondents had sub-specialized in cardiology; while, 60% of the respondents considered CMD diagnosis

Table 3. Comparing the opinion of both genders on coronary microvascular disease-entity

	Gender		
	Male	**Female**	**Total**
Count	26	17	43
% within Gender	42.6%	31.5%	37.4%
Count	26	26	52
% within Gender	42.6%	48.1%	45.2%

Count	9	11	20
% within Gender	14.8%	20.4%	17.4%
Count	61	54	115
% within Gender	100.0%	100.0%	100.0%

Table 4. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.664[a]	2	.435
Likelihood Ratio	1.672	2	.434
Linear-by-Linear Association	1.570	1	.210
N of Valid Cases	115		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.39.

The findings show that 42.6% and 31.5% of the male and female respondents believe that coronary microvascular disease exist as a separate-entity. Of the respondents, 48.1% of the female respondent and 42.6% of the male respondents believe coronary microvascular disease do not exist as separate-entity (p=0.435). These findings are consistent with previous studies that have indicated that significant differences do not exists on the perception of CMD among the various gender of cardiologists [2].

Table 5. Comparing the opinion of both male and female on the issue of evidence-based treatment options

Evidence-based treatment options do not exist for patients with CMD * Gender Cross tabulation

	Gender		
	Male	Female	Total
Count	23	23	46
% within Gender	37.7%	42.6%	40.0%
Count	25	19	44
% within Gender	41.0%	35.2%	38.3%
Count	13	12	25
% within Gender	21.3%	22.2%	21.7%
Count	61	54	115
% within Gender	100.0%	100.0%	100.0%

Table 6. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.434[a]	2	.805
Likelihood Ratio	.434	2	.805
Linear-by-Linear Association	.077	1	.782
N of Valid Cases	115		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.74.

The data shows that 37.7% of the male respondents and 42.6% of the female respondents believe that evidence-based treatment options exist for patients. Additionally, 41% and 35.2% of the male and female respondents believe that evidence-based treatment does not exist for patients, respectively (p=0.805).

Table 7. Comparing the opinion of professions on coronary microvascular disease-entity.

Coronary microvascular disease is a separate disease-entity

	Profession		
	Cardiologist	Cardiologist in training	Total
Count	30	13	43
% within Profession	42.3%	29.5%	37.4%
Count	29	23	52
% within Profession	40.8%	52.3%	45.2%
Count	12	8	20
% within Profession	16.9%	18.2%	17.4%
Count	71	44	115
% within Profession	100.0%	100.0%	100.0%

Table 8. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.983[a]	2	.371
Likelihood Ratio	2.009	2	.366

Linear-by-Linear Association	1.038	1	.308
N of Valid Cases	115		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.65.

The findings show that 42.3% and 29.5% of the respondents who are cardiologists and cardiologist in training believe that coronary microvascular disease exists as a separate-entity, respectively. Additionally, 40.8% of the respondents who are cardiologist and 52.3 % of the cardiologists-in-training believe coronary microvascular disease do not exist as separate-entity(p=0.371). In our study, while the response rate was commendable, the respondents could potentially reflect those with great interest in CMD, overestimating the findings. Our study was dependent on voluntary participation, and could contain non-response bias, the accurate percentages are still unknown. The study can be generalized because of the large study region.

Conclusion

Our study shows that 42.3% of practicing cardiologists and 29.5% of cardiologists in training believe that coronary microvascular disease exists as a separate-entity. Cardiologists practicing in non-academic hospitals indicated that there is a need for specific guidelines on CMD (58%) compared to those in academic hospitals (42%; p=0.01). There is a need for specific guidelines for managing CMD in clinical practice as well.

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