



## Prognosis of the Midlife-Elderly from ECG Testing to Gastroesophageal Reflux Disease and Coronary Artery Disease

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### Abstract

We investigated midlife-elderly patients enrolled for echocardiography and the prevalence of gastroesophageal reflux disease (GERD) and coronary artery disease (CAD). This was a cross sectional study. Patients (n = 236) enrolled for echocardiography (ECG) over the age of 30 were selected regardless of their chief complaint and those presented with chest pain were a key feature in this study. Patients free from known disease of age below 30 were excluded from the study. We investigated consented patients in a 3 month period by issuing an F-scale questionnaire followed by an ECG. Our control group consisted of persons free from GERD or CAD. All patients were screened for GERD and/or CAD. We found that 57 were normal, 49 had GERD, 73 had CAD and 57 had both GERD and CAD. The most prevalent symptoms experienced by GERD patients were heart burn, rubbing of their chest unconsciously, bitter liquid emanation from their throat and feeling sick after meals. When analysed using SPSS chi-square test at the 95% confidence level, more females had GERD as  $\chi^2(1) = 10.80 < 0.05$  as  $p = 0.001$  and both GERD and CAD which gave  $\chi^2(1) = 7.07 < 0.05$  as  $p = 0.008$ . Additionally, CAD patients had at least two chronic conditions including T2D and HBP as  $\chi^2(9) = 19.8$ ,  $p = 0.019$ . We found that on average, patients with chest pain were linked to having CAD;  $t(41) = 3.6$ ,  $p = 0.001$ . Our present study showed the importance of midlife-elderly patients being recommended for ECG testing.

### Keywords

Chest pain, Midlife, Elderly, GERD, CAD, ECG

reflux (GERD) [4]. Non-cardiac chest pain (NCCP) gastroesophageal reflux occurs at the same frequency in patients with both normal and pathological coronary angiographies [5]. Research has shown that approximately 50% of patients who experienced chest pain, assumed it was linked to CAD yet it was merely a symptom of being diagnosed with GERD [6]. In fact patients who experience symptoms of angina are really diagnosed as GERD [7].

GERD has been defined as a condition that develops when the reflux of stomach contents generates troublesome symptoms and/or complications [8]. Other research has profoundly defined it as heart burn and or regurgitation once a week or common [9]. The main symptoms of GERD are believed to be heartburn, retrosternal pain, regurgitation and less complicated symptoms such as bloating and the common cough which appears to diversify distinctly to the patient. It has been estimated that GERD affects 20-40 % of individuals in Western Countries [10] and surveys have also shown that approximately 20 % of US adults experience GERD symptoms such as heart burn and acid regurgitation at least once per week [11]. This condition has also been observed to be increasing within adults in Japan and studies are displaying the visibility of its symptomatic appearance in children. GERD is having a high incidence worldwide as it is affecting the quality of life with various equivocal symptoms [12]. Long term measures of GERD can advance to more serious complications such as heart disease and even death regardless of the countless independent randomized trials of medical and surgical treatments for it.

The mortality due to heart disease remains disconcerted and requires more in depth investigation [13].

The evaluation of the association between GERD and coronary heart disease was previously studied in Japan but has never been evaluated in a smaller less developed country such as Trinidad. The results obtained from the study in Japan revealed a link among patients with GERD and ischemic heart disease [14]. Coronary heart disease is a major problem in men and women. Symptoms of the acute coronary syndrome (ACS) include chest pain in both and additional back and jaw pain, nausea/vomiting, dyspnoea, indigestion and palpitations [15]. A study conducted in Japan with 1970 consecutive

### Introduction

The classification of chest pain in relation to angina is defined as a substernal discomfort with distinguishing features and duration time in which the role of sex attributes significantly to the symptoms experienced by each gender [1,2]. An innumerable amount of persons who are presented with chest pain are still yet underdiagnosed in primary care and presently there exist only a minority of those patients who experience chest pain of a definite symptomatic feature that are being diagnosed with cardiac disease [3].

Chest pain experienced by patients can be of non-cardiac origin and the symptoms can be commonly related to gastroesophageal

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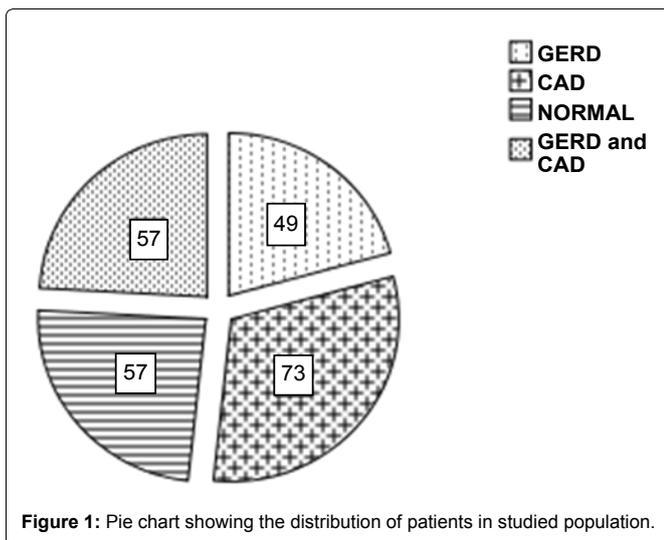
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**Table 1:** Showing the list of questions used to identify the GERD patients.

Do you experience heart burn?
Does your stomach feel bloated?
Does your stomach ever feel heavy after meals?
Do you subconsciously rub your chest with your hands?
Do you ever feel sick after meals?
Do you get heartburn after meals?
Do you have an unusual sensation in your throat?
Do you feel while eating?
Do you sometimes get things stuck when you swallow?
Do you get bitter liquid coming up your throat?
Do you burp a lot?
Do you get heartburn if you bend over?
<b>0-never</b> <b>1-occasionally</b> <b>2-sometimes</b> <b>3-often</b> <b>4-always</b>

**Table 2:** Demographic Results for all groups.

GROUP	GERD (N = 49)	CAD (N = 73)	GERD/CAD (N = 57)	NORMAL (N = 57)
<b>Age</b>	54.82 ± 16.445	63.48 ± 13.499	62.93 ± 10.610	56.40 ± 14.318
<b>Gender (no.)</b>				
Male	13	37	22	15
Female	36	36	35	42
<b>Ethnicity</b>				
Indians	24	29	28	18
Africans	14	30	20	24
Mixed	13	13	9	15



the study. All selected patients were informed about the study and asked to give a written consent for their participation. Participants of the study were asked to complete an F-scale questionnaire which consisted of a series of questions regardless of their chief complains [16]. The F-scale is a well presented questionnaire designed previously by Kusana M et al. and the questions consisted of a series of scaled questions as seen in Table 1. Patients were asked to scale their answers as 0-never, 1-occasionally, 2-sometimes, 3-often and 4-always. These were the questions used to determine GERD symptoms.

A statistical value of P < 0.05 was accepted as indicating statistical significance [17,18].

An ECG was performed on the patients by a physician from the relative diagnostic unit. The hospital records were additionally checked for basic data on the consented patients. The procedure basically followed a small part of the study path as conducted in Japan [14]. The data was statically analysed using the SPSS program.

Patients were classified into four major categories as being present with GERD, CAD, both GERD and CAD and normal if they had neither. From this they were then assessed for similar symptoms and chronic conditions mainly type 2 diabetes (T2D), hypertension (HBP) and hyperglycaemia to understand the prevalence of ethnicity, gender, chronic conditions and symptoms experienced occasionally.

## Results

The sample size of 236 patients with a mean age of 59.86 ± 14.14 was issued an F-scale questionnaire and underwent ECG testing. After the distribution of a questionnaire and ECG testing, the physician was able to assess patients ECG in which 57 (24%) were normal, 49 (21%) had GERD, 73 (31%) had CAD and 57 (24%) had both GERD and CAD as shown in Figure 1.

Table 2 shows the demographic results obtained for all four groups. The prevalence of symptoms experienced by the GERD occasionally were shown to be heart burn, rubbing their chest subconsciously, feeling sick after meals and bitter liquid coming up their throat as shown in Table 3. The majority of all the patients with CAD did not experience any of the GERD symptoms. The normal group did not experience any of the symptoms as experienced by the GERD patients.

patients was presented to make the proper assessment for referral if diagnostic necessity arose for an ECG [14].

The main objective of this study was to evaluate the association of chest pain in relation to GERD and/or CAD with the use of the F- scale questionnaire designed by Kusano M et al. and an ECG [16]. This will be able to assist in simplifying disease management for patient's experiencing symptoms of angina by providing physicians with the proper assessment for referral if diagnostic necessity arises.

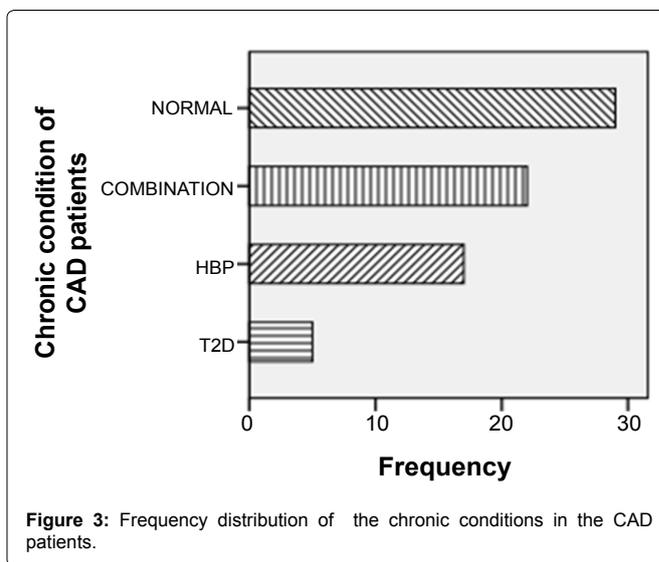
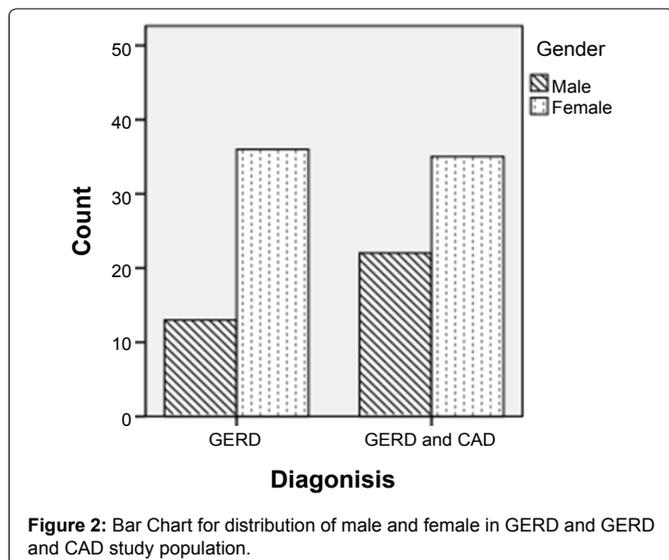
## Materials and Methods

Patients were recruited from the cardiovascular clinics of North Central Hospital Regional Authority (NCHRA) who were enrolled for echocardiography (ECG). Ethical approval was obtained from the ethic committee at the University of The West Indies, Trinidad. The selection of patients was made with identification in the database of individuals with a recorded diagnosis of chest pain. Patients over the age of 30 referred to ECG due to chest pain were included in this study. Persons suffering from any known diseases, pregnant women, mentally diminished patients and those suffering from Asthma or any known heart conditions that would affect results were excluded from

**Table 3:** Distribution of symptoms in patients occasionally diagnosed with GERD.

Symptom	Mean ± SD	P value	Count (patients)
Heartburn	1.84 ± 1.14	0.00*	24
Stomach bloated	1.08 ± 1.37	0.00*	11
Rub chest	1.57 ± 1.34	0.00*	17
Heartburn after meals	1.04 ± 1.28	0.00*	14
Bitter liquid up throat	1.31 ± 1.29	0.00*	14
Burp alot	1.16 ± 1.33	0.00*	11

Values are based on a 95% confidence interval limit



results were seen consistent with a previously reported study which showed the contribution of coffee, caffeine, spicy foods and other consumables such as citrus fruits and juices, chocolate and fatty foods in the development of GERD [22] (Figure 4).

Occasionally patients are referred for ECG in misperception with CAD. This complaint poses special diagnostic and therapeutic challenges in patients and if left untreated it can lead to more intricate diseases such as esophagitis, esophagitis ulceration and Barrett’s esophagus [23,24]. Therapeutic options for these patients presently include lifestyle changes, medication and surgery. Some management treatment options also include the use of various medications such as proton pump inhibitors as it is safe for both short and long term therapy effect in patients, also anti-reflux surgery [25]. Special care must be taken in administration as drug interaction and treatment response must be monitored especially as these elderly patients take multiple drugs for various comorbidities [24].

The association of symptoms experienced by elderly patients such as chest pain can sometimes be under projected. This study showed that patients who experienced chest pain were linked to having CAD.

CAD has been considered to be one of the leading cause of death and morbidity in the industrialized world [26]. Diagnosis involves clinical evaluation, identification of dyslipidaemia, hyperglycaemia, biochemical risk factors and coronary imaging. Clinical factors include lifestyle and history of vascular diseases.

Non-invasive cardiac investigations such as ECG and chest x-ray have shown to be very helpful and the use of these methods is immensely important as basic resting ECG has shown to establish a baseline for comparison in future circumstances. The ECG assist in clarifying the differential diagnosis in detection of dynamic ST-segment changes, showing vasospasm, left ventricular hypertrophy (LVH), arrhythmias and much more [27]. The diagnostic accuracy of the use of an ECG was found to be 80.3% in a study on the “diagnostic accuracy and prognostic implications of stress testing for coronary artery disease in the elderly” [28].

The major risk factors found to be associated with CAD has been identified as abnormal levels of circulating cholesterol, HBP and T2D [29,30]. CAD has been shown to be a major cause of mortality in patients with T2D, HBP and hyperglycaemia [29]. However chest pain has been assumed to remain the cornerstone of CAD [27]. From our study patients with CAD were also found to have T2D, HBP and hyperglycaemia as expected. A limitation from this study was not recording the dietary lifestyle and the occupation of the patients as they can be contributory to the research.

It is advised that physicians apprehend the guidelines endorsed to be applied to stable patients suspected of CAD as sometimes these patients who present with chest pain can be considered as low

Overall we observed that when analysed using SPSS chi-square test the male to female ratio of GERD patients gave  $\chi^2 (1) = 10.80 < 0.05$  as  $p = 0.001$  as shown in Figure 2 and there was also a difference between gender and the diagnosis of having both GERD and CAD which gave  $\chi^2 (1) = 7.07 < 0.05$  as  $p = 0.008$ .

Additionally, when all three major groups were compared with the normal group for chronic conditions, we did not see a clear pattern except for CAD patients which had at least two chronic conditions including T2D and HBP as  $\chi^2 (9) = 19.8, p = 0.019$  as shown in Figure 3.

There were 42 patients overall who were presented with occasional chest pain. We found that on average, patients with chest pain were linked to having CAD;  $t (41) = 3.6, p = 0.001$  as calculated by One-Sample T-test.

## Discussion

Screening of both midlife and elderly persons regardless of their chief complaint is very important in making accurate assessments for their appropriate treatment of care and longevity. Our study highlighted the necessity for understanding these patients who present themselves as recommended by their physicians for regular check-ups. We specifically focused on chest pain, GERD and CAD in this study along with chronic conditions.

Our findings displayed that regardless of ethnicity GERD affected and will continue to affect all persons. This was previously seen in another study conducted in the United States, though African ethnicity persons were shown to have a lower prevalence of GERD symptoms [19]. GERD is a common disease in the midlife and elderly as its occurrence increases with age. The associations of symptoms were found to differ from those we would observe in the younger persons [20]. The prevalence of symptoms have shown to be roughly the same across both male and female nonetheless women indicated to suffer ( $P < 0.5$ ) more frequently than men [21]. The most common symptoms include chest pain, dysphagia and heartburn. This was clearly observed in our study as patients with GERD complained of experiencing heartburn occasionally. Patients expressed their symptoms after intake of curry, spicy foods and coffee. These

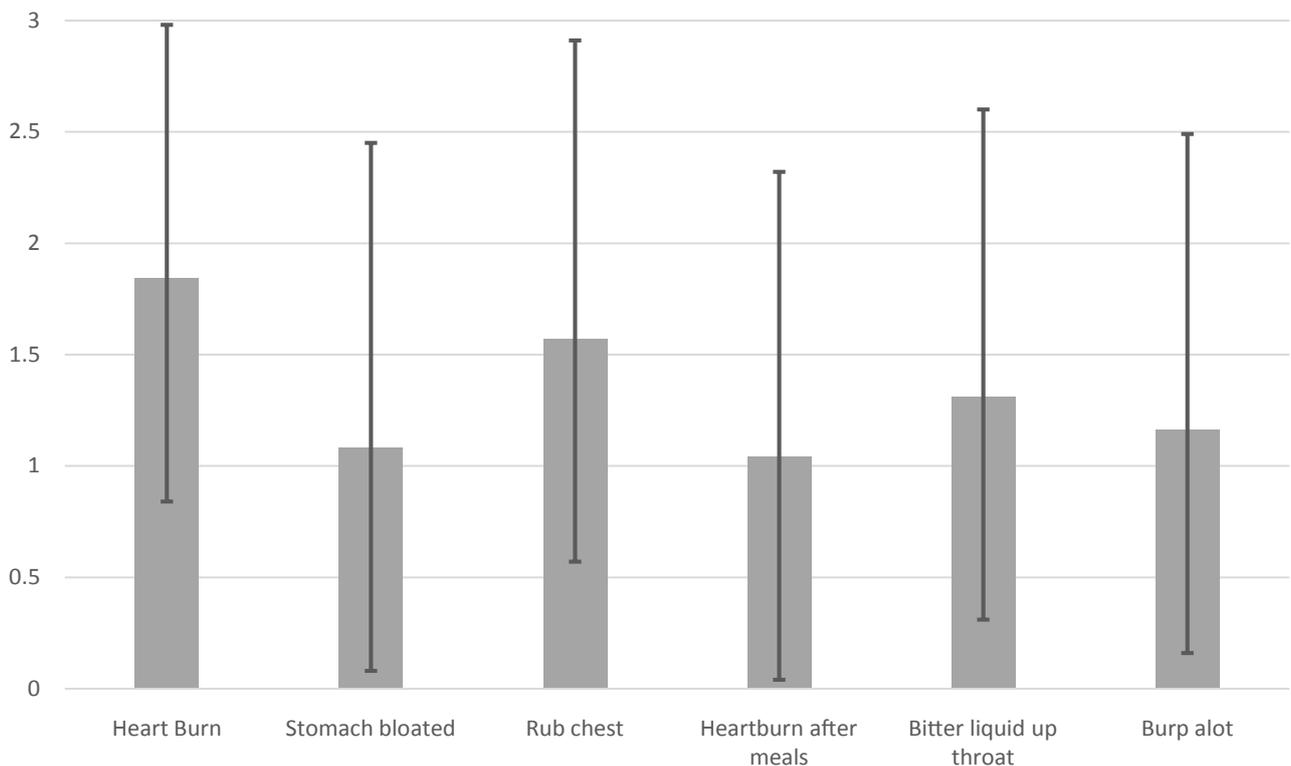


Figure 4: Box plot of symptoms experienced by GERD patients.

risk acute coronary syndrome (ACS) [27]. Developing efficacious methods for patient care of both the midlife and elderly with multiple morbidities is very important. Patient care teams have the potential to improve the quality of care for the patients with chronic illness [31]. A happy life contributes to the longevity of these patients to an extent and we recommend that the physicians always endorse both clinical and non-invasive testing for the midlife and elderly regardless of their chief complaint [32].

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