Unrecognized dyslipidemia among patients presented with first attack of acute coronary syndrome (ACS) in a multi-ethnic population in GMC hospital, Ajman, UAE (Dyslipidemia-ACS UAE Study)

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ABSTRACT

Introduction: Acute coronary syndrome (ACS) is a major reason for hospitalization in our country. Dyslipidemia has been identified as one of the major modifiable risk factors for Coronary Artery Disease (CAD). Our clinical observation was that many patients presenting with first ACS in Ajman, had no known risk factors, yet their routine investigations revealed lipid derangements. The aim of this study was to determine the prevalence of unrecognized dyslipidemia and its relation to other modifiable risk factors in an Ajman cohort of patients with first ACS.

Materials and Methods: All patients who visited the Department of Cardiology during the period of January 2006 to December 2012 with first attack of ACS without history of previous coronary artery disease or dyslipidemia were studied through a descriptive epidemiological approach. Case records of these were first reviewed, data collected and questionnaires were filled. From this, data was entered into excel spreadsheet and was transformed to SPSS 21 version for statistical analysis.

Results: A total of 438 case records were studied and 169 patients met inclusion criteria. Out of these, 141 patients (83.4%) were unrecognized dyslipidemics and 28 patients (16.6%) were non-dyslipidemics. We documented the demographic and clinical characteristics of the 141 unrecognized dyslipidemics along with other comorbid conditions. We found that most of the patients (54/141, 38.3%) were less than 40 years, 40/141 (28.4%) were between 41-50 years, and 47/141 (33.4%) were above 50 years. Majority of our patients were males (109/141, 77.3%) and Asians (74/141, 54%) were the major ethnic group being affected, followed by the Arabs (52/141, 38%). We also found that smoking was the most common risk factor encountered in our population (57/141, 40.4%), followed by family history of early coronary artery disease (40/141, 36.7%), hypertension (47/141, 33.3%) and diabetes (29/141, 20.6%). 82 patients out of the 141 patients presented with high systolic and diastolic BP. During presentation non ST-segment elevation-ACS was a more frequent diagnosis (120/141, 85.1%) than ST-segment elevation myocardial infarction (13/141, 9.2%) or unstable angina (8/141, 5.7%). The LDL levels >100 mg/dl in majority (123/141, 88.6%) of the patients.

Conclusion: Dyslipidemia was one the major risk factors which was widely prevalent and it went unrecognized until being detected during the first presentation with ACS. There were also other risk factors which contributed to the presentation of ACS at a young age, especially in males. This research implied the importance of creating more awareness and maintaining strict control of lipid levels in at risk patients. It provides useful information to health authorities, to design locally relevant interventions.

Keywords: Acute coronary syndrome (ACS), dyslipidemia
INTRODUCTION

Coronary heart disease (CHD) has become a true pandemic respecting no borders. In the coming years, it will be the greatest epidemic mankind has ever seen, unless we reverse the trend by concentrating research on its cause and prevention. Recent estimates by the World Health Organization (WHO) highlight cardiovascular disorders as one of the leading causes of death. Future projections of the global burden of disease indicate that ischemic heart diseases are becoming the most significant cause for disability adjusted life years. It has been projected that between 1990 and 2020, cardiovascular disease mortality in the Middle East countries will increase by 146% for women and 174% for men.

Dyslipidemia has been identified as one of the major modifiable risk factors for coronary artery disease; it is therefore a serious public health issue in the healthcare system, and in the nation at large. Over the past 4 decades, researches have consistently shown the burden of dyslipidemia to be very high, in terms of mortality, morbidity, and also medical costs. The W.H.O. has reported that dyslipidemia was associated with more than half of the cases of ischemic heart disease globally and lead to more than 4 million deaths every year.

With regards to dyslipidemia, the risk factors for atherosclerotic cardiovascular disease (ASCVD) are high total cholesterol (TC) or low-density lipoprotein cholesterol (LDL-C) levels and low high-density lipoprotein cholesterol (HDL-C) levels. Other risk factors are age, male sex, tobacco use, high blood pressure, and diabetes mellitus.

The Adult Treatment Panel III of the National Cholesterol Education Program (NCEP ATP-III) has issued evidence-based guidelines emphasized the significance of an intensified lipid-lowering treatment to improve outcomes. It highlighted the current gap in the treatment of CHD that existed in hospitals and in outpatient settings; recognized the high number of eligible patients who are not receiving any therapy; and correlated this with ample opportunity for reducing morbidity and mortality with appropriate treatment.

The epidemiological characteristics of ACS patients and the pattern of their management change over time, mainly due to temporal trends in the prevalence of coronary risk factors, differences in the availability of healthcare resources and facilities, and the varying degree of implementation of treatment guidelines. In this context, repeated surveys are needed to account for the dynamic nature of these variables and to provide relevant, comprehensive and updated information.

Although there is high prevalence of dyslipidemia and diabetes mellitus in the Gulf region, especially in the United Arab Emirates, probably due to the varied ethnic origins and sedentary lifestyle, there are not enough trials targeting this population. Our clinical observation was that many patients presenting with first ACS in Ajman, had no known risk factors. During their routine investigations on admission, different derangements were discovered which would include elevated lipid levels or undiagnosed diabetes mellitus.

The objective of this study was to determine the prevalence of unrecognized dyslipidemia and its relation to other modifiable risk factors in a cohort of patients who presented with first attack of acute coronary syndrome.

MATERIALS AND METHODS

Design
This was a retrospective study conducted by the department of Cardiology in the GMC hospital, Ajman. The population was studied through a descriptive epidemiological approach.

Study Population
This included patients, irrespective of age, nationality and gender, who presented with first attack of ACS to the Department of Cardiology during the period of 2006 to 2012. It included patients with any past history except those in the exclusion criteria.
Exclusion criteria included patients with known history of coronary artery disease, known dyslipidemia and case records with incomplete data. A total of 438 case records were studied, out of which 169 patients met the inclusion criteria.

**Methods**
A descriptive epidemiological study was conducted. The questionnaire included questions under the domains of socio-demographic characteristics, family history, clinical data and biochemical parameters. Co-morbidities were recorded based on the Charlson Co morbidity Index. Data was collected by reviewing the case records in the medical records department and questionnaires were filled. From this, data was entered into excel spread sheet and was transformed to SPSS 21 version for statistical analysis. Based on that, report was prepared and the findings were disseminated.

**RESULTS**

Figure 1 shows that among the ACS patients, 141 patients (83%) were unrecognized dyslipidemic and 28 patients (17%) were non-dyslipidemic.

**Demographic characteristics and comorbid conditions**

<table>
<thead>
<tr>
<th>Socio-demographic characteristics</th>
<th>Groups</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group in years</td>
<td>≤40 years</td>
<td>54</td>
<td>38.3</td>
</tr>
<tr>
<td></td>
<td>41-50 Years</td>
<td>40</td>
<td>28.4</td>
</tr>
<tr>
<td></td>
<td>51-60 years</td>
<td>39</td>
<td>27.7</td>
</tr>
<tr>
<td></td>
<td>&gt;60 years</td>
<td>8</td>
<td>5.7</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>109</td>
<td>77.3</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>32</td>
<td>22.7</td>
</tr>
<tr>
<td>Ethnicity*</td>
<td>Asians</td>
<td>74</td>
<td>54.0</td>
</tr>
<tr>
<td></td>
<td>Arabs</td>
<td>52</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>European/African</td>
<td>11</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Table 1 shows the demographic characteristics: 54 patients (38.3%) were ≤40 years, 40 patients (28.4%) were between 41-50 years, 39 patients (27.7%) between 51-60 years and only 8 patients (5.7%) were more than 60 years. Regarding gender comparison, there was a male predominance, 109 patients (77.3%). Regarding, the ethnicity of our patients, 74 (54%) were Asians, followed by Arabs 52 (38%) and Europeans or Africans 11 (8%). There were 4 cases with missing data.

![Figure 2: Distribution of personal habits among the unrecognized dyslipidemic ACS patients (N=141)](image)

Figure 2 shows that smoking was a habit in 57 patients (40.4%). Alcohol consumption was found in only 18 patients (12.8%).

![Figure 3: Distribution of different co-morbid conditions among the unrecognized dyslipidemic ACS patients (N=141)](image)

Figure 3 shows that a history of hypertension was recorded in 47/141 patients (33.3%). 29 patients were known diabetics (20.6% of patients). Other past medical history was noted among 6 patients (4.3%) and included anxiety, hypothyroidism, COPD, bronchial asthma and epilepsy among others.
Table 2: Distribution of dyslipidemia among ACS patients with and without family history of CAD

<table>
<thead>
<tr>
<th>Family History</th>
<th>Groups</th>
<th>Dyslipidemia</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non Dyslipidemic</td>
<td>Unrecognized Dyslipidemic</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>CAD Yes</td>
<td>3</td>
<td>7.0</td>
<td>40</td>
</tr>
<tr>
<td>CAD No</td>
<td>19</td>
<td>21.6</td>
<td>69</td>
</tr>
</tbody>
</table>

*p value <0.05 (statistically significant)

In table 2, it was observed that 43 ACS patients had a family history of early coronary artery disease, and among them 40 patients (93%) were found to have unrecognized dyslipidemia. This was found to be statistically significant with a p value <0.05.

Clinical characteristics

Table 3: Distribution of the type of ACS during presentation (N=141):

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Presentation</td>
<td>STEMI</td>
<td>13</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>NSTEMI</td>
<td>120</td>
<td>85.1</td>
</tr>
<tr>
<td></td>
<td>UA</td>
<td>8</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Table 3 shows that NSTEMI was diagnosed in a majority of 120 patients (85.1%) as compared to STEMI in 13 patients (9.2%) and Unstable Angina in 8 patients (5.7%).

Table 4: Distribution of LDL values among the unrecognized dyslipidemic ACS patients (N=141):

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL Optimal</td>
<td>Optimal (&lt;100)</td>
<td>16</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Near optimal (100-129)</td>
<td>56</td>
<td>40.3</td>
</tr>
<tr>
<td></td>
<td>Borderline (130-159)</td>
<td>45</td>
<td>32.4</td>
</tr>
<tr>
<td></td>
<td>High risk (160-189)</td>
<td>14</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Very high risk (&gt;=190)</td>
<td>8</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Table 4 shows that the LDL values were <100 mg/dL for only 16 patients (11.5%); whereas it was >100mg/dL (88.5%) for the remaining. i.e. between 100-129 mg/dL for 56 patients (40.3%); and >130 mg/dL, for 67 patients (48.3%). There were only 3 missing data.
Table 5(A): Distribution of HDL levels among males with unrecognized dyslipidemia and ACS (N=141)

<table>
<thead>
<tr>
<th>Gender</th>
<th>HDL</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (≥40)</td>
<td>Abnormal (&lt;40)</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5(B): Distribution of HDL levels among females with unrecognized dyslipidemia and ACS (N=141)

<table>
<thead>
<tr>
<th>Gender</th>
<th>HDL</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (≥50)</td>
<td>Abnormal (&lt;50)</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 (A & B) shows that the HDL values were abnormal for 83 (78.3%) males and 28 (87.5%) females. There were only 3 missing data.

**DISCUSSION**

In our patients presenting with first ACS, there was underlying unrecognized dyslipidemia present in 83.4% of the cases. This finding revealed that dyslipidemia was highly prevalent in ACS patients and this has been confirmed in numerous other studies\textsuperscript{10-12}.

On evaluating the epidemiological characteristics of these unrecognized dyslipidemic patients; it was alarming to find a major proportion to be young. In comparison to the results of UAE-ACS Registry\textsuperscript{13} and SPACE registry\textsuperscript{14} where the population age group was older and majority were below 40 years (38.3%) with decreasing incidence as the age progressed. This has important implications and could be partially explained by the large number of young adults who come to the UAE for employment. These young people have risk factors like smoking, dietary imbalance and stress leading to dyslipidemia, hypertension and diabetes, which are sufficient for them to suffer MI. This was recently shown in an analysis of young individuals with acute MI by Prashant Joshi et al\textsuperscript{15}. Also supported by the study conducted by Andreas et al\textsuperscript{14} which reported that cardiovascular risk factors in the young ACS patients <35 years were different from older ACS patients and dyslipidemia was one of the most important predisposing factor. This calls for strict primary prevention especially in this particular segment of society.

We found that majority of our patients were males (77.3%), which confirmed male gender as one of the non-modifiable risk factors for coronary heart disease\textsuperscript{11,13}. Rosengarten et al\textsuperscript{17} found fewer women than men, aged <65 years develop ACS. One should bear in mind that though women have lower CAD rates than men, environmental and lifestyle factors that cause high CAD rates in men can also influence women\textsuperscript{18}.
It is worth notice that the ethnicity of our population was mainly Asian (54%) and followed by Arabs (38%). Recent studies found that South Asians have two-fold increased rate of ACS incidence; they were younger, had lower socio-economic status, with more social and occupational stresses, more cigarette smokers than other patients. This was supported by Prashant et al who reported that the South Asians have high rates of acute myocardial infarction (AMI) at younger ages compared with individuals from other countries. Also a cross sectional analysis of mortality by country of birth, done in England by S. Wild et al, found that South Asians had mortality mainly from CAD.

Recent studies have shown that there is an association of the apolipoprotein E (apoE) genotype with the incidence of acute coronary syndromes in young South Asians. This genotype also adversely affects LDL and HDL cholesterol levels, both of which contribute to premature atherosclerosis. This might necessitates further research about the genotypes of such population in our community.

Regarding the comorbid conditions present in our population, it was found that smoking was the most common risk factor encountered (40.4%), followed by family history of early coronary artery disease (36.7%), hypertension (33.3%) and diabetes (20.6%).

In CYPACS Study smoking is found as one of the most frequent risk factor for ACS (48%) in addition to dyslipidemia and others. Other studies like SPACE registry (66%)14, Gulf RACE registry (36.6%)23, UAE ACS registry (46.4%)13, M. Parajuli et al. (55.2%)24, and Abraham et al. (50.4%)25. This goes in concordance with our study results.

Alcohol consumption was recorded in only 12.8% of our population which was compatible with some recent studies. Our finding was in contrast to the findings of Parajuli et al24 where they found a significant proportion (30.6%) had excessive use of alcohol.

One third of our study population where hypertensive. History of hypertension was observed in 37% of the ACS patients by Bhalli et al27 and in TARGET study, it constituted 67.9% of the total ACS patients.

Diabetes Mellitus is also one of the major risk factors for ACS. Our results agreed with the TARGET study (27.5%)12 and UAE ACS registry (38.9%)13.

Family history of early coronary artery disease is considered one of the three most important risk factors in the young ACS patients, along with dyslipidemia and smoking, supported by Andreas et al16 and CYPACS Study where they documented 55% and 34.6 % respectively. This was similar to our observation of 36.7%. The disturbing fact is that despite having a positive family history, these patients had poor awareness which had prevented early detection of possible risk status. Therefore this clearly emphasizes the need for creating more awareness about the importance of positive family history.

Our study also documented the type of ACS presentation and it was revealed that NSTE-ACS patients were the majority (85.1%) as compared to STEMI (9.2%) and Unstable Angina (5.7%). Our findings are consistent with literature findings and with scientific data from recent surveys. They indicate that ACS episodes occur more commonly these days in the form of NSTE-ACS, as opposed to STEMI. Over the years, the relationship between STEMI and NSTE-ACS has changed, resulting in increasing presentation of NSTE-ACS, though there has been no clear explanation for this change. It is possibly due to the significant efforts aiming at prevention of coronary heart disease for the past 20 years.
Contradicting our findings was the CYPACS study\textsuperscript{11} where STEMI (45\%) was found in patients with no previous CAD and NSTEMI (41.3\%) was found in previous CAD patients. Also, our data was against the findings of the UAE ACS registry\textsuperscript{13} which recorded more cases of STEMI than NSTEMI or unstable angina.

Laboratory findings revealed that LDL levels of more than 100 mg/dL were found in majority of the cases (88.6\%) with near optimal and borderline values occurring more frequently (40.3\% and 32.4\%, respectively). This pointed towards the significance of stringent control of lipids. Although optimal levels does not rule out the possibility of developing CAD yet it is an important modifiable risk factor. Comparably, high rate of dyslipidemia was found in the TARGET Study (57.4\%)\textsuperscript{12}, the CYPACS study (49\%)\textsuperscript{11} and in the study conducted by Addulla et al\textsuperscript{10}.

Strength and Limitations

Strength of our study is our population which was from a multiethnic background. A limitation of our study was the number of patients which was less which made it difficult to apply different tests of association.

Due to our study setting which did not have invasive management facilities, certain complicated cases were transferred to other facilities and therefore there were incomplete investigations. These records with incomplete data had to be excluded from the study.

CONCLUSIONS

Dyslipidemia is a highly predictable, independent, modifiable risk factor which is widely prevalent. In our population, it went unrecognized until being detected during the first presentation with ACS. This research was a step towards identifying the magnitude and trend of dyslipidemia in our local population. It implies the importance of maintaining strict control of lipid levels in at risk groups.

There were also other risk factors which contributed to the presentation of ACS at a young age, especially in males. Smoking is undoubtedly a major contributor which has to be curbed from this society. We also stress on creating awareness for early assessment of the risk status, especially in those with a family history of coronary artery disease and South Asian ethnic background. The alarmingly high rate of risk factors remains a cause for concern and a challenge that needs to be tackled. It provides ample opportunity for reducing mortality and morbidity.

In addition, our study also provides useful information for health authorities, to design locally relevant interventions, keeping in mind the socio-cultural factors, and can predict the impact of determinants on these patients. Thus it would make prevention, early detection and appropriate management of ACS possible.

ETHICAL CONSIDERATIONS

Approval was obtained from the Ethics and Research committees of Gulf Medical University and the management of GMC hospital to conduct this study. Anonymity of the study subjects were maintained by not identifying them by their names and confidentiality of the research data was maintained.
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