Incidence, recurrence, and case fatality rates for myocardial infarction in southwestern France, 1985 to 1993

P Marques-Vidal, J-B Ruidavets, J-P Cambou, J Ferrières

Abstract

Objective—To assess the impact of incidence, recurrence, and case fatality rates for myocardial infarction on coronary heart disease mortality in southwestern France between 1985 and 1993.

Design—Toulouse-MONICA myocardial infarction register.

Settings and patients—All subjects aged 35 to 64 years living in the French department of Haute-Garonne.

Interventions—All coronary artery disease events between 1985 and 1993.

Main outcome measures—7210 events collected by the register between 1985 and 1993.

Results—In men, adjusted attack, total, and out of hospital mortality decreased by 2% (95% confidence interval (CI), −3.8% to −0.1%), 6.2% (95% CI −8.4% to −4.0%), and 4.2% (95% CI −7.0% to −1.5%) a year, respectively (p < 0.05). Incidence and recurrence rates decreased by 2% (95% CI −4.1% to −0.1%, p < 0.05) and 1.9% (95% CI −5.9% to 2.2%) a year (NS). In women, attack, total, and out of hospital mortality decreased by 1.7% (95% CI −5.2% to 1.8%), 4.8% (95% CI −9.6% to 0.1%), and 2.6% (95% CI −9.4% to 4.1%) a year, respectively; incidence decreased by 2% (95% CI −6.5% to 2.5%) and recurrence increased by 1.4% (95% CI −9.8% to 12.6%) a year (all NS). In men, total, incident, and recurrent 28 day case fatality decreased by 3.8% (95% CI −4.8% to −2.8%), 3.2% (95% CI −4.1% to −2.3%), and 6.4% (95% CI −9.5% to −3.3%) a year, respectively (p < 0.05). For women, the corresponding decreases were 3.3% (95% CI −6.1% to −0.6%), 3.3% (95% CI −13.2% to 6.6%), and 11.7% (95% CI −24.6% to 1.3%) a year, but only the decrease in total 28 day case fatality reached significance. In both sexes, the reduction in case fatality contributed nearly 70% of the decrease in myocardial infarction mortality.

Conclusions—In southwestern France, the decrease in myocardial infarction mortality mainly reflects improvements in acute management rather than prevention.

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Keywords: myocardial infarction; case fatality

In recent years, coronary heart disease mortality has decreased considerably in western populations, but whether this reflects a decline in cardiovascular risk factors (primary prevention), improvement in treatment (secondary prevention), or a combination of both remains to be assessed in France. Primary prevention would decrease the incidence of new coronary events, whereas secondary prevention would decrease recurrent events. More intensive treatment after the onset of acute myocardial infarction is also believed to decrease case fatality.

Southwestern France is characterised by a low mortality from myocardial infarction and by rapidly increasing invasive management of this condition. Cardiovascular risk factors in southwestern France are similar to those in other regions with much higher myocardial infarction rates, such as Northern Ireland. Although screening for the main cardiovascular risk factors has increased in this region, attempts to modify these factors have remained relatively stable. Though dietary factors might partly explain the difference in attack rates between southwestern France and Northern Ireland, the effect of primary and secondary prevention of myocardial infarction has not yet been studied. Thus we hypothesised that any decrease in coronary heart disease mortality could reflect better treatment of cases of myocardial infarction and also improved secondary prevention. To test this hypothesis, we used the data collected between 1985 and 1993 by the Toulouse MONICA (monitoring trends and determinants in cardiovascular disease) myocardial infarction register to examine the evolution of attack, incidence, recurrence, and case fatality rates of myocardial infarction events.

Methods

Populations

The World Health Organization MONICA project is a study that monitors deaths from coronary heart disease, myocardial infarction, coronary care, and risk factors in men and women aged 35 to 64 years. It consists of 39 MONICA collaborative centres in 26 countries. Each collaborative centre is in charge of a coronary event register for patients aged 35 to 64 years living in the geographical area of the centre. The details of the registration procedure have been described elsewhere. Briefly, all private and public hospitals within the geographical area of the collaborative centre were screened by trained staff for suspected coronary heart disease events; death
Trend −2.0 −6.2 −4.2 −2.0 −5.6 −3.4 −1.9 −8.2 −7.8

1993 206 65 53 162 50 45 44 14 8

1992 203 72 53 172 59 45 31 13 8

1989 224 88 70 191 73 57 33 15 13

1987 225 92 65 180 71 54 45 21 11

1986 240 107 74 199 83 60 41 25 13

1985 258 119 80 211 90 62

Ye a r

Table 1 Age standardised attack, incidence, recurrence, total mortality, and out of hospital mortality rates (per 100 000) from myocardial infarction

<table>
<thead>
<tr>
<th>Year</th>
<th>Attack rates</th>
<th>Total mortality</th>
<th>Out of hosp mortality</th>
<th>Incidence rates</th>
<th>Total mortality</th>
<th>Out of hosp mortality</th>
<th>Recurrence rates</th>
<th>Total mortality</th>
<th>Out of hosp mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>258</td>
<td>119</td>
<td>80</td>
<td>211</td>
<td>90</td>
<td>62</td>
<td>47</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>1986</td>
<td>240</td>
<td>107</td>
<td>74</td>
<td>199</td>
<td>83</td>
<td>60</td>
<td>45</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>1987</td>
<td>225</td>
<td>92</td>
<td>65</td>
<td>180</td>
<td>71</td>
<td>54</td>
<td>45</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>1988</td>
<td>234</td>
<td>94</td>
<td>75</td>
<td>198</td>
<td>76</td>
<td>63</td>
<td>36</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>1989</td>
<td>224</td>
<td>88</td>
<td>70</td>
<td>191</td>
<td>73</td>
<td>57</td>
<td>33</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>1990</td>
<td>246</td>
<td>90</td>
<td>71</td>
<td>203</td>
<td>68</td>
<td>55</td>
<td>43</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>1991</td>
<td>245</td>
<td>90</td>
<td>69</td>
<td>205</td>
<td>74</td>
<td>59</td>
<td>40</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>1992</td>
<td>203</td>
<td>72</td>
<td>53</td>
<td>172</td>
<td>59</td>
<td>45</td>
<td>44</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>1993</td>
<td>206</td>
<td>65</td>
<td>53</td>
<td>162</td>
<td>50</td>
<td>45</td>
<td>5.9 to 8.2</td>
<td>7.8</td>
<td>11.4 to 15</td>
</tr>
</tbody>
</table>

hosp. hospital.

Results

NUMBER OF EVENTS

In all, 7210 events were collected by the register during the period 1985 to 1993, of which 3839 fulfilled the criteria for inclusion in the analysis. Eighty five per cent of all the events occurred in men (3263 of 3839), and 29% of all the events in men were out of hospital deaths (964 of 3839); for women, 45% of all the events were out of hospital deaths (262 of 561).

ATTACK, INCIDENCE, AND RECURRENCE RATES

In men, adjusted attack, total mortality, and out of hospital mortality rates decreased significantly between 1985 and 1993 (table 1). Incidence, mortality from incident events, and out of hospital mortality for incident events also decreased significantly (table 1). Recurrence rates decreased by 1.9% a year, but this decrease was not significant. Conversely, total and out of hospital mortality rates from recurrent events decreased significantly during 1985 and 1993 (table 1), and most of the decreases in rates tended to be steeper in the first three years.

In women, similar decreases were found for attack, total mortality, and out of hospital mortality rates, but those decreases were not significant (table 2). Also, a non-significant decrease was found for incidence, total mortality, and out of hospital mortality from previously, with slight modifications. Briefly, the reduction in age standardised mortality for the period 1985 to 1993 was calculated from a regression model using the natural logarithm of rate as the dependent variable and year as the independent variable. The incidence of first coronary events at the beginning and at the end of the study period was estimated using a similar regression model. The reduction in the number of deaths (per 100 000 inhabitants) resulting from the decrease in the incidence of first events was then obtained by calculating [estimated incidence rate for year 1985 − estimated incidence rate for year 1993] × 28 day case fatality rate for incident events. The reduction in the number of deaths resulting from the decrease in recurrent events was calculated similarly. In this study, mean 28 day case fatality rates for incident and recurrent events were used in the calculations.

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Table 2  Age standardised attack, incidence, recurrence, total mortality, and out of hospital mortality rates (per 100 000) from myocardial infarction events in women, 1985 to 1993

<table>
<thead>
<tr>
<th>Year</th>
<th>First attack</th>
<th>Recurrent attack</th>
<th>Total attacks</th>
<th>First recurrence</th>
<th>Recurrent recurrence</th>
<th>Total recurrence</th>
<th>Out of hospital mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>33</td>
<td>24</td>
<td>15</td>
<td>27</td>
<td>20</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>1986</td>
<td>38</td>
<td>22</td>
<td>17</td>
<td>35</td>
<td>21</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>1987</td>
<td>39</td>
<td>25</td>
<td>19</td>
<td>37</td>
<td>24</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>1988</td>
<td>38</td>
<td>23</td>
<td>16</td>
<td>36</td>
<td>22</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>1989</td>
<td>42</td>
<td>28</td>
<td>24</td>
<td>39</td>
<td>25</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>1990</td>
<td>39</td>
<td>20</td>
<td>15</td>
<td>33</td>
<td>18</td>
<td>15</td>
<td>6</td>
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<tr>
<td>1991</td>
<td>39</td>
<td>20</td>
<td>10</td>
<td>24</td>
<td>11</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>1992</td>
<td>34</td>
<td>20</td>
<td>17</td>
<td>29</td>
<td>18</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>1993</td>
<td>32</td>
<td>18</td>
<td>14</td>
<td>29</td>
<td>16</td>
<td>14</td>
<td>3</td>
</tr>
</tbody>
</table>

Trend: −1.7 to −0.3 95% CI: −5.2 to −1.8

Table 3  Age standardised 28 day case fatality (%) for all, incident, and recurrent myocardial infarction events: data from 1985 to 1993 in men and women aged 35 to 64 years from the Toulouse MONICA register

<table>
<thead>
<tr>
<th>Year</th>
<th>First attack</th>
<th>Recurrent attack</th>
<th>All events</th>
<th>First recurrence</th>
<th>Recurrent recurrence</th>
<th>All events</th>
<th>Out of hospital mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>43.4</td>
<td>61.2</td>
<td>46.9</td>
<td>67.9</td>
<td>64.5</td>
<td>73.7</td>
<td>5</td>
</tr>
<tr>
<td>1986</td>
<td>42.0</td>
<td>60.9</td>
<td>45.7</td>
<td>40.9</td>
<td>38.2</td>
<td>57.7</td>
<td>2</td>
</tr>
<tr>
<td>1987</td>
<td>39.6</td>
<td>47.8</td>
<td>41.1</td>
<td>40.3</td>
<td>15.9</td>
<td>61.7</td>
<td>1</td>
</tr>
<tr>
<td>1988</td>
<td>38.6</td>
<td>48.1</td>
<td>40.3</td>
<td>54.7</td>
<td>65.5</td>
<td>64.6</td>
<td>1</td>
</tr>
<tr>
<td>1989</td>
<td>38.1</td>
<td>44.0</td>
<td>39.2</td>
<td>45.5</td>
<td>31.8</td>
<td>50.2</td>
<td>1</td>
</tr>
<tr>
<td>1990</td>
<td>36.0</td>
<td>52.1</td>
<td>38.8</td>
<td>32.4</td>
<td>45.5</td>
<td>50.2</td>
<td>1</td>
</tr>
<tr>
<td>1991</td>
<td>37.4</td>
<td>45.2</td>
<td>38.6</td>
<td>55.9</td>
<td>23.9</td>
<td>58.0</td>
<td>1</td>
</tr>
<tr>
<td>1992</td>
<td>35.7</td>
<td>41.2</td>
<td>36.5</td>
<td>33.6</td>
<td>25.5</td>
<td>53.3</td>
<td>1</td>
</tr>
<tr>
<td>1993</td>
<td>31.8</td>
<td>31.8</td>
<td>32.8</td>
<td>32.4</td>
<td>45.5</td>
<td>50.2</td>
<td>1</td>
</tr>
</tbody>
</table>

Trend: −3.2 to −1.7 95% CI: −4.1 to −2.3

Table 4  Proportion (%) of observed reduction in mortality from myocardial infarction (change in age standardised rate/100 000 inhabitants), predicted by changes in incidence, recurrence, and case fatality rates

<table>
<thead>
<tr>
<th>Observed reduction</th>
<th>Incidence</th>
<th>Recurrence</th>
<th>Case fatality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>49%</td>
<td>27%</td>
<td>6%</td>
</tr>
<tr>
<td>Women</td>
<td>8%</td>
<td>11%</td>
<td>−2%</td>
</tr>
</tbody>
</table>

Discussion
Little is known about the evolution of cardiovascular morbidity and mortality, and about the impact of prevention and the medical management of myocardial infarction in France. Because of its well standardised methodology, data from the WHO MONICA project can be used to assess these issues.

Mortality from myocardial infarction decreased considerably in both men and women, but the decrease was significant only in men. Those findings are in agreement with other studies, and as the decrease in mortality exceeded the decrease in incidence, our data suggest that the decline in mortality from myocardial infarction mainly reflects improvements in the treatment of this condition rather than a decrease in new events.

The decrease in incidence was comparable for both men and women, but again the decrease in women did not reach significance. Those findings suggest that primary prevention is equally effective in both sexes.

Recurrence rates decreased in men, but only the decrease in mortality from recurrent myocardial infarction reached significance. As secondary prevention would decrease recurrence rates and medical care would decrease mortality, these findings indicate that acute medical care (thrombolysis, angioplasty, and emergency medicine facilities) takes precedence over secondary prevention in southwestern France. Nevertheless, in a previous report, patients living in France who survived a...
myocardial infarct received significantly more medical treatment than their Northern Irish counterparts. A possible explanation is that improvements in the acute medical care of myocardial infarction have outpaced improvements in secondary prevention in southwestern France. In women, recurrence rates decreased less than incidence rates; this suggests either a lower level of secondary prevention in this group or more severe coronary disease in women than in men. Nevertheless, this latter hypothesis would not apply to southwestern France, as the distribution of one, two, and three vessel disease was comparable in women and men (data not shown).

Out of hospital mortality decreased in both sexes, but the decrease was significant only in men. The decrease was more pronounced for recurrent cases than for incident cases, possibly indicating better management of patients with a history of myocardial infarction. These findings also suggest the need for a better education of subjects at risk of myocardial infarction, as patients who have already had an infarct tend to be admitted to hospital more rapidly than patients presenting with their initial event.

The favourable trends observed in men are reflected in other data from the French MONICA centres, and may be related in part to an increase in the acute treatment of myocardial infarction in southwestern France, a region that has been at the forefront of the acute management of myocardial infarction. The less favourable trends observed in women are most probably explained by the small number of events leading to a decrease in statistical power.

The relative part of medical treatment and of changes in cardiovascular risk factor levels on the decline in coronary heart disease mortality has been estimated at 60% and 40%, respectively. However, it is unlikely that changes in cardiovascular risk factor levels of this degree are present in Haute-Garonne, as the distribution of one, two, and three vessel disease was comparable in women and men (data not shown). The e

CONCLUSIONS
Our results show that myocardial infarction events are decreasing in men aged 35 to 64 years living in southwestern France, and that the decline in coronary heart disease mortality has probably resulted from improved management of acute cases. The non-significant trends observed in women may either reflect the small number of events collected or a stabilisation of coronary heart disease in this group. Further
Trends in myocardial infarction mortality in France

research is necessary to clarify this point. Finally, the decline in mortality from myocardial infarction appears to be almost entirely caused by improved medical management, and the effect of primary and secondary prevention remains modest.

We would like to thank all the investigators of the Toulouse MONICA centre for their invaluable contribution in the careful collection and validation of the data, as well as the physicians and cardiologists of the following institutions who helped in this process: Centre Hospitalier Universitaire Toulouse-Purpan; Centre Hospitalier Universitaire Toulouse-Rangueil; Centre Hospitalier de Luchon; Centre Hospitalier de Saint-Gaudens; Hôpital Larrey; Hôpital Marchant; Hôpital de Revel; Clinique Ambroise Paré; Clinique Aufré; Clinique Beaujpy; Clinique des Cèdres; Clinique du Château; Clinique des Connaissances; Clinique du Cours Dilon; Clinique Laziard; Clinique Marigny; Clinique Occitania; Clinique du Parc; Clinique Pasteur; Clinique du Pont de Chausse; Clinique des Pyrénées; Clinique Roquelaure; Clinique Saint-Exupéry; Clinique Saint-Jean; Clinique Saint-Michel; Clinique Saint-Roch; Clinique Sarrasani; Clinique de l’Union; Clinique Vassort; SAMU; SMUR.

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