Table S1. Hyperlipidemia diagnose rules which formulated by China Adult Dyslipidemia Prevention Guide formulate joint committee and American National Cholesterol Education Program.

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>TC (mmol/L)</th>
<th>LDL (mmol/L)</th>
<th>HDL (mmol/L)</th>
<th>TG (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Range</td>
<td>&lt;5.18</td>
<td>&lt;3.37</td>
<td>≥1.04</td>
<td>&lt;1.70</td>
</tr>
<tr>
<td></td>
<td>5.18–6.19</td>
<td>3.37–4.12</td>
<td>-</td>
<td>1.70–2.25</td>
</tr>
<tr>
<td>Verge Level</td>
<td>5.18–6.19</td>
<td>3.37–4.12</td>
<td>-</td>
<td>1.70–2.25</td>
</tr>
<tr>
<td>Increase</td>
<td>≥6.22</td>
<td>≥4.14</td>
<td>≥1.55</td>
<td>≥2.26</td>
</tr>
<tr>
<td>Decrease</td>
<td>-</td>
<td>-</td>
<td>&lt;1.04</td>
<td>-</td>
</tr>
</tbody>
</table>

Electronic Supplementary Material (ESI) for RSC Advances. This journal is © The Royal Society of Chemistry 2016
<table>
<thead>
<tr>
<th>NO.</th>
<th>Gender</th>
<th>Age</th>
<th>Diagnosis</th>
</tr>
</thead>
</table>
| 1   | Female | 64  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Unstable angina pectoris  
4. Hypertension (extremely high-risk groups) |
| 2   | Female | 80  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Chronic renal insufficiency  
4. Coronary atherosclerotic cardiopathy |
| 3   | Female | 67  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary atherosclerotic cardiopathy |
| 4   | Female | 78  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Unstable angina  
4. Hypertension (extremely high-risk groups)  
5. Arrhythmia and Atrial fibrillation |
| 5   | Male   | 61  | 1. Hyperlipidemia  
2. Atrial flutter  
3. Hypertension (high-risk groups)  
4. Chronic renal insufficiency |
| 6   | Male   | 69  | 1. Hyperlipidemia  
2. Arrhythmia and Atrial fibrillation  
3. Bronchial asthma  
4. Coronary atherosclerotic cardiopathy  
5. Hyperuricemia |
| 7   | Female | 48  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Hypertension (extremely high-risk groups)  
4. Arrhythmia and Atrial fibrillation |
| 8   | Male   | 77  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy |
| 9   | Male   | 69  | 1. Hyperlipidemia  
2. Arrhythmia and Atrial fibrillation  
3. Bronchial asthma  
4. Hyperuricemia |
| 10  | Male   | 80  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Hypertension (extremely high-risk groups)  
4. Chronic cardiac failure |
| 11  | Female | 68  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Hypertension (extremely high-risk groups)  
4. Type 2 Diabetes  
5. Acute pancreatitis |
| 12  | Female | 73  | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Hypertension (extremely high-risk groups)  
4. Type 2 Diabetes |
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 13 | Female | 77 | 5. Cardiac failure  
1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy |
| 14 | Male | 80 | 2. Hypertension (extremely high-risk groups)  
1. Hyperlipidemia |
| 15 | Male | 60 | 2. Coronary atherosclerotic cardiopathy  
3. Hypertension (extremely high-risk groups)  
4. Arrhythmia and Atrial fibrillation |
| 16 | Female | 69 | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary atherosclerotic cardiopathy  
4. Chronic renal insufficiency |
| 17 | Male | 65 | 1. Hyperlipidemia  
2. Type 2 Diabetes  
3. Coronary atherosclerotic cardiopathy |
| 18 | Female | 75 | 1. Hyperlipidemia  
2. Arrhythmia Atrial premature beats  
3. Fleshy cardiomyopathy  
4. Hypertension (extremely high-risk groups)  
5. Type 2 Diabetes  
6. Coronary atherosclerotic cardiopathy |
| 19 | Male | 77 | 1. Hyperlipidemia  
2. Arrhythmia and Atrial fibrillation  
3. Hypoproteinemia  
4. Coronary atherosclerotic cardiopathy  
5. Hyperuricemia |
| 20 | Female | 66 | 1. Hyperlipidemia  
2. Arrhythmia  
3. Hypertension  
4. Coronary atherosclerotic cardiopathy  
5. Type 2 Diabetes |
| 21 | Female | 74 | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary atherosclerotic cardiopathy  
4. Chronic renal insufficiency |
| 22 | Female | 77 | 1. Hyperlipidemia  
2. Coronary atherosclerotic cardiopathy  
3. Hypertension (high-risk groups)  
4. Cervical spondylosis |
| 23 | Male | 71 | Hyperlipidemia |
| 24 | Female | 80 | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Type 2 Diabetes  
4. Coronary atherosclerotic cardiopathy  
5. Arrhythmia and Atrial fibrillation |
| 25 | Female | 56 | 1. Hyperlipidemia  
2. Chronic renal insufficiency  
3. Hypertension (extremely high-risk groups) |
<table>
<thead>
<tr>
<th>ID</th>
<th>Gender</th>
<th>Age</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| 26 | Male   | 79  | 1. Hyperlipidemia  
2. Coronary atherosclerotic | |
| 27 | Male   | 80  | 1. Hyperlipidemia  
2. Type 2 Diabetes  
3. Arrhythmia and Atrial fibrillation  
4. Coronary atherosclerotic cardiopathy | |
| 28 | Female | 79  | 1. Hyperlipidemia  
2. Arrhythmia and Atrial fibrillation  
3. Hypertension (extremely high-risk groups)  
4. Coronary atherosclerotic cardiopathy | |
| 29 | Female | 78  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary atherosclerotic cardiopathy  
4. Type 2 Diabetes | |
| 30 | Female | 59  | 1. Hyperlipidemia  
2. Hypertension  
3. Diabetes  
4. Coronary heart disease | |
| 31 | Female | 55  | 1. Hyperlipidemia  
2. Hypertension  
3. Coronary heart disease | |
| 32 | Female | 79  | 1. Hyperlipidemia  
2. Hypertension  
3. Diabetes  
4. Coronary heart disease | |
| 33 | Male   | 60  | 1. Hyperlipidemia  
2. Hypertension  
3. Diabetes  
4. Coronary heart disease | |
| 34 | Female | 45  | 1. Coronary heart disease  
2. Hyperlipidemia | |
| 35 | Male   | 62  | 1. Hyperlipidemia  
2. Coronary heart disease | |
| 36 | Female | 52  | 1. Hyperlipidemia  
2. Unstable angina  
3. Coronary heart disease | |
| 37 | Male   | 66  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary heart disease | |
| 38 | Female | 64  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary heart disease | |
| 39 | Female | 61  | 1. Hyperlipidemia  
2. Unstable angina  
3. Hypertension (extremely high-risk groups)  
4. Coronary heart disease | |
| 40 | Female | 58  | 1. Hyperlipidemia  
2. Coronary heart disease | |
41  Male  57  1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups)  
3. Coronary heart disease  
4. Fatty liver 

42  Female  73  1. Hyperlipidemia 

43  Male  65  1. Coronary heart disease 
2. Type 2 Diabetes 
3. Hyperlipidemia 

44  Female  57  1. Hyperlipidemia 
2. Coronary heart disease 

45  Male  59  1. Hyperlipidemia  
2. Coronary heart disease  
3. Fatty liver 
4. Hypertension (extremely high-risk groups) 

46  Female  51  1. Hyperlipidemia 
2. Arrhythmia 
3. Sinus bradycardia 
4. Coronary heart disease 
5. Type 2 Diabetes 

47  Female  69  1. Hyperlipidemia 
2. Hypertension (extremely high-risk groups) 
3. Type 2 Diabetes 
4. Coronary heart disease 

48  Female  78  1. Hyperlipidemia  
2. Unstable angina 
3. Hypertension (extremely high-risk groups) 
4. Coronary heart disease 

49  Male  61  1. Hyperlipidemia 
2. Hypertension (extremely high-risk groups) 
3. Coronary heart disease 

50  Female  61  1. Hyperlipidemia 
2. Coronary heart disease 

51  Female  51  1. Hyperlipidemia 
2. Unstable angina pectoris 
3. Coronary heart disease 
4. Cervical spondylosis 

52  Female  74  1. Hyperlipidemia 
2. Hypertension (extremely high-risk groups) 
3. Coronary heart disease 

53  Male  71  1. Hyperlipidemia 
2. Coronary heart disease 

54  Female  52  1. Hyperlipidemia 
2. Arrhythmia 
3. Sinus bradycardia 
4. Coronary heart disease 
5. Fatty liver 

55  Female  56  1. Hyperlipidemia
<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Age</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>Female</td>
<td>74</td>
<td>1. Hyperlipidemia, 2. Hypertension (extremely high-risk groups), 3. Coronary heart disease</td>
</tr>
<tr>
<td>57</td>
<td>Male</td>
<td>61</td>
<td>1. Hyperlipidemia, 2. Coronary heart disease</td>
</tr>
<tr>
<td>58</td>
<td>Male</td>
<td>77</td>
<td>1. Hyperlipidemia</td>
</tr>
<tr>
<td>60</td>
<td>Female</td>
<td>53</td>
<td>1. Hyperlipidemia, 2. Unstable angina pectoris, 3. Arrhythmia</td>
</tr>
<tr>
<td>61</td>
<td>Female</td>
<td>58</td>
<td>1. Hyperlipidemia, 2. Type 2 Diabetes, 3. Coronary heart disease</td>
</tr>
<tr>
<td>62</td>
<td>Female</td>
<td>70</td>
<td>1. Hyperlipidemia</td>
</tr>
<tr>
<td>63</td>
<td>Female</td>
<td>76</td>
<td>1. Hyperlipidemia, 2. Hypertension (extremely high-risk groups), 3. Type 2 Diabetes, 4. Coronary heart disease</td>
</tr>
<tr>
<td>64</td>
<td>Male</td>
<td>65</td>
<td>1. Hyperlipidemia, 2. Hypertension, 3. Diabetes</td>
</tr>
<tr>
<td>65</td>
<td>Female</td>
<td>42</td>
<td>1. Hyperlipidemia</td>
</tr>
<tr>
<td>66</td>
<td>Female</td>
<td>51</td>
<td>1. Hyperlipidemia</td>
</tr>
<tr>
<td>67</td>
<td>Male</td>
<td>61</td>
<td>1. Hyperlipidemia, 2. Hypertension (extremely high-risk groups), 3. Type 2 Diabetes, 4. Coronary heart disease</td>
</tr>
<tr>
<td>Age</td>
<td>Gender</td>
<td>Age</td>
<td>Conditions</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>-----</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 69  | Male   | 44  | 1. Hyperlipidemia  
2. Coronary heart disease  
3. Cervical spondylosis |
| 70  | Female | 68  | 1. Hyperlipidemia  
2. Coronary heart disease  
3. Unstable angina pectoris |
| 71  | Female | 79  | 1. Hyperlipidemia  
2. Hypertension (extremely high-risk groups) |
Table S3. UPLC-MS identification of potential serum biomarkers in hyperlipidemia patients.

<table>
<thead>
<tr>
<th>NO.</th>
<th>Metabolite name</th>
<th>Rt</th>
<th>m/z</th>
<th>Molecular Formula</th>
<th>mDa</th>
<th>[M+H]/[M-H]</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-(sn-glycero-3-phospho)-1d-myo-inositol</td>
<td>0.47</td>
<td>333.0588</td>
<td>C9H19O11P</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>2</td>
<td>Gamma-Glutamyl-beta-cyanoulanine</td>
<td>0.51</td>
<td>242.0804</td>
<td>C9H13N3O5</td>
<td>1.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>3</td>
<td>Uric acid</td>
<td>0.65</td>
<td>167.0220</td>
<td>C5H4N4O3</td>
<td>-0.2</td>
<td>[M-H]</td>
<td>↑</td>
</tr>
<tr>
<td>4</td>
<td>Beta-D-Galactose</td>
<td>1.02</td>
<td>179.0573</td>
<td>C6H12O6</td>
<td>0.4</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>5</td>
<td>Acetyl-N-formyl-5-methoxykynurenamine</td>
<td>1.25</td>
<td>263.1044</td>
<td>C13H16N2O4</td>
<td>-1.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>6</td>
<td>P-Cresol</td>
<td>1.42</td>
<td>107.0501</td>
<td>C7H8O</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>7</td>
<td>Azelaic acid</td>
<td>1.68</td>
<td>187.0976</td>
<td>C9H16O4</td>
<td>0.2</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>8</td>
<td>4-Hydroxybenzaldehyde</td>
<td>1.78</td>
<td>121.0297</td>
<td>C7H6O2</td>
<td>1.2</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>9</td>
<td>Testosterone sulfate</td>
<td>2.27</td>
<td>367.1609</td>
<td>C19H28O5S</td>
<td>-0.4</td>
<td>[M-H]</td>
<td>↓**</td>
</tr>
<tr>
<td>10</td>
<td>Hydroxy-24-omo-7-(sulfoxoxy)cholan-24-yll-glycerine</td>
<td>2.3</td>
<td>528.2661</td>
<td>C26H43O18S</td>
<td>0.9</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>11</td>
<td>2-Phenylethanol glucuronide</td>
<td>2.32</td>
<td>299.1160</td>
<td>C14H18O7</td>
<td>-2.5</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>12</td>
<td>Murocholic acid</td>
<td>3.41</td>
<td>391.2861</td>
<td>C24H40O4</td>
<td>-1.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>13</td>
<td>Sphingosine 1-phosphate</td>
<td>3.47</td>
<td>378.2409</td>
<td>C18H36N5O5P</td>
<td>0.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>14</td>
<td>LysoPC(14:0)</td>
<td>3.53</td>
<td>468.3124</td>
<td>C22H46N6O7P</td>
<td>0.3</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>15</td>
<td>LysoPC(18:3(6Z,9Z,12Z))</td>
<td>3.57</td>
<td>518.3284</td>
<td>C26H48N8O7P</td>
<td>1.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>16</td>
<td>LysoPC(20:5(5Z,8Z,11Z,14Z,17Z))</td>
<td>3.58</td>
<td>542.3283</td>
<td>C28H48N8O7P</td>
<td>0.7</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>17</td>
<td>LysoPC(18:3(9Z,12Z,15Z))</td>
<td>3.65</td>
<td>518.3283</td>
<td>C26H48N8O7P</td>
<td>0.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>18</td>
<td>LysoPC(16:1(9Z))</td>
<td>3.74</td>
<td>494.3285</td>
<td>C24H48N8O7P</td>
<td>0.9</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>19</td>
<td>LysoPC(22:6(4Z,7Z,10Z,13Z,16Z,19Z))</td>
<td>3.98</td>
<td>568.3453</td>
<td>C30H50N8O7P</td>
<td>0.2</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>20</td>
<td>LysoPC(18:4(5Z,8Z,11Z,14Z))</td>
<td>4.41</td>
<td>319.2292</td>
<td>C20H32O3</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>21</td>
<td>LysoPC(20:5(5Z,8Z,11Z))</td>
<td>4.42</td>
<td>546.3605</td>
<td>C28H52N8O7P</td>
<td>1.5</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>22</td>
<td>LysoPC(16:0)</td>
<td>4.48</td>
<td>496.3446</td>
<td>C24H50N8O7P</td>
<td>0.3</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>23</td>
<td>LysoPC(18:1(11Z))</td>
<td>4.54</td>
<td>522.3605</td>
<td>C26H52N8O7P</td>
<td>0.4</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>24</td>
<td>LysoPC(22:5(7Z,10Z,13Z,16Z,19Z))</td>
<td>4.54</td>
<td>570.3620</td>
<td>C30H52N8O7P</td>
<td>0.4</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>25</td>
<td>LysoPC(16:0)</td>
<td>4.8</td>
<td>480.3472</td>
<td>C24H50N6O6P</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↓</td>
</tr>
<tr>
<td>26</td>
<td>LysoPC(22:4(7Z,10Z,13Z,16Z))</td>
<td>4.89</td>
<td>572.3764</td>
<td>C30H54N8O7P</td>
<td>-0.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>27</td>
<td>LysoPC(15:0)</td>
<td>5.96</td>
<td>482.3274</td>
<td>C23H48N8O7P</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>28</td>
<td>LysoPC(18:0)</td>
<td>6.03</td>
<td>524.3758</td>
<td>C26H54N8O7P</td>
<td>0.8</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>29</td>
<td>LysoPC(18:0)</td>
<td>6.46</td>
<td>508.3801</td>
<td>C26H54N6O6P</td>
<td>-0.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>30</td>
<td>Linoleic acid</td>
<td>7.29</td>
<td>279.2345</td>
<td>C18H32O2</td>
<td>-0.7</td>
<td>[M-H]</td>
<td>↑</td>
</tr>
<tr>
<td>31</td>
<td>Masmillic acid</td>
<td>7.92</td>
<td>471.3484</td>
<td>C30H48O4</td>
<td>-1.5</td>
<td>[M-H]</td>
<td>↓</td>
</tr>
<tr>
<td>32</td>
<td>PC(18:0/20:5(5Z,8Z,11Z,14Z,17Z))</td>
<td>8.12</td>
<td>808.5867</td>
<td>C46H82N8O8P</td>
<td>0.0</td>
<td>[M-H]</td>
<td>↑</td>
</tr>
<tr>
<td>33</td>
<td>Oleic acid</td>
<td>8.12</td>
<td>281.2499</td>
<td>C18H32O2</td>
<td>-0.3</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>34</td>
<td>SM(d18:0/16:1(9Z))</td>
<td>8.28</td>
<td>703.5788</td>
<td>C39H79N2O6P</td>
<td>-5.0</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>35</td>
<td>PC(18:0/18:4(6Z,9Z,12Z,15Z))</td>
<td>8.52</td>
<td>782.5739</td>
<td>C44H84N8O8P</td>
<td>0.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>36</td>
<td>Chenodeoxycholic acid</td>
<td>8.75</td>
<td>393.2999</td>
<td>C24H40O4</td>
<td>-0.8</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
<tr>
<td>37</td>
<td>PE(14:1(9Z)/14:1(9Z))</td>
<td>8.75</td>
<td>632.4344</td>
<td>C33H62N8O8P</td>
<td>-1.1</td>
<td>[M-H]</td>
<td>↑**</td>
</tr>
</tbody>
</table>

(*): P<0.01