EXPLORING LIPOPROTEIN PATTERNS IN DI@BET.ES STUDY

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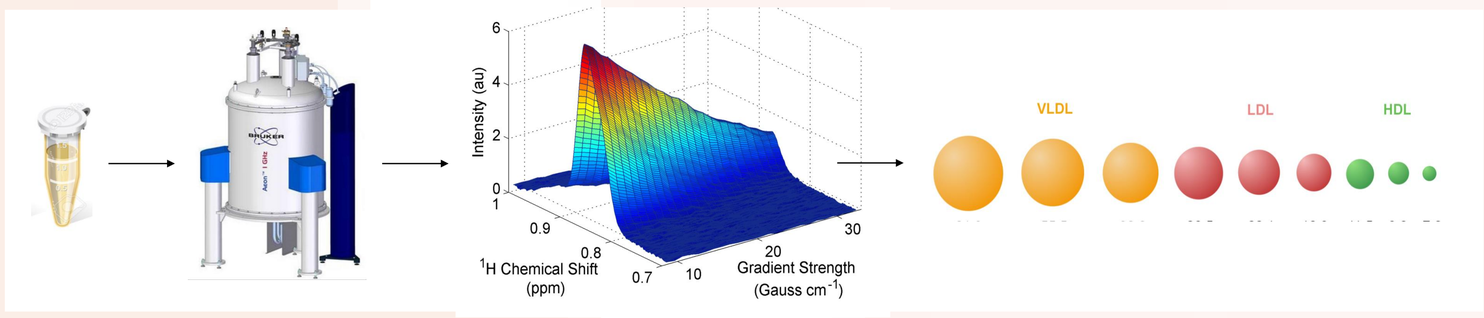
Background

- The use of advanced lipoprotein testing has largely been proposed for improving evaluation of cardiovascular disease risk associated to dyslipidaemia.
- The Di@bet.es Study was a cross-sectional, population-based study conducted in 2009-10 to evaluate Diabetes Mellitus (DM) prevalence in Spain. The aim of the present was to define informative lipoprotein patterns according to 2D diffusion-ordered 1H-Nuclear Magnetic Resonance (NMR) spectroscopy data (Liposcale Test®) with the aim to screen different risk levels among general population.

Materials and methods

- Di@bet.es study included 4826 subjects of general population. The Liposcale Test[1] was used to quantify lipid content -cholesterol (-C) and triglycerides (-TG), particle number (-P) and size (-Z) of main lipoprotein classes (VLDL, LDL, HDL) from serum samples.



- We performed exploratory multivariate analysis (unsupervised k-means clustering) to identify different lipoprotein patterns among major traditional lipid profiles. The variables included in the pattern definition were total cholesterol (TC), triglycerides (TG), prevalence of small particles and lipid composition of each lipoprotein fraction (VLDL, IDL, LDL and HDL).

Results

- Study subjects were initially classified according to major lipid profiles and further divided in 9 clusters (characteristics shown in Table 1).
- Normolipidemic individuals (30%, TC<200 mg/dl; TG<150 mg/dl) presented a low-risk lipoprotein profile, although there was a subgroup (Cluster 1, 10%, 57% men, age 50±18, LDL-C 116±19, 36% obesity, 14% DM) that showed increased triglyceride composition in HDL particles (Figure 1c).
- Hypercholesterolemic individuals (50%, TC>200mg/dl, TG<150 mg/dl) showed increased cholesterol composition in VLDL and IDL particles as well as prevalence of large and medium LDL particles (Figure 1d and 1h).
- Combined hyperlipidaemia individuals (20%, TC>200 mg/dl; TG>150 mg/dl) could be reclassified on the bases of markedly elevated triglycerides in LDL and HDL fractions. There was a subgroup with severe hyperlipidaemia (2,5%, 72%men, age 51 ± 13) with prevalence of small LDL particles (Figure 1i).

Table 1. Characteristics of each subgroup. Values as mean ± std.

	Normolipidemic			Hypercholesterolemic			Combined hyperlipidaemia		
	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**	**Cluster 6**	**Cluster 7**	**Cluster 8**	**Cluster 9**
N	482	319	618	852	671	803	119	326	470
% population	10	7	13	18	14	17	2,5	7,0	10,1
Men (%)	57	33	29	31	37	49	72	45	55
Age (years)	50 ± 18	36 ± 15	45 ± 16	50 ± 16	56 ± 15	52 ± 17	51 ± 13	56 ± 16	54 ± 17
BMI (kg/m2)	29 ± 5	25 ± 4	26 ± 5	27 ± 4	28 ± 5	29 ± 5	31 ± 4	30 ± 5	31 ± 5
TC (mg/dl)	193 ± 24	172 ± 20	201 ± 21	227 ± 23	251 ± 27	216 ± 23	271 ± 36	242 ± 38	222 ± 31
TGs (mg/dl)	110 ± 28	63 ± 15	75 ± 24	82 ± 13	121 ± 29	107 ± 21	311 ± 88	180 ± 48	172 ± 38
LDL-C (mg/dl)	116 ± 19	104 ± 15	125 ± 16	148 ± 19	160 ± 25	137 ± 20	150 ± 31	138 ± 35	129 ± 26
HDL-C (mg/dl)	52 ± 11	57 ± 12	60 ± 12	59 ± 10	56 ± 10	51 ± 9	44 ± 8	49 ± 11	49 ± 9
Known DM (%)	14	3	4	3	7	9	18	20	19
HTA (%)	33	9	18	21	33	31	39	44	43
Obesity (%)	36	11	17	19	29	34	55	44	49

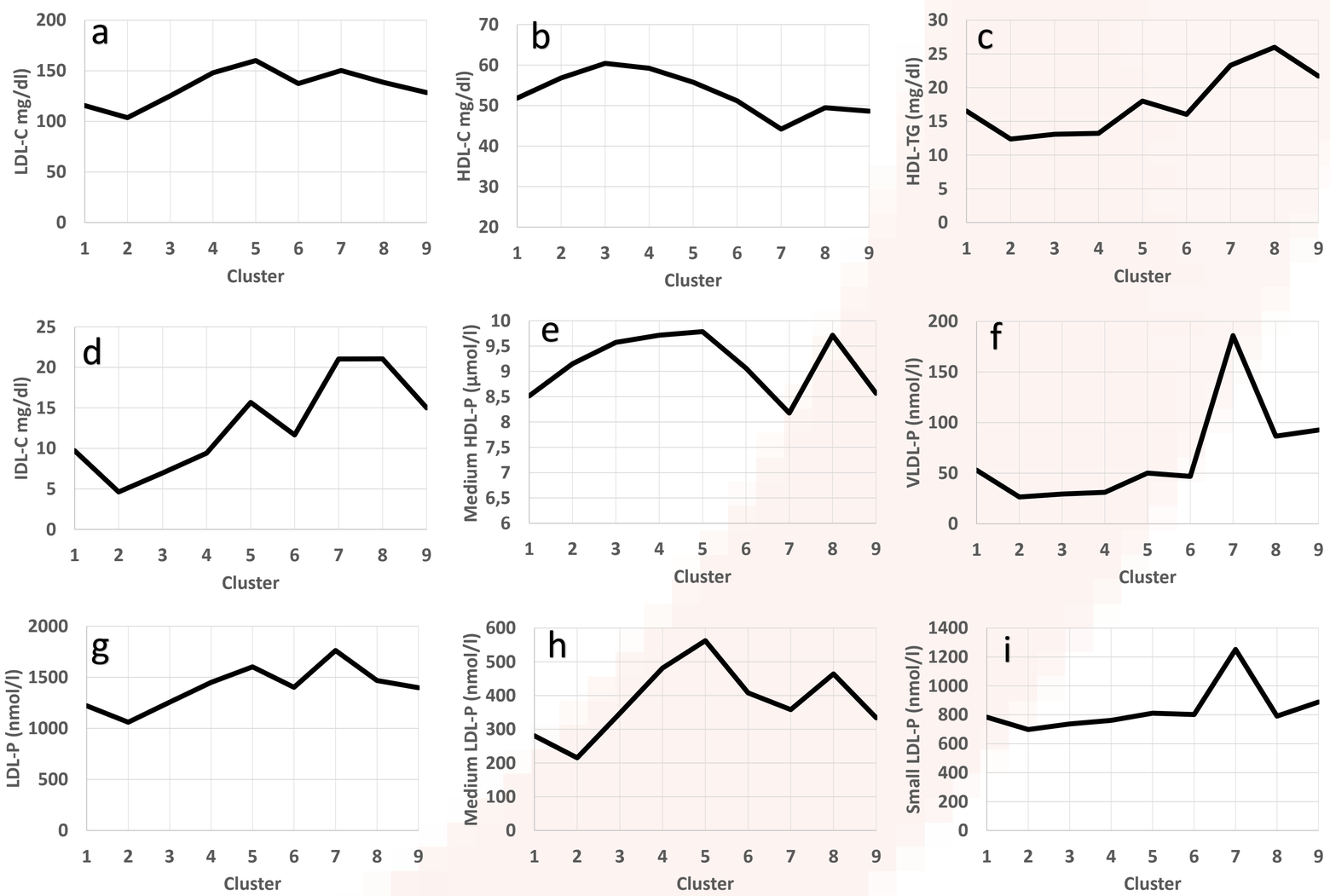


Figure 1. Mean values of each cluster for LDL cholesterol, HDL cholesterol, HDL triglycerides, IDL cholesterol, medium HDL particles, VLDL particles, LDL particles (total, medium and small)

Conclusions

- The 2D-1H-NMR Liposcale Test provides a more complete insight into lipid metabolism disturbances.
- Lipoprotein pattern recognition beyond standard lipid values allows a broad analysis of lipoprotein disturbances, a better stratification of patients and thus a more accurate clinical assessment.

References: 1. Mallol R. et al., Journal of Lipid Research, 2015.

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