Independent Research Group Clinical Epidemiology (KEPI)

Highlight/Publication:
Riedl A, Wawro N, Gieger C, Meisinger C, Peters A, Roden M, Kronenberg F, Herder C, Rathmann W, Völzke H, Reincke M, Koenig W, Wallaschofski H, Hauner H, Daniel H, **Linseisen J** (2018) Identification of comprehensive metabotypes associated with cardiometabolic diseases in the population-based KORA study. Mol Nutr Food Res 62(16), e1800117.

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Keywords:
metabotype, metabolic phenotype, cluster analysis, cardiometabolic diseases, diabetes

Central statement of the highlight in one sentence:
We identified comprehensive metabotypes in the KORA F4 study, which are significantly associated with the later occurrence of cardiometabolic diseases and, thus, relevant for disease prevention.

Text of the highlight:
Metabotyping describes the grouping of metabolically similar individuals. We aimed to identify comprehensive metabotypes in a large cohort for targeted dietary intervention, e.g. for disease prevention.
We grouped 1729 adults aged 32-77 years of the German population-based KORA F4 study (2006-2008) using k-means cluster analysis based on 34 biochemical and anthropometric parameters. We identified three metabolically distinct clusters showing significantly different biochemical parameter concentrations. Cardiometabolic disease status was determined at baseline in the F4 study and at the 7-year follow-up termed FF4 (2013/2014) to compare disease prevalence and incidence between clusters. Cluster 3 showed the most unfavorable marker profile with the highest prevalence of cardiometabolic diseases. Also, disease incidence was higher in cluster 3 compared to clusters 2 and 1, respectively, for all metabolic (54.5%/36.8%/19.7%) and all cardiovascular (6.3%/5.5%/2.3%) diseases together.
Cluster analysis based on an extensive set of biochemical and anthropometric parameters allows the identification of comprehensive metabotypes that were distinctly different in cardiometabolic disease occurrence. As a next step, these metabotypes will be replicated and validated in other populations. Finally, these metabotypes may be relevant for the development of targeted strategies with the goal of preventing diseases.

Taking account of the HMGU mission:
The metabotyping concept may be used for the development of targeted approaches for successful prevention and management of metabolic diseases, including type 2 diabetes, and cardiovascular diseases.

The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:
EPI, AME

Identification of three clusters representing metabotypes in the KORA F4 study population

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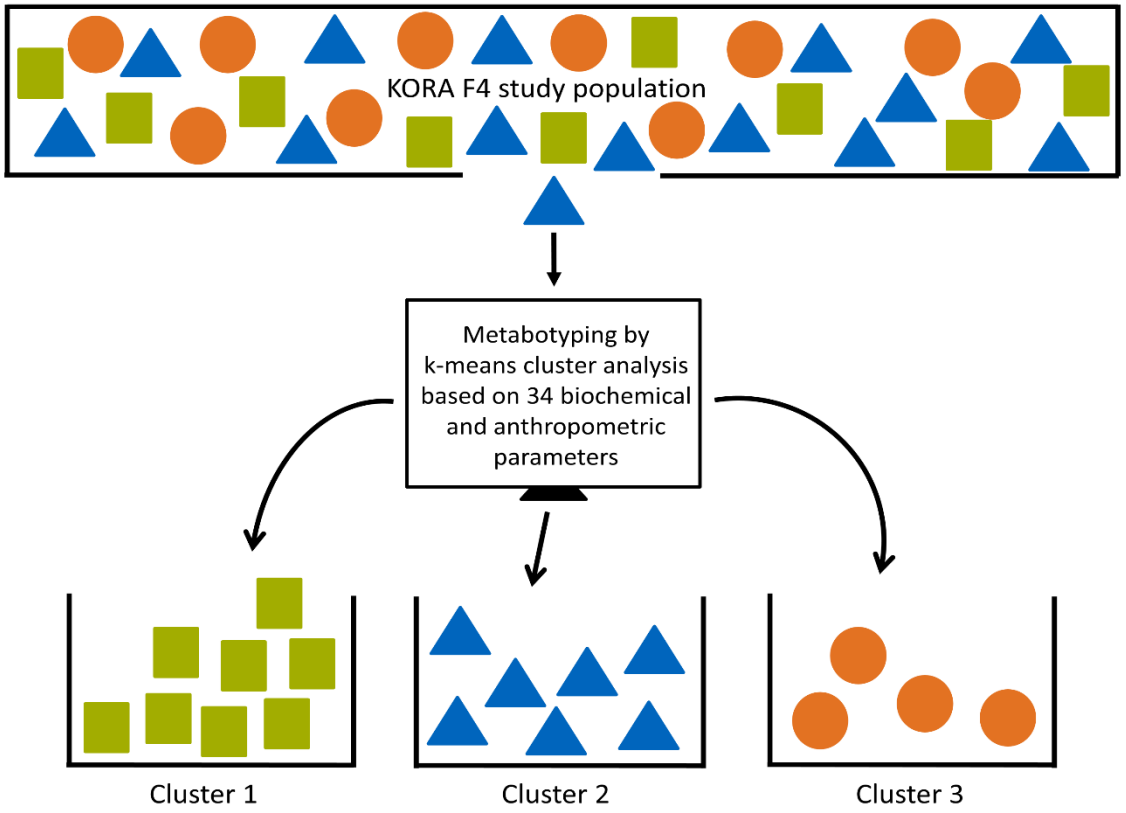

[Riedl A, Wawro N, Gieger C et al. (2018) Identification of comprehensive metabotypes associated with cardiometabolic diseases in the population-based KORA study. Mol Nutr Food Res 62(16):e1800117. Copyright Wiley-VCH Verlag GmbH & Co. KGaA. Reproduced with permission.]

Biochemical and anthropometric parameters in the total KORA F4 study population and across the three metabotype clusters

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	Total	Metabotype clusters			
		Cluster 1	Cluster 2	Cluster 3	
	N=1729	N=760	N=616	N=353	p-value
Clustering variables					
BMI (kg/m²)	27.6 (24.8, 30.7)	25.2 (23.1, 27.7)[a]	28.6 (26.1, 30.8)[b]	**31.8** (28.8, 35.5)[c]	**<0.0001**
Glucose (mg/dL)	96 (90, 106)	92 (86, 98)[a]	98 (92, 104)[b]	**114** (101, 133)[c]	**<0.0001**
Total cholesterol (mmol/L)	5.68 (5.01, 6.36)	5.45 (4.83, 6.02)[a]	**6.25** (5.68, 6.93)[b]	5.19 (4.63, 5.79)[c]	**<0.0001**
Glycated hemoglobin (%)	5.5 (5.3, 5.8)	5.4 (5.2, 5.6)[a]	5.5 (5.3, 5.8)[b]	**5.9** (5.6, 6.6)[c]	**<0.0001**
HDL cholesterol (mmol/L)	1.42 (1.19, 1.68)	**1.65** (1.42, 1.91)[a]	1.27 (1.11, 1.45)[b]	1.21 (1.06, 1.42)[b]	**<0.0001**
Uric acid (µmol/L)	313 (255, 375)	263 (226, 313)[a]	340 (293, 394)[b]	**370** (316, 428)[c]	**<0.0001**
LDL cholesterol (mmol/L)	3.57 (3.00, 4.19)	3.28 (2.79, 3.75)[a]	**4.21** (3.70, 4.73)[b]	3.18 (2.71, 3.70)[a]	**<0.0001**
Triglycerides (mmol/L)	1.26 (0.88, 1.78)	0.88 (0.70, 1.17)[a]	1.65 (1.27, 2.30)[b]	**1.73** (1.20, 2.38)[b]	**<0.0001**
Leukocytes (/nL)	5.7 (4.8, 6.7)	5.3 (4.6, 6.2)[a]	5.8 (4.9, 6.7)[b]	**6.4** (5.4, 7.6)[c]	**<0.0001**
Cystatin C (mg/L)	0.74 (0.68, 0.83)	0.71 (0.65, 0.78)[a]	0.75 (0.69, 0.83)[b]	**0.84** (0.74, 0.95)[c]	**<0.0001**
High-sensitive C-reactive protein (mg/L)	1.28 (0.63, 2.65)	0.85 (0.44, 1.56)[a]	1.51 (0.77, 2.84)[b]	**2.47** (1.17, 4.75)[c]	**<0.0001**

Median (25th, 75th percentile)

Incidence of metabolic diseases across the three metabotype clusters

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