Biomarker Trends and Health Burden in UAE Residents:

A Five-Year Longitudinal Analysis of 28,904 Clients Using Real-World Clinical Data (2021–2026)

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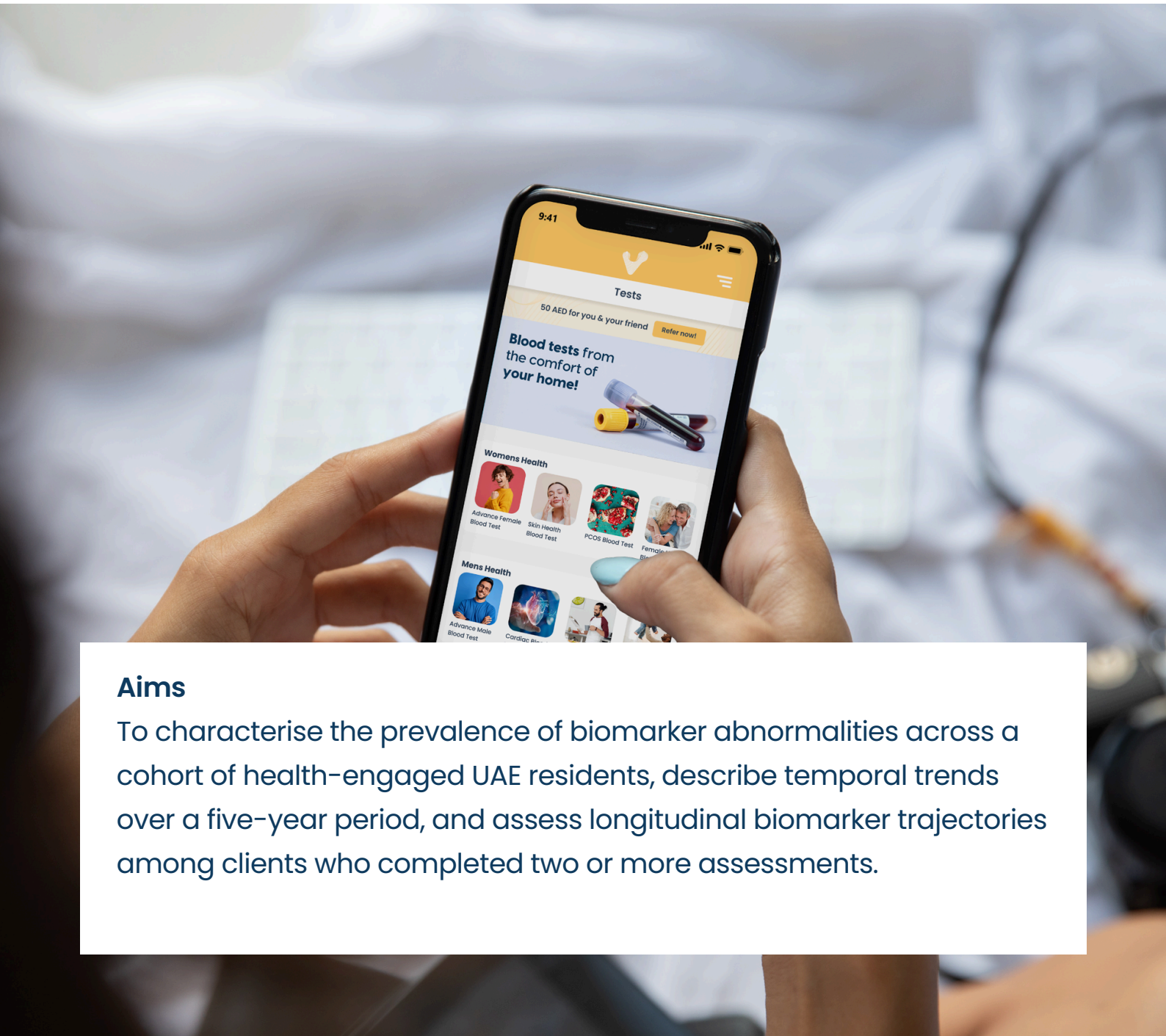
Abstract

Background

The United Arab Emirates (UAE) is a high-income, rapidly urbanised nation with a growing burden of non-communicable disease driven by sedentary lifestyles, dietary transition, and limited systematic preventive screening. Population-level biomarker data from real-world clinical settings remains scarce. This study presents findings from one of the largest longitudinal biomarker datasets compiled in the UAE private health sector.



Aims

To characterise the prevalence of biomarker abnormalities across a cohort of health-engaged UAE residents, describe temporal trends over a five-year period, and assess longitudinal biomarker trajectories among clients who completed two or more assessments.

Methods

Retrospective longitudinal analysis of anonymised biomarker data from 28,904 unique clients tested at Valeo Health, Dubai, between June 2021 and June 2026. Descriptive statistics (mean, median, SD, IQR) and 95% Wilson confidence intervals were computed for prevalence estimates. Paired two-tailed t-tests with Cohen's d effect sizes were applied to first-versus-last biomarker readings in the longitudinal cohort (n = 10,128 with ≥2 tests). Gender differences in abnormality prevalence were assessed using chi-square tests. Pearson correlations were computed between age and selected biomarker values. Data quality was assessed per biomarker using physiologically defined implausibility thresholds; biomarkers with >2% implausible readings were excluded from inferential analyses.

Results

The most prevalent abnormality was vitamin D deficiency (43.2%), followed by elevated total cholesterol (42.8%) and high LDL (34.7%). Iron abnormality was significantly more prevalent in female clients (27.0% vs 15.6%). Among repeat testers, statistically significant improvements were observed in magnesium, HbA1c, non-HDL cholesterol, and platelet count. Directional improvement was observed in ≥80% of repeat testers for iron, ferritin, creatinine, magnesium, BUN, and calcium. Supplement purchasing patterns demonstrated alignment with the detected deficiency burden: iron, omega-3, and metabolic support products were among the top ten sellers.

Conclusion

This dataset reveals a high and persistent burden of nutritional deficiency and cardiometabolic risk among health-engaged UAE residents. Vitamin D deficiency, dyslipidaemia, and iron deficiency represent the most actionable and prevalent findings. Longitudinal engagement with biomarker-led health monitoring was associated with improvement in nutritional and renal markers. These findings have implications for preventive health policy, corporate wellness strategy, and clinical practice in the UAE and broader Gulf region.

Background

The United Arab Emirates occupies a distinctive epidemiological position: a high-income country with rapid economic development, a predominantly expatriate working-age population, and a nutritional and lifestyle transition that has compressed decades of public health challenges into a single generation. National estimates indicate that non-communicable diseases (NCDs) account for approximately 73% of all deaths in the UAE, with cardiovascular disease, diabetes, and obesity identified as primary contributors.

Despite this burden, systematic preventive health screening remains inconsistently implemented across the UAE's heterogeneous population. Routine biomarker monitoring — encompassing lipid profiles, glycaemic markers, nutritional status, and hormonal function — is not universally accessible or culturally embedded in the resident population. As a result, the true prevalence of subclinical deficiency and cardiometabolic dysregulation in the UAE's working-age population is poorly characterised in the literature.

Background

Published epidemiological studies from the Gulf Cooperation Council (GCC) region have documented high rates of vitamin D deficiency, dyslipidaemia, and iron deficiency anaemia (particularly in women of reproductive age). However, the majority of these studies are cross-sectional in design, drawn from small clinical or hospital-based samples, and limited in their ability to characterise trends over time or across the range of clinically relevant biomarkers.

Over 50%

of the population is estimated to be vitamin D defiecient

50%

of the population is estimated to have dyslipidaemia

About Valeo Health

Valeo Health is a Dubai-based direct-to-consumer preventive health platform founded in 2021. Over five years, the platform has grown from a boutique testing service into a comprehensive health ecosystem, combining advanced laboratory diagnostics, clinical coaching, and precision supplementation. Clients begin with a blood panel tailored to their health goals and receive results alongside a personalised longevity score and clinical interpretation. From there, they access one-on-one coaching, targeted supplement protocols, and retesting to track progress over time.

STUDY METHODOLOGY

Study Design

Retrospective, observational, longitudinal cohort analysis of anonymised real-world biomarker data.

No experimental intervention was applied. All data was de-identified at source prior to analysis. No individual client records were accessed by the research team. Findings are presented as a hypothesis-generating observational report per standard conventions for real-world evidence studies.

28,904
Unique clients

10,128
Longitudinal cohort (≥2 tests)

6
Physiological domains

Timeframe

June, 2021 — June, 2026

Methods

Data Source and Population

Data were extracted from Valeo Health's clinical database. The study population comprised all unique clients completing at least one blood test during the study period. Biomarker readings were captured via accredited laboratory partners within the UAE regulatory framework. Inclusion: any client with at least one valid biomarker reading during the study period. Exclusion: administrative records with no biomarker values. The analytical population for trajectory analysis was restricted to clients with a minimum of two test dates separated by at least one calendar day, with the same biomarker recorded on both occasions.

Biomarker Panel

Domain	Biomarkers Included
Cardiometabolic	Total cholesterol, LDL, HDL, non-HDL cholesterol, LDL/HDL ratio, triglycerides, HbA1c, fasting glucose
Nutritional	Vitamin D (25-OH), Vitamin B12, serum iron, ferritin, magnesium, calcium
Inflammatory	C-reactive protein (CRP)
Renal	Creatinine, eGFR, blood urea nitrogen (BUN), albumin
Hepatic	SGPT (ALT), AST, GGT, alkaline phosphatase (ALP)
Haematological/Hormonal	Haemoglobin, platelet count, TSH, free testosterone, estradiol

Methods

Reference Ranges and Abnormality Definitions

Standard international laboratory reference ranges were applied for each biomarker. Abnormality was defined directionally: for biomarkers where lower values are preferable (e.g. LDL, CRP, HbA1c), a reading above the upper reference limit was classified as abnormal. For biomarkers where higher values are preferable (e.g. HDL, vitamin D, haemoglobin), a reading below the lower reference limit was classified as abnormal. For two-sided range biomarkers (e.g. calcium, magnesium, TSH), readings outside either bound were classified as abnormal.

Statistical Analysis

All analyses were conducted in Python 3.12 using NumPy, Pandas, and SciPy. Statistical significance was defined at $\alpha = 0.05$ (twotailed). No correction for multiple comparisons was applied given the exploratory nature of this analysis.

Results

Study Population

Characteristic	n	% of Total
Total unique clients	28,904	100%
Female	17,644	61.0%
Male	11,260	39.0%
Age <30 years	1,402	15.5%
Age 30–39 years	4,069	44.9%
Age 40–49 years	2,624	29.0%
Age 50–59 years	677	7.5%
Age ≥60 years	283	3.1%
Single-test clients	4,535	15.7%
2 tests	4,537	15.7%
3 tests	1,964	6.8%
4 tests	1,163	4.0%
5 or more tests	1,760	6.1%
Median inter-test interval (repeat testers)	53 days (mean: 107 days; range: 1–1,322)	

Results

Study Population

The cohort was predominantly female (61.0%) and working-age, with a median age of 38 years (range: 18–94). The largest age group was 30–39 years (44.9% of clients with known age). The age distribution was significantly associated with gender ($p < 0.001$), with men more concentrated in the 50–59 band (5.4% vs 3.4% of women) and women more concentrated in the under-30 band (15.4% vs 10.2% of men). Age data was missing for approximately 10.6% of clients (n = 1,073). Women were significantly more likely than men to retest ($p = 0.003$): 62.5% of repeat testers were female versus 59.6% of single-test clients — a difference that may reflect differential health-seeking behaviour and engagement with preventive monitoring.

17x

Growth in annual testing volume

35%

og clients returned for a second or further tests

38 years

is the median client age — peak productive years

61% Female

majority among client with higher repeat test rates

Biomarker Abnormality Prevalence

Biomarker	Prevelance	% Female	%Male	p value
Vitamin D deficiency	43.2%	40.9%	36.3%	**o.o31**
Elevated total cholesterol	42.8%	42.3%	44.3%	0.281
High LDL cholesterol	34.7%	31.2%	39.3%	**<0.001**
Elevated blood urea nitrogen	24.4%	22.3%	27.2%	**<0.001**
Iron abnormality	22.5%	27.0%	15.6%	**<0.001**
Elevated CRP (inflammation)	20.2%	19.9%	17.3%	**<0.001**
Low/abnormal magnesium	20.5%	19.4%	22.1%	**<0.001**
Non-HDL cholesterol elevated	26.8%	23.6%	31.8%	**<0.001**
Free testosterone abnormal	28.6%	N/A	6.8%	**<0.001**
Creatinine abnormal	15.9%	18.1%	13.1%	**<0.001**
TSH abnormal	16.4%	18.0%	16.4%	0.340

Biomarker Abnormality Prevalence

Table 2. Cross-sectional prevalence of biomarker abnormalities.
Prevalence based on all readings

Biomarker	Prevelance	% female	%male	p value
Ferritin abnormal	16.5%	18.7%	12.4%	<0.001
Elevated triglycerides	16.6%	13.0%	17.4%	0.002
Elevated HbA1c	8.5%	7.4%	9.0%	<0.001
Haemoglobin low	9.5%	13.3%	4.1%	<0.001
Elevated fasting glucose	10.3%	8.6%	12.2%	<0.001
Elevated SGPT (ALT)	5.8%	3.4%	9.4%	<0.001
Elevated AST	7.1%	4.2%	11.2%	<0.001

Nutritional Deficiencies

Vitamin D deficiency (25-OH < 30 ng/mL) was the most prevalent abnormality in the dataset, affecting 43.2% of clients (95% CI: 41.6–44.9%; n = 2,662). Prevalence was modestly higher in female clients (40.9% vs 36.3%; p = 0.031). Median serum 25-OH vitamin D was 32.1 ng/mL (mean: 35.6 ± 17.2 ng/mL), indicating the distribution sits close to the deficiency threshold. Vitamin D showed a significant inverse correlation with age (r = 0.089, p < 0.001), with older clients showing slightly higher levels — likely reflecting increased supplement use in that group.

Iron abnormality (serum iron outside 60–170 µg/dL) was detected in 22.5% of clients, with a highly significant gender disparity: 27.0% of female clients versus 15.6% of male clients (p < 0.001). Ferritin abnormality was similarly more prevalent in women (18.7% vs 12.4%; p < 0.001). This pattern is clinically consistent with menstrual iron loss and represents the most pronounced gender-stratified finding in the dataset.

Magnesium abnormality (outside 1.7–2.2 mg/dL) affected 20.5% of clients, with slightly higher prevalence in men (22.1% vs 19.4%; p < 0.001).

Cardiometabolic Risk Markers

Elevated total cholesterol (>200 mg/dL) was detected in 42.8% of clients — the second most prevalent finding. Elevated LDL (>130 mg/dL) was present in 34.7%, with significantly higher prevalence in men (39.3% vs 31.2%; $p < 0.001$). LDL showed a weak but significant positive correlation with age ($r = 0.036$, $p < 0.001$). Triglyceride elevation (>150 mg/dL) was present in 16.6%, more prevalent in men (17.4% vs 13.0%; $p = 0.002$). Reduced HDL (<40 mg/dL) was markedly more prevalent in men (18.1% vs 7.5%; $p < 0.001$). Glycaemic abnormalities were less prevalent but clinically significant. Elevated HbA1c (≥5.7%) was present in 8.5% (95% CI: 8.1– 8.9%), with a strong positive correlation with age ($r = 0.161$, $p < 0.001$) and higher prevalence in the ≥60 age band (38.6% vs 4.9% in under-30s). Elevated fasting glucose (>100 mg/dL) affected 10.3%.

Inflammatory Risk Markers

Elevated CRP (>5 mg/L) was detected in 20.2% of clients, with a weak positive correlation with age ($r = 0.044$, $p < 0.001$) and slightly higher prevalence in women (19.9% vs 17.3%; $p < 0.001$). Liver enzyme elevation was more prevalent in men across all three markers — SGPT: 9.4% M vs 3.4% F; AST: 11.2% M vs 4.2% F; GGT: 4.6% M vs 2.7% F (all $p < 0.001$) — consistent with higher rates of visceral adiposity and alcohol exposure in male populations.

Age-Band Stratification

Table 3. Biomarker abnormality prevalence by age band for selected cardiometabolic and metabolic marker

Biomarker	<30 yrs	30–39 yrs	40–49 yrs	50–59 yrs	≥60 yrs
LDL (>130 mg/dL)	28.7%	34.1%	37.2%	38.8%	32.7%
Total Cholesterol (>200)	43.7%	42.5%	46.1%	54.5%	37.9%
Triglycerides (>150)	11.9%	14.4%	13.5%	22.3%	29.5%
HbA1c	4.9%	5.4%	8.3%	11.7%	38.6%
Fasting Glucose	5.3%	8.5%	9.3%	16.9%	35.9%
CRP (>5 mg/L)	17.4%	18.5%	18.2%	18.0%	31.3%
Vitamin D (<30 ng/mL)	46.8%	37.7%	35.1%	41.2%	23.7%
Magnesium (abnormal)	18.6%	20.1%	20.8%	23.2%	29.0%
Haemoglobin (low)	8.4%	9.2%	8.9%	7.9%	17.1%

Key findings:

HbA1c abnormality shows a dramatic age gradient — from 4.9% in clients under 30 to 38.6% in those aged ≥60 (Pearson $r = 0.161$, $p<0.001$). The 40–49 window (8.3% abnormal) represents the highest-yield point for preventive glycemic intervention before progression to overt pre-diabetes.

Temporal Trends — Year-on-Year Prevalence

Finding	2022	2023	2024	2025	2026*
Vitamin D deficiency	52.0%	46.1%	43.8%	39.4%	46.2%
Elevated total cholesterol	52.9%	41.6%	40.4%	45.9%	41.7%
Elevated LDL	39.2%	30.7%	34.3%	36.3%	34.5%
Elevated CRP	15.4%	31.4%	14.8%	15.9%	23.9%
Elevated HbA1c	19.1%	15.1%	10.2%	10.9%	10.2%
Elevated fasting glucose	27.3%	12.4%	9.4%	12.5%	7.6%
Low/ abnormal magnesium	15.5%	31.8%	20.5%	16.5%	14.3%
Iron abnormality	22.6%	22.4%	22.1%	21.5%	21.7%

Table 3. Biomarker trends over years

Temporal Trends — Year-on-Year Prevalence

Improving Trends

- Vitamin D deficiency fell from 52.0% (2022) to 39.4% (2025), suggesting growing supplementation awareness — though the 2026 partial-year rebound to 46.2% indicates the improvement is not yet sustained without systematic protocols ·
- HbA1c fell markedly from 19.1% (2022) to 10.2% (2024–2025), temporally coinciding with rapid growth of GLP-1 therapy prescribing in the UAE from 2023 onward ·
- Fasting glucose declined from 27.3% to 7.6%, consistent with the HbA1c trend and likely reflecting the same GLP-1 adoption signal

Persistent & Worsening Areas

- LDL has remained broadly stable at 30.7–39.2% across all five years — cardiovascular risk is not improving at the population level without targeted lipid intervention ·
- Iron abnormality has shown virtually no change (21.5–22.6%) — a structural deficiency requiring systematic rather than awareness-based intervention ·
- CRP showed an anomalous spike in 2023 (31.4% vs 15.4% in 2022) before returning to baseline — likely reflecting a shift in the demographic profile of clients pr

Longitudinal Biomarker Trajectories

Biomarker	Improvement
Calcium	97.7%
Platelet count	96.1%
Ferritin	89.6%
Magnesium	86.6%
Creatinine	86.2%
Blood Urea Nitrogen	83.0%
Iron	82.0%
Vitamin D	59.4%
HbA1c	54.2%
Fasting Glucose	55.3%
Non-HDL Cholesterol	52.9%
LDL cholesterol	50.9%
Triglycerides	48.4%
CRP	47.4%

Among 10,128 clients completing ≥2 tests, paired first-versus-last biomarker readings were available for 3,300–3,900 unique clients per marker. The median inter-test interval was 53 days.

Table 5. Paired longitudinal analysis: first versus most recent biomarke

Supplement Purchasing Behaviour

Rank	Product	Biomarker Alingment
1	Valeo Hair+	Iron 22.5%, ferritin 16.5% abnormal — iron-related hair loss (telogen effluvium)
2	Mounjaro 15mg + Consultation	HbA1c 8.5%, glucose 10.3%, LDL 34.7%, TG 16.6% abnormal
3	Mounjaro 5mg	
4	Mounjaro 2.5mg	
5	Valeo Marine Collagen+	Joint/skin health — secondary to metabolic programme
6	Valeo Super Omega+	CRP 20.2% elevated; TG 16.6% elevated; LDL 34.7%
7	Mounjaro 7.5mg	see above
8	Ferrolactin+	Iron 22.5% abnormal; ferritin 16.5%; haemoglobin 9.5% low
9	Valeo Berberine+ 1000mg	Glucose 10.3% abnormal; HbA1c 8.5%; LDL 34.7%
10	Mounjaro 15mg Kwikpen	See above

The top ten products by volume during the study period are shown in Table 6. Combined Mounjaro (tirzepatide) sales across four dosage variants totalled approximately 7,973 units, representing four of the top ten products by volume. Table 6. Top 10 products by volume, Valeo Health, 2022–2026.

Temporal Trends — Year-on-Year Prevalence

GLP-1 Demand Signal

Mounjaro accounts for 4 of the top 10 products and ~7,973 units — the most concentrated demand signal in the commercial dataset. This aligns directly with the cardiometabolic risk burden (43% elevated cholesterol, 34.7% high LDL, 8.5% pre-diabetic HbA1c) and with the year-on-year decline in HbA1c abnormality from 2023 onward. Clients appear to be connecting biomarker results to pharmacological action.

Supplement–Biomarker Coherence

The alignment between deficiency burden and purchasing behaviour is striking: Ferrolactin+ (iron) ↔ 22.5% iron abnormality; Super Omega+ ↔ 20.2% CRP + 16.6% triglycerides; Berberine+ ↔ 10.3% glucose abnormality; Hair+ ↔ iron/ferritin-driven hair loss in women. The testing-to action pathway is functioning — clients identify deficiencies and respond.

Discussion

The UAE's Nutritional Health Burden

Vitamin D deficiency at 43.2% is consistent with — and in the lower range of — published estimates for the Gulf region. The finding that deficiency remained elevated across all five years, with only modest year-on-year improvement (52.0% to 39.4%) before a partial 2026 rebound, suggests that awareness alone is insufficient.

Structural interventions — testing at enrolment combined with automatic supplementation protocols — are likely required to sustain meaningful population-level change. The age-vitamin D relationship ($r = 0.089$, $p<0.001$) in the expected direction confirms that older clients are supplementing more actively. Iron deficiency affecting 22.5% overall and 27.0% of women is a finding with direct clinical significance.

The coherence between iron abnormality findings, haemoglobin abnormality (13.3% in women), ferritin abnormality (18.7% in women), and the strong commercial demand for Hair+ (3,258 units — the top-selling product) and Ferrolactin+ (1,114 units) illustrates a population where iron deficiency is manifesting clinically — and where testing is translating into targeted action. The flat year-on-year iron abnormality trend (21.5–22.6% across five years) underscores that this is a structural problem requiring systematic rather than awareness-based intervention.

Discussion

Cardiometabolic Risk at Scale

With 42.8% of clients showing elevated total cholesterol and 34.7% elevated LDL, the findings broadly align with published UAE epidemiological data (Malik & Razig, 2008; Alyousefi et al., 2019). The gender patterns are consistent with established cardiovascular epidemiology: men show higher LDL (39.3% vs 31.2%), triglycerides (17.4% vs 13.0%), and reduced HDL (18.1% vs 7.5%), and the male cohort carries a meaningfully higher composite cardiovascular risk profile. The stability of LDL abnormality across five years (30.7–39.2%) indicates that cardiovascular risk is not improving at the population level in the absence of targeted lipid intervention — a concerning pattern given the long-term consequences for UAE public health. HbA1c elevation at 8.5% — while lower than UAE population-level diabetes estimates (~17%) — represents clinically actionable pre-diabetic readings in a population that has sought preventive testing. The strong age gradient (4.9% in <30s rising to 38.6% in ≥60s; $r = 0.161$, $p < 0.001$) and male predominance are consistent with established risk factor distributions. The 40–49 age band (8.3% abnormal) represents the optimal window for preventive glycaemic intervention

The GLP-1 Transition — A Population-Level Signal

The temporal decline in HbA1c abnormality from 19.1% (2022) to 10.2% (2024–2025) is among the most striking findings in this dataset. This coincides precisely with the UAE adoption of GLP-1 receptor agonist therapy from 2023. The commercial data is corroborative: Mounjaro products account for four of the ten highest-selling products on the platform, with combined sales of approximately 7,973 units. While causality cannot be established from this observational data alone, the temporal and commercial alignment is notable and warrants prospective investigation — specifically, a study linking individual Mounjaro prescriptions to HbA1c trajectory at 3-, 6-, and 12-month follow-up in this cohort.

Discussion

Trajectory Findings — What Improves and What Does Not

The longitudinal analysis reveals a consistent pattern: biomarkers most responsive to nutritional intervention (iron, ferritin, magnesium, calcium, creatinine, BUN) show the highest directional improvement rates (82–97%), while complex cardiometabolic markers (LDL, CRP, HbA1c) show modest or non-significant effects and near-50% directional improvement rates. This distinction is clinically coherent. Iron, magnesium, and calcium respond directly and predictably to supplementation — the gap between deficiency and sufficiency is largely nutritional and can be closed within weeks of targeted repletion. LDL, CRP, and HbA1c, by contrast, are influenced by genetics, diet, exercise, pharmacotherapy, and lifestyle — and are unlikely to show large, consistent changes in an observational cohort without controlled intervention and long-term follow-up. The statistically significant but small effect on HbA1c (d = -0.106) and LDL (d = -0.041) are consistent with the expected trajectory for a population engaging in health optimisation, but should not be overstated. The BUN finding merits specific attention: the large effect size (d = 0.328) and highly significant t-statistic (t = -18.99) reflect systematic shift toward mid-range values from both above and below the reference range — consistent with normalisation of a marker sensitive to hydration, protein intake, and kidney function, all of which may improve with structured health coaching and dietary guidance.

Discussion

The Gender Health Divide

The gender-stratified findings reveal two distinct health risk profiles. Women in this cohort carry a predominantly nutritional and haematological risk burden (iron, ferritin, haemoglobin, CRP), while men carry a predominantly cardiometabolic and hepatic burden (LDL, triglycerides, reduced HDL, liver enzyme elevation). These profiles align with global epidemiology and have specific implications for targeted health programming in the UAE context. The significant gender difference in retesting rates ($\chi^2 = 8.80$, $p = 0.003$) also suggests that engagement strategies may need to differ by gender — women may be more receptive to longitudinal monitoring frameworks, while men may require stronger clinical prompting.

Implications

- **For UAE Public Health & Policy**

The scale of nutritional deficiency revealed — vitamin D at 43.2%, iron at 22.5%, magnesium at 20.5% — points to a population health gap that routine healthcare is not systematically addressing. Preventive biomarker testing, particularly for working-age adults, could serve as an effective early intervention layer before these deficiencies manifest as more serious chronic conditions.

- **For Corporate Wellness**

The predominantly 30–49 year old, professionally active client base is precisely the demographic most relevant to corporate health programmes. Elevated inflammatory markers (CRP 20.2%), cardiovascular risk (cholesterol 42.8%), and iron deficiency in women (26%) represent addressable health burdens affecting workplace performance and long-term health costs.

Discussion

- **For Clinical Practice**

The strong improvement signals in iron, ferritin, magnesium, and kidney function markers among repeat testers suggest that structured, data-led supplementation protocols produce measurable results in the nutritional markers most responsive to intervention. Clinicians working in preventive medicine in the UAE may find this dataset a useful reference for what to expect in otherwise healthy, health-engaged adults.

- **For Future Research**

Future research design should link interventions to outcomes — connecting test results to specific coaching sessions and supplement protocols would enable causal analysis. Prospective HOMA-IR calculation, anti-TPO antibody testing in the PMOS cohort, and a matched control group design would substantially strengthen subsequent publications.

Conclusions

This five-year analysis of real-world biomarker data from 28,904 UAE-resident clients provides what is, to our knowledge, one of the most comprehensive characterisations of preventive health biomarker burden in the UAE private health sector.

Conclusions

Finding 1
Vitamin D deficiency and iron abnormality — with pronounced female gender gap — represent the most prevalent and most addressable nutritional findings in this dataset.

Finding 2
Cardiometabolic risk is the dominant clinical pattern and is more pronounced in male clients — stable across all five years without targeted intervention.

Finding 3
HbA1c abnormality declined as is temporally aligned with GLP-1 prescriptions

Finding 4
Among repeat testers, 82–97% directional improvement in nutritional/mineral markers

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Data Availability Statement:

Aggregate-level statistical outputs supporting this report are available upon reasonable request to the corresponding author. Individual client data is not available for sharing due to privacy commitments. All analyses were conducted on fully anonymised data.

Ethics & Disclosure:

All data was de-identified prior to analysis. No individual client can be identified from any statistic reported in this paper. Analysis was conducted by Valeo Health's clinical research team using Valeo Health operational data — this conflict of interest is declared and should be stated in any external submission. This report is for informational and research purposes only and does not constitute clinical advice.