Supplementary material

Urbanowicz T, Skotak K, Domański-Giec I, et al. Air pollution as a non-traditional coronary disease progression risk factor in diabetic patients. Pol Heart J. 2024.

Appendix 1

The spatial distributions of air concentration fields for Poland provided by the Chief Inspectorate of Environmental Protection was used to assess the level of individual patient exposure. The air pollution components were defined accordingly to WHO criteria [1]. The median values of air pollutant exposure for the analysed period of time were related to angiogram repeated results. The individual chronic exposure was based on air pollution maps that resulted from the National Air Quality Modelling (NAQM) system elaborated by the Institute of Environmental Protection – National Research Institute in Poland (IEP-NRI) in accordance with the legal obligation set out in the Environmental Protection Act in Poland (Art 66, paragraph 6). The air quality modelling relies on air pollutants, high-resolution bottom-up emission inventory maps stored in the Central Emission Database, and air concentration maps elaborated using the GEM-AQ model, operating in the Copernicus Atmosphere Monitoring Service—Regional Production (CAMS2-40).

Statistical analysis

Data were tested for normality with Shapiro-Wilks test. Continuous data were not normally distributed and were presented as medians and interquartile range (Q1-Q3) and compared with nonparametric Mann-Whitney test. Categorical variables were presented as counts and percentages and compared with chi-square test. Spearman's test was used to describe possible correlations between air pollution parameters and Gensini score progression and age. Logistic regression was performed to analyze the predictors of coronary artery disease progression. Both univariable and multivariable analysis was performed. The multivariable logistic regression model with backward stepwise elimination method was denoted and the results were presented

as odds ratio and its 95% confidence interval. The receiver operator curve for Gensini score progression was performed, presenting the area under the curve (AUC), including its sensitivity and specificity for diagnostic performance assessment. Statistical analysis was performed using JASP statistical software (JASP Team; 2023. Version 0.18.1). $p < 0.05$ was considered statistically significant.

Table S1. Demographical, clinical, and angiographical characteristics of the analyzed group.

Parameters	All patients n=126	Diabetic patients Group 1 n=38	Non-diabetic Group 2 n=88	P 1 vs 2 group
Demographical				
Age (years) (median (Q1 – Q3)	70 (63 – 76)	69.5 (66 – 72.8)	71.5 (61 – 77)	0.65
Sex (M/F) (n, %)	79 (63) / 47 (37)	24 / 14	55 / 33	0.95
Hight (median (Q1 – Q3)	168 (160 – 175)	165 (158 – 171)	168 (161 – 177)	0.10
Weight (median (Q1 – Q3)	83 (68 – 96)	86 (73 - 95)	79 (67 – 96)	0.43
Co-morbidities				
Arterial hypertension (n, %)	77 (61)	35 (92)	42 (48)	<0.001*
Dyslipidemia (n, %)	75 (60)	30 (79)	45 (51)	0.004*
Peripehral artery disease	14 (11)	3 (8)	11 (13)	0.45
Thyroid (n, %)	8 (6)	2 (5)	6 (7)	0.95
COPD (n, %)	7 (6)	2 (5)	5 (6)	0.93
Kidney disease# (n, %)	7 (6)	3 (8)	4 (5)	0.30
Clinical presentation				
Shortness of breath (n, %)	69 (55)	23 (60)	50 (57)	0.84
Fatique on excertion (n, %)	57 (45)	15 (40)	38 (43)	0.84
CCS class (median, Q1- Q3)	2.4 (0.3)	2.3 (0.4)	2.3 (0.3)	0.79
Coronary angiography				
Gensini Score 1 (median (Q1 – Q3)	11.5 (4.4 – 34)	10.5 (3 – 29)	13 (4.6 – 37.8)	0.76
Number of PCI (n, %)	81 (64)	20 (53)	61 (69)	0.59
Gensini score after PCI (median (Q1 – Q3)	5 (0 – 12)	4 (0 – 17)	5 (0 – 10.5)	0.88

Abbreviations: CCS – canadian cardiovascular society, COPD – chronic obstructive pulmonary disease, f - female. m – male, n – number, PCI – percutaneous coronary intervention.

Table S2. Differences in Gensini score between primary and secondary coronary angiography.

Parameters	All patients n=126	Diabetic patients Group 1 n=38	Non-diabetic Group 2 n=88	P 1 vs 2 group
Time interval (days) (median, (Q1 – Q3)	371 (118 – 882)	326 (115 – 707)	371 (124 – 905)	0.68
Gensini score:				
Gensini 1 after initial PCI (median, Q1 – Q3)	5 (0 -12)	4 (0 – 17)	5 (0 – 10.5)	0.88
Gensini 2 on secondary angiography (median Q1 – Q3)	9 (1 – 30)	14 (1 – 29)	8 (1 – 29)	<0.001
Gensini progression (G2 – G1 difference) (median Q1 – Q3)	5 (0 – 16)	9 (0 - 15)	2 (0 – 10)	<0.001

Abbreviations: n – number, PCI – percutaneous coronary intervention.

Table S3. Ambient pollutant exposure in the analyzed group

Parameters ug/m3	All patients n=126	Diabetic patients Group 1 n=38	Non-diabetic Group 2 n=88	P 1 vs 2 group
PM2.5				
median values (Q1 – Q3)	15.9 (14.1 – 18.5)	16.1 (14.7 – 18.6)	15.5 (13.8 18.0)	0.19 1.00
above 15 ug/m3 (n, %)	62 (49)	19 (50)	43 (49)	0.32
above 20 ug/m3 (n, %)	4 (3)	0 (0)	4 (5)	
PM10				
median values (Q1 – Q3)	23 (21.2 – 26.1)	24.5 (22.4 – 27.7)	22.6 (20.5 – 25.6)	0.08
above 20 ug/m3 (n, %)	10 (8)	5 (13)	5 (6)	0.17
NO2				
median values (Q1 – Q3)	12.7 (10.8 – 18.9)	12.7 (11.3 – 18.9)	12.7 (10.8 – 18.9)	0.58

Abbreviations: n – number, NO2 – nitric dioxide, PM2.5 – particulate matter 2.5 microns or less, PM10 - fine particles 10 microns or less.

Table S4. Uni- and multivariable analysis for Genisini difference prediction

Parameters	Univariable			Multivariable		
	OR	95% CI	p	OR	95% CI	p
Demographical:						
Sex	1.31	0.90 – 1.90	0.16			
Age	0.99	0.96 – 1.03	0.70			
Obesity	1.19	0.71 – 1.97	0.51			
Clinical:						
HA	1.20	0.83 – 1.73	0.34			
DM	0.86	0.60 – 1.27	0.44	2.92	0.88 – 9.68	0.08
Dyslipidemia	1.03	0.72 – 1.48	0.87			
Kidney disease	0.74	0.32 – 1.72	0.48			
PAD	1.41	0.80 – 2.47	0.23			
Nicotine	1.11	0.65 – 1.91	0.70			
Gensini 1	1.03	1.00 – 1.06	0.03	1.03	0.99 – 1.07	0.08
Air pollution:						
PM2.5	1.10	0.95 – 1.27	0.20	1.26	1.00 – 1.58	0.05
PM10	1.10	0.99 – 1.22	0.09			
NO	1.07	0.98 – 1.18	0.15			

Abbreviations: DM – diabetes mellitus, HA- arterial hypertension, NO – nitrogen dioxide, PM2.5- airborne fine particles of diameter 2.5 microns or less, PM10 - airborne particulate matters of diameter 10 microns or less,

REFERENCES

1. https://www.who.int/teams/environment-climate-change-and-health/air-quality-and-health/health-impacts/types-of-pollutants