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RESEARCH LETTER
Prevention in practice

Prevalence of ideal cardiovascular health and its correlates in patients with inflammatory bowel disease, psoriasis and spondyloarthropathy

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Immune-mediated inflammatory diseases (IMIDs) — including inflammatory bowel disease (IBD), psoriasis, and spondyloarthropathy — are associated with an increased risk of cardiovascular diseases (CVD). Relative risks vary from 1.2 to 3.0 for myocardial infarction and from 1.2 to 1.6 for stroke, as compared with the general population.[1] Since available risk calculators are not designed nor validated in patients with IMIDs, CVD screening is hindered. Moreover, the 5 to 10-year time frame is too short for young adults since incident CVD will occur over decades. Ideal cardiovascular health (CVH), as defined by the American Heart Association, is strongly associated with lower CVD morbidity and mortality.[2,3] Since CVH constitutes modifiable health behaviours and factors, the assessment provides a practical approach for CVD prevention. To identify CVD risk factors that warrant assessment in routine practice in patients with IMIDs, we studied CVH and its correlates. In addition, we assessed the potential of CVH screening to identify targets for CVD preventive measures at the level of individual patients and at the level of specific IMIDs.

In this cross-sectional study (2019–2021), consecutive adult patients with IBD, psoriasis and spondyloarthropathy were included at the outpatient clinics of the Erasmus University Medical Center. The exclusion criteria were diagnosis of primary sclerosing cholangitis, history of liver transplantation, pregnancy, or lactation. The four CVH health behaviours [smoking, body mass index (BMI), physical activity, and diet] and three health factors (total cholesterol, glucose, and blood pressure) were assessed by anthropometrics, non-fasting serum samples, and patient questionnaires. The overall CVH score was calculated with 2, 1, and 0 points for an ideal, intermediate, and poor metric; the sum of these metrics yielded an overall CVH score between 0 and 14. Non-ideal CVH was defined as a CVH score <10 or a history of CVD.

Data on ethnicity and indicators of socioeconomic state (highest level of education, employment state, and median household income by ZIP code) were collected with patient questionnaires. Data on the diagnosis of CVD (heart failure, ischaemic heart disease, cerebrovascular disease, and peripheral artery disease), inflammatory activity [clinical scores (IBD: HBI and SCCAI, psoriasis: PASI, and spondyloarthropathy: ASDAS and DAPSA) and CRP levels], and medication use were extracted from medical records. Primarily, complete cases were analysed. In the case of >5% incomplete cases, sensitivity analyses were performed incorporating worst-case (0 points) and best-case (2 points) scenarios. Multivariable logistic regression models were applied to analyse the association between non-ideal CVH and patient characteristics.

A total of 670 IMID patients were included (participation rate 82.5%): 459 IBD, 105 psoriasis, and 106 SpA patients [51% male patients, median age 47 years (IQR 35–58)]. Non-ideal CVH was observed in 54% of IBD patients (in sensitivity analyses: 31–58%), 80% of psoriasis patients (56–76%), and 77% of spondyloarthropathy patients (53–71%). Non-smoking and normal glucose levels were the most prevalent ideal CVH metrics (>70%), whereas blood pressure and diet were the most prevalent non-ideal CVH metrics (>80%) (*Figure 1*). Non-ideal CVH was associated with older age (OR 1.04,

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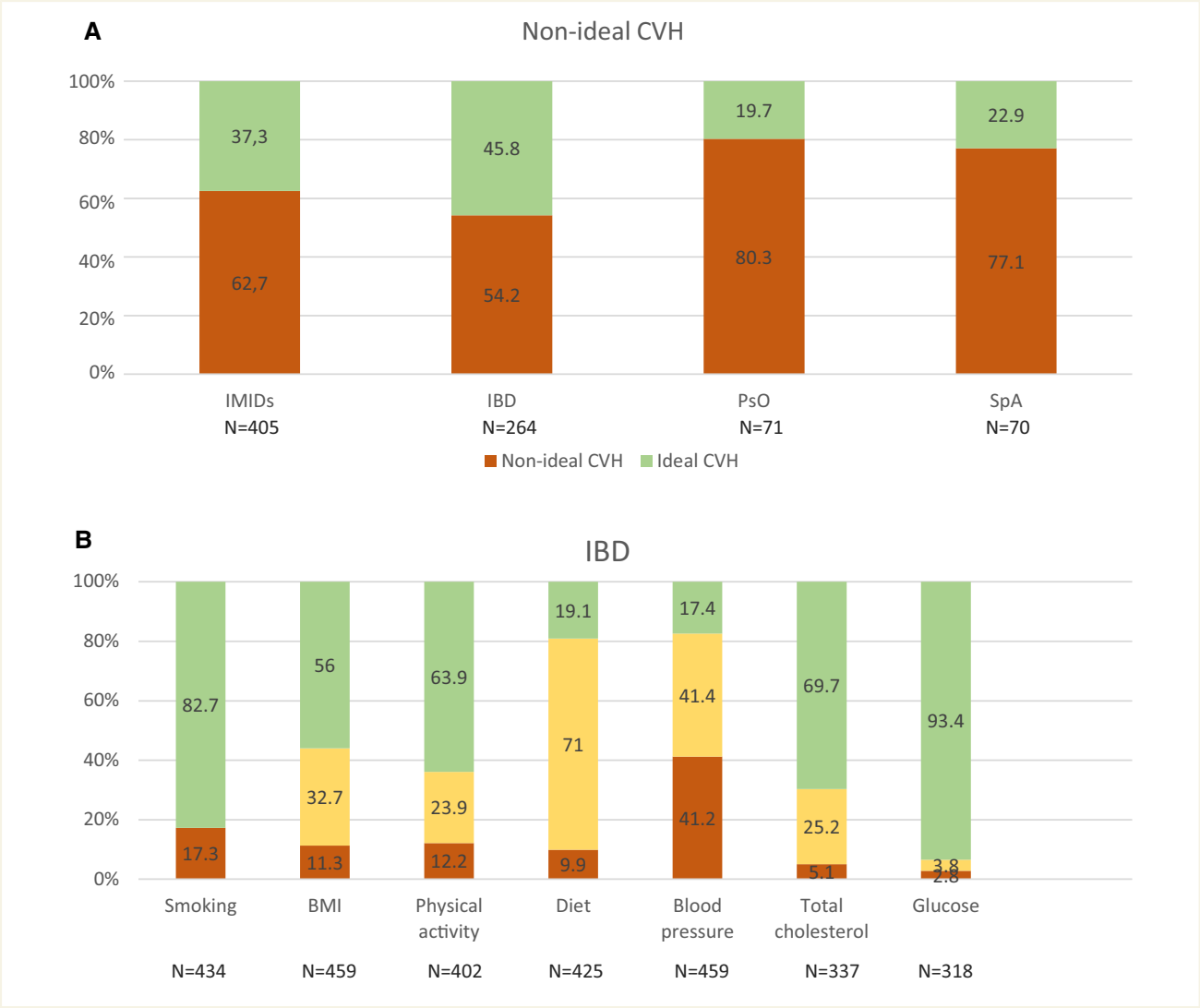

Figure 1 (*A–D*) Prevalence of non-ideal CVH and CVH metrics per IMID. Handled definitions per metric: Smoking, poor = current, ideal = never/former; BMI (kg/m^2), poor = ≥30, intermediate = 25–29.99, ideal = <25; blood pressure (mmHg), poor = systolic ≥140 and/or diastolic ≥90, intermediate = systolic 120–139 and/or diastolic 80–89 mmHg, or treated to goal, ideal = systolic <120 and diastolic <80; physical activity, poor = inactive, intermediate = moderately active, ideal = active; diet (number of ideal components), poor = 0–1, intermediate = 2–3, ideal = 4–5; total cholesterol level (mmol/L), poor = ≥6.2, intermediate = 5.2–6.2, ideal = <5.2; glucose (mmol/L, non-fasting), poor = ≥11.1, intermediate = 7.8–11.11, ideal = <7.8.

95%CI 1.02–1.05), a lower education level (OR 1.51, 95%CI 1.15–2.00), and clinical disease activity (OR 2.08, 95%CI 1.31–3.31), but not CRP level (OR 1.02, 95%CI 0.99–1.05) (*Table 1*). In particular, the diagnosis of psoriasis was related to non-ideal CVH (OR 3.85, 95%CI 1.06–14.03). Within subgroup analyses, the association between non-ideal CVH and clinical disease activity was significant in IBD (OR 1.65, 95%CI 1.09–2.78), with a similar trend in psoriasis and spondyloarthropathy.

Non-ideal CVH is an epidemic problem. According to two contemporary European studies, the prevalence of non-ideal CVH in the general population ranges from 75 to 85%.[4,5] These prevalences correspond to our study findings; however, a direct comparison of literature is non-valid since CVH is affected by region and study time variations. Clustering of cardiovascular risk factors and excess cardiovascular risk has previously been reported in older age and lower educated groups.

With regard to CVH metrics, the higher prevalence of hypertension is in line with previous publications in psoriasis and spondyloarthropathy and parallels disease activity.[6] Although its pathophysiological mechanism is unknown, evidence implies an increased activation of inflammatory pathways involving TNFα and interleukin-17.[7] In our study population, the proportion of smokers was lower (19%) than that in the Dutch general population (27%).[8] This might be explained by the aggravating effect of smoking on disease activity and the severity of IMIDs motivating patients to quit. The tendency of lipid levels to decrease during active inflammation might contribute to our observation of favourable lipid profiles in patients with IMIDs.

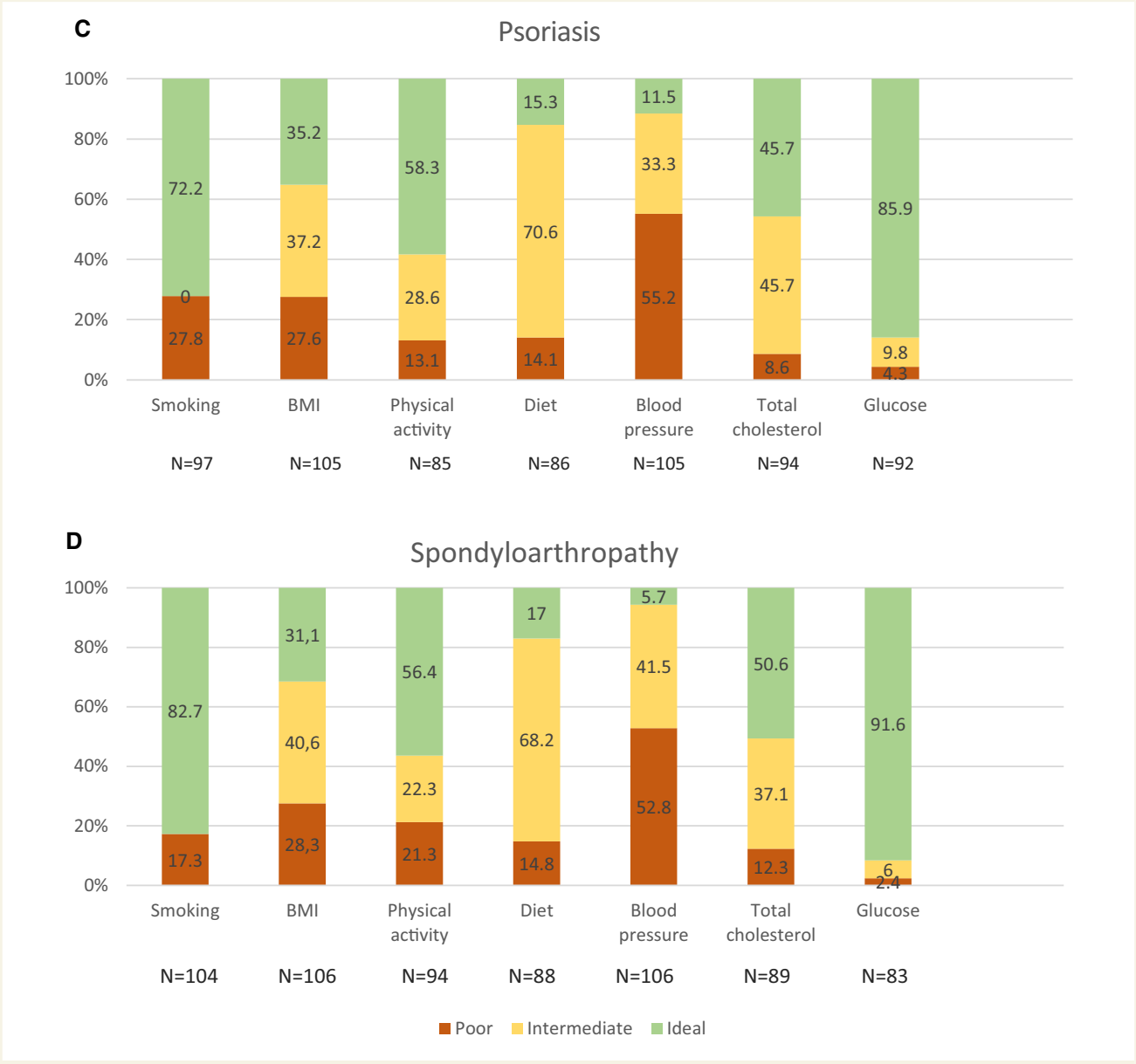

Figure 1 Continued

Differences in CVH profiles between the studied IMIDs are probably caused by the nature of the diseases. In IBD, the ideal BMI might not reflect the actual physical status of patients. Being underweight is relatively more prevalent among IBD patients. As being underweight doubles the risk of CVD compared with people of normal weight, incorporating BMI < 18.5 kg/m^2 as a non-ideal CVH metric might be justified.[9] In contrast, the majority of psoriasis and spondyloarthropathy patients is overweight (≥65%). Inherent to the symptomatology of spondyloarthropathy, physical activity was more often impaired compared with IBD and psoriasis patients. In addition, impaired intestinal lipid fat uptake might explain the low prevalence of hypercholesterolaemia in IBD. The contribution of clinical disease activity to non-ideal CVH seems plausible, as functional impairment induced by diarrhoea, arthralgia, and/or fatigue is a strong determinant of non-ideal health behaviour. Further data are required to verify the correlation between the clinical symptoms and objective inflammatory activity in IMIDs.

In addition to decreasing cardiovascular risk, CVH improvement may positively affect IMID outcomes. Obesity worsens IBD activity and might result in a suboptimal response to therapy, including DMARDs and anti-TNFα.[10] Physical training is the cornerstone of treatment in axial spondyloarthropathy and positively affects health-related quality of life in IBD and psoriasis. [1]

To conclude, non-ideal CVH is observed in the majority of patients with IMIDs. CVH assessment is a readily available screening tool that provides guidance for preventive measures. Since hypertension is a highly prevalent non-ideal CVH in patients with IMID, blood

Table 1 Association between non-ideal CVH and demographic and disease characteristics

	Model 1			Model 2		
	OR	95%CI	*P*-value	OR	95%CI	*P*-value
IMID						
IBD				ref		
PsO				3.85	1.06–14.03	**0.041**[a]
SpA				2.31	0.41–13.08	0.343
Male	1.12	0.71–1.76	0.623	1.03	0.65–1.67	0.882
Age, per year	1.04	1.02–1.05	<**0.001**[a]	1.03	1.01–1.05	<**0.001**[a]
Ethnicity, Caucasian	0.83	0.44–1.55	0.554	0.91	0.49–1.68	0.753
Socioeconomic state						
Low education level	1.51	1.15–2.00	**0.004**[a]	1.49	1.12–2.00	**0.006**[a]
Unemployment	1.05	0.67–1.94	0.866	1.23	0.51–1.71	0.814
Disability[b]	1.30	0.56–3.01	0.542	1.29	0.55–2.98	0.561
Median household income	0.84	0.65–1.09	0.195	0.83	0.64–1.08	0.161
Disease activity						
Clinical activity	2.08	1.31–3.31	**0.002**[a]			
Clinical activity*IBD				1.65	1.09–2.78	**0.044**[a]
Clinical activity*PsO				1.65	0.51–5.31	0.401
Clinical activity*SpA				1.19	0.95–3.43	0.195
CRP level, mg/L	1.02	0.99–1.05	0.133	1.02	0.98–1.05	0.230

Multivariable logistic regression models were applied to analyse the association between non-ideal CVH and patient and disease characteristics in the total population (Model 1) and in separate IMID populations (Model 2).

Justification for the covariate selection: clinical symptoms may influence health behaviour; CRP has proposed independent risk factors for CVD but may also partly reflect mutual associations with established CVD risk factors. As the definition of clinical disease activity differs per IMID, interaction terms are used in Model 2. OR, odds ratio; CI, confidence interval; IBD, inflammatory bowel disease; PsO, psoriasis; SpA, spondyloarthropathy; CRP, C-reactive protein.

[a]Below the significance level of *P* 0.05.

[b]Partial or complete incapacity or eligibility for the Sickness Benefits Act.

pressure monitoring during routine practice seems warranted. Our data suggest that prevention strategies should be targeted to IMID diagnosis, age group, and education level. The effect of CVH intervention in IMIDs requires further longitudinal investigation.

Authors' contributions

No additional writing assistance was used for this manuscript. J.A.M.S., J.E.R.v.L., A.C.d.V., and C.J.v.d.W. contributed to the design of the study. J.A.M.S. and P.J.P.V. collected the data and J.A.M.S. analysed the data and drafted the manuscript. All authors critically revised the manuscript for important intellectual content. All authors have approved the final versions of this manuscript.

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Data availability

Data are available on reasonable request.

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