Primary care-based screening for cardiovascular risk factors in patients with psoriasis*

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Summary

Background Studies assessing cardiovascular disease (CVD) risk factors in patients with psoriasis have been limited by selection bias, inappropriate controls or a reliance on data collected for clinical reasons.

Objectives To investigate whether screening for CVD risk factors in patients with psoriasis in primary care augments the known prevalence of CVD risk factors in a cross-sectional study.

Methods Patients listed as having psoriasis in primary care were recruited, screened and risk assessed by QRISK2.

Results In total, 287 patients attended (mean age 53 years, 57% women, 94% white British, 22% severe disease, 33% self-reported psoriatic arthritis). The proportion with known and screen-detected (previously unknown) risk factors was as follows: hypertension 35% known and 13% screen-detected; hypercholesterolaemia 32% and 37%; diabetes 6·6% and 3·1% and chronic kidney disease 1·1% and 4·5%. At least one screen-detected risk factor was found in 48% and two or more risk factors were found in 21% of patients. One in three patients (37%) not previously known to be at high risk were found to have a high (> 10%) 10-year CVD risk. Among the participants receiving treatment for known CVD risk factors, nearly half had suboptimal levels for blood pressure (46%) and cholesterol (46%).

Conclusions Cardiovascular risk factor screening of primary care-based adults with psoriasis identified a high proportion of patients (i) at high CVD risk, (ii) with screen-detected risk factors and (iii) with suboptimally managed known risk factors. These findings need to be considered alongside reports that detected limited responses of clinicians to identified risk factors before universal CVD screening can be recommended.

What's already known about this topic?

- Several studies have suggested that patients with psoriasis have a greater number of risk factors for cardiovascular disease (CVD) and a higher risk for vascular events compared with the general population.
- However, the prevalence data used to support systematic CVD risk factor screening in psoriasis have been limited by selection bias, inappropriate choice of control groups or reliance on risk factors measured for other clinical reasons.

> **What does this study add?**
>
> - Cardiovascular risk factor screening of primary care-based adults with psoriasis identified a high proportion of patients (i) at high CVD risk, (ii) with screen-detected risk factors and (iii) with suboptimally managed known risk factors.
> - These findings need to be considered alongside reports that detected limited responses of clinicians to identified risk factors before universal CVD screening can be recommended.

Several studies have suggested that patients with psoriasis have a greater number of risk factors for cardiovascular disease (CVD) and a higher risk for vascular events compared with the general population.[1] However, the prevalence data used to support systematic CVD risk factor screening in psoriasis have been limited by selection bias, inappropriate choice of control groups or reliance on risk factors measured for other clinical reasons.[1-4]

No previous primary care-based study has assessed how CVD risk factor screening influences the estimated prevalence of CVD risk factors in patients with psoriasis or estimated the potential benefits of CVD risk factor identification or intervention.

Our aims were (i) to investigate whether CVD risk factor screening in primary care could influence the estimated prevalence of CVD risk factors in patients with psoriasis, (ii) to assess whether the prevalence of screen-detected CVD risk factors or CVD risk varies by age, psoriasis severity and the presence of psoriatic arthritis (PsA) and (iii) to calculate the expected clinical benefits of normalizing modifiable risk factors.

Materials and methods

Selection of general practices

We recruited patients from 13 general practices within North West England sampled on list size and deprivation level based on practice postcode.

Selection of participants

Participating practices were invited to identify adults with psoriasis using Read codes mapping to psoriasis and current prescribing of psoriasis medications (Appendix 1). Exclusion criteria were severe mental health problems, those without capacity to consent, recently bereaved and terminally ill individuals. Eligible patients with psoriasis were sent an invitation by their general practitioner (with a reminder when appropriate) to attend their practice for CVD risk screening.

Data collection

Respondents were asked to self-complete several questionnaires before the assessment visit [Self-assessment Psoriasis Area and Severity Index (PASI),[5] Rose Angina Questionnaire,[6] Psoriasis Epidemiology Screening Tool][7] and during the visit (PsA questions, medical history, psoriasis history, social and family history, therapy and comorbidity) with some additional face-to-face questions asked by the nurse (alcohol and smoking). Examination included height, weight (Seca 877; Seca, Hamburg, Germany) and blood pressure (Omron 907 BPM; Omron, Osaka, Japan). A fasting blood sample was taken for glycated haemoglobin (HbA_{1c}), lipids, glucose, liver and renal function.

Known cardiovascular disease risk factors

Practice staff provided information about known CVD risk factors. We used this information along with information about medication and self-reported risk factors to assess whether risk factors were newly detected by screening.

Comparison with Health Survey for England

The prevalence of risk factors was compared with that in a general population sample drawn from the Health Survey for England 2011.[8]

Exposure and outcome definitions

'PsA' was defined as positive responses to any three out of the five Psoriasis Epidemiology Screening Tool questions[7] or a positive response to the question 'Have you ever been told that you have arthritis associated with psoriasis?'.

'Severe psoriasis' was defined as a self-assessment PASI score > 10 or currently receiving one or more psoriasis medications (Appendix 2).

We used the following definitions for abnormal values also used in the Health Survey for England.

'Hypercholesterolaemia' was defined as a positive response to the question 'Have you been told you have high cholesterol or high blood fat levels?', the use of lipid-lowering therapy or total cholesterol > 5 mmol L^{-1}.

'Diabetes' was defined as a positive response to the question 'Have you ever been told by a doctor you have diabetes?' or $HbA_{1c} \geq 48$ mmol mol^{-1} or the use of diabetes medication.

'Hypertension' was defined as a positive response to the question 'Have you been told you have high blood pressure?', systolic blood pressure > 140 mmHg, diastolic blood pressure > 90 mmHg or use of antihypertensive medication.

'Alcohol excess' was defined as > 21 units per week in men and > 14 units per week in women.

'Suboptimal levels of risk factors on therapy' were defined as systolic blood pressure: > 140 mmHg, diastolic blood pressure > 90 mmHg, cholesterol > 5 mmol L^{-1} and HbA_{1c} ≥ 53 mmol mol^{-1}.

'Rheumatoid arthritis' was defined as a positive response to the question 'Have you ever been told by a doctor that you have rheumatoid arthritis?'.

Sample size calculations

We aimed to recruit 320 people to yield estimates of the prevalence of CVD risk factors to within ~ 1·9% of the true value for rarer factors and to within ~ 5·3% of the true value for common factors.

Statistical methods

Data are reported as mean (SD) or median (range) depending on data distribution. Groups were compared using χ^2-test or Fisher's exact test for categorical data and Student's t-test or the Mann–Whitney U-test for continuous data.

Sampling weights for the Health Survey for England data were calculated by sex, ethnicity and 5-year age band, weights being equal to the number of subjects in the stratum in the psoriasis sample divided by the number of subjects in that stratum in the Health Survey for England data. These weights were used as sampling weights to standardize Health Survey for England estimates to the age, ethnicity and sex distribution of the psoriasis sample.

QRISK2 data were calculated by using STATA plugins using the QRISK-2013 source code (ClinRisk Ltd., Nottingham, U.K.). Using the QRISK2 calculator, the optimized CVD risk was calculated using an ideal set of modifiable risk factors for each individual (no smoking, cholesterol/high-density lipoprotein ratio = 5, systolic blood pressure = 140 mmHg and body mass index = 25 kg m^{-2}). The absolute change in predicted risk through risk factor optimization was calculated as the optimized risk minus the predicted risk before risk factor optimization.

P < 0·05 was considered statistically significant. All analyses were performed using STATA 13 (StataCorp, College Station, TX, U.S.A.).

Research ethics

The study was approved by the local research ethics committee [North West Research Committee, Greater Manchester East (REC ref: 11/NW/0654)]. Written informed consent was obtained from all participants.

Results

Invitations to attend were sent to 1446 patients, 287 of whom (20%) enrolled. Overall, 22% of participants had severe psoriasis defined by a high self-administered PASI score (7·4% had an index of > 10) or use of disease-modifying therapies (16% of participants) and one-third self-reported PsA (Table 1).

More than one-third (35%) of patients were clinically obese, 52% had a very high waist circumference (> 102 cm for men; > 88 cm for women) and one in six (18%) participants were current smokers (Table 1). Diabetes was self-reported in 6·6% and two-thirds of these patients were receiving diabetes medication. Approximately one-third self-reported high cholesterol levels (29%) and high blood pressure (33%) and over two-thirds of these were receiving medication for these conditions [21% of the total cohort were taking lipid-lowering medication (96% were taking a statin); 25% were taking antihypertensive medication].

A self-reported history of coronary or cerebrovascular disease or atrial fibrillation was reported by less than 10% of participants (Table 1). In a separate assessment, the Rose Angina Questionnaire elicited a history of myocardial infarction in 7·7% of participants, angina in 7·7% and intermittent claudication in 1·4%.

Prevalence of known and screen-detected (not previously known) cardiovascular disease risk factors

The proportion of participants with known and screen-detected (not known) CVD risk factors was as follows: hypertension, 35% known and 13% screen-detected; hypercholesterolaemia, 32% and 37%; diabetes, 6·6% and 3·1%; and chronic kidney disease, 1·1% and 4·5% (Fig. 1). At least one screen-detected risk factor was found in 48% of patients and at least two risk factors were found in 21% of patients. The prevalence of screen-detected risk factors did not vary significantly by age, psoriasis severity or by the presence of self-reported PsA (Table S1; see Supporting Information).

Comparison of prevalent cardiovascular disease risk factors with Health Survey for England data

In an age-, sex- and ethnicity-weighted analysis, the prevalence of hypertension was 12% higher (P < 0·001) in study participants and the prevalence of hypercholesterolaemia was 7% lower (P = 0·03; Fig. 2) than in the general population.

As ciclosporin can cause hypertension we excluded patients treated with this drug but the results were essentially unchanged [n = 269, proportion with hypertension = 47·6%, prevalence difference compared with Health Survey for England data = 11·2%; 95% confidence interval (4·6–17·8)].

Some,[9–11] but not all,[12] previous studies have suggested that methotrexate therapy is associated with a lower serum cholesterol. In our study cohort, prevalent

Table 1 Clinical characteristics of Identification and Management of Psoriasis Associated ComorbidiTy study participants, n = 287

Variable	Data
Age, years	53 (15)
Female sex	57
Index of multiple deprivation for practice [median (range)]	19 (10–49)
Ethnicity	
White British	94
Other white	3
Asian/Asian British	3
Weight, kg	81 (17)
BMI, kg m^{-2}	28·8 (5·9)
Obesity (BMI ≥ 30 kg m^{-2})	35
Waist circumference, cm	96 (15)
Smoking	
Current	18
Previous	39
Family history of premature cardiovascular disease	19
Psoriasis severity and psoriatic arthritis	
Severe psoriasis[a]	22
Self-administered PASI, median (range); mean (SD)	3·4 (0–26·9); 4·2 (3·8)
Self-reported psoriatic arthritis	33
Self-reported cardiovascular disease risk factors	
Hypercholesterolaemia	29
Hypertension	33
Diabetes	6·6
Cardiovascular disease[b]	8·4
Chronic kidney disease	1·1
Rheumatoid arthritis	7·7
Atrial fibrillation	5·6
Screening test results (all patients)	
Total cholesterol, mmol L^{-1}	5·1 (1·2)
LDL cholesterol, mmol L^{-1}	3·1 (1·0)
HDL cholesterol, mmol L^{-1}	1·5 (0·4)
Non-HDL cholesterol, mmol L^{-1}	3·2 (1·2)
Triglycerides, mmol L^{-1}, median (range)	1·3 (0·4–4·9)
Blood pressure, mmHg	130 (18)/78 (11)
Fasting plasma glucose, mmol L^{-1}	5·6 (5·3)
HbA$_{1c}$ mmol mol^{-1}	38·3 (7·1)
eGFR, mL min^{-1}	89 (20)

BMI, body mass index; PASI, Psoriasis Area and Severity Index; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate; HbA$_{1c}$, glycated haemoglobin. Data are provided as percentages or mean (SD) values, unless otherwise stated. [a]Defined as Self-administered PASI > 10 or use of disease-modifying therapy (psoralen–ultraviolet A, methotrexate, ciclosporin, acitretin, fumaric acid esters, etanercept, adalimumab, infliximab or ustekinumab). [b]Self-reported myocardial infarction, stroke, transient ischaemic attack, coronary artery bypass surgery, coronary angioplasty or carotid endarterectomy.

hypercholesterolaemia was lower in subjects taking methotrexate compared with those not taking methotrexate (59% vs. 70%, P-value not significant). When we excluded patients

taking methotrexate from the psoriasis cohort, the prevalence of hypercholesterolaemia was not statistically different from the prevalence in the Health Survey for England (P = 0·08).

Level of control of risk factors in participants with known risk factors

Among the study participants receiving treatment for CVD risk factors, nearly half had suboptimal levels for blood pressure (46%) and/or total cholesterol (46%) and one-quarter of participants had suboptimal levels for glucose assessed by HbA$_{1c}$ (26%) (Table S2; see Supporting Information).

Predicted 10-year risk and the anticipated response to risk factor optimization

Using current National Institute for Health and Care Excellence (NICE) guidelines, most patients with established CVD, type 1 diabetes, familial hypercholesterolaemia or renal impairment are considered to be at high risk of CVD and unsuitable for CVD risk calculation.[13] In our study, participants not considered 'high risk' by NICE guidelines had an average QRISK2-predicted 10-year CVD risk of 10%, meaning that over 10 years 10% would be expected to have a CVD event (Table 2). Owing to the skewed risk distribution, just over one-third of these patients (37%) were assessed to be at high CVD risk using the 10-year CVD risk threshold of > 10%.[13] The predicted average absolute reduction in 10-year risk achieved through optimizing modifiable risk factors was 1·6%, giving a number needed to treat (NNT) of 60 patients to prevent one vascular event over 10 years.

Predicted lifetime risk and the anticipated response to risk factor optimization

The mean predicted lifetime CVD risk estimated by QRISK2 was 35%. Overall, 13% of participants had a high lifetime CVD risk of > 50%. Optimization of modifiable risk factors would reduce the lifetime risk by 2·8%, giving an NNT of 36 patients to prevent one vascular event over a lifetime.

Predicted risk and response to risk factor optimization by psoriasis severity and psoriatic arthritis

Compared with patients without self-reported PsA, those with self-reported PsA had a 77% higher predicted 10-year CVD risk assessed by QRISK2 (Table 2; 14·0% vs. 7·9%, P = 0·001). This higher risk largely disappeared after adjusting for mean age, which was higher in those with self-reported PsA (58 years vs. 51 years; analysis not shown).

The absolute reduction in 10-year and lifetime CVD risk, predicted through risk factor optimization, was higher for participants with severe psoriasis and self-reported PsA compared with those without these conditions (Table 2).

In participants < 40 years of age, the average CVD risks were much lower [10-year CVD risk = 0·7%, lifetime CVD
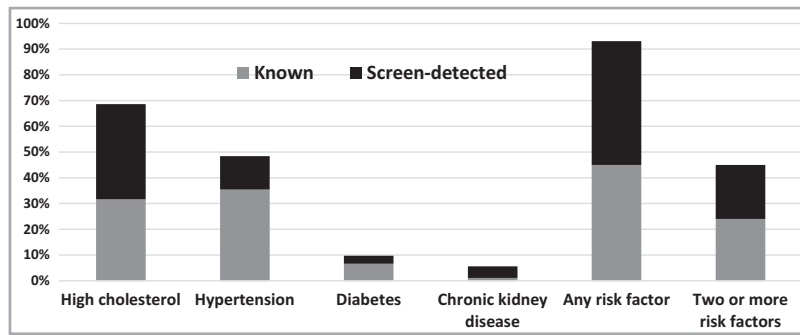
Fig 1. Proportion of Identification and Management of Psoriasis Associated ComorbidiTy (IMPACT) study participants with known and screen-detected cardiovascular disease risk factors. Data are proportions of IMPACT study participants. 'Known' is the sum of (i) self-report, (ii) medical or nursing staff knowing about this risk factor and (iii) medication for this risk factor. High blood pressure was defined as systolic blood pressure $\geq$ 140 mmHg or diastolic blood pressure $\geq$ 90 mmHg. High cholesterol was defined as total cholesterol $\geq$ 5 mmol L^{-1}. Diabetes was defined by high glycated haemoglobin $\geq$ 48 mmol mol^{-1}. Chronic kidney disease was defined by low estimated glomerular filtration rate < 60 mL min^{-1}.
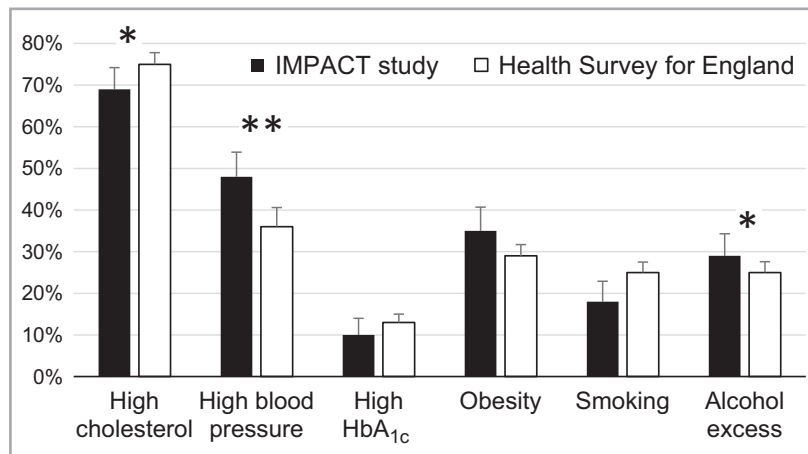

Fig 2. Prevalence of combined known and screen-detected cardiovascular risk factors in Identification and Management of Psoriasis Associated ComorbidiTy (IMPACT) study and Health Survey for England participants. Data are proportions (95% confidence interval) of IMPACT study and Health Survey for England participants with suboptimal risk factor status. Statistical significance for between-cohort comparisons is denoted by *P < 0·05; **P < 0·001. Prevalence of high cholesterol was not significant (P = 0·08) after excluding IMPACT study patients with psoriasis taking methotrexate. High cholesterol was defined as self-reported hypercholesterolaemia or lipid-lowering therapy or total cholesterol > 5 mmol L^{-1}. High blood pressure was defined as self-reported hypertension or use of antihypertensive therapy or systolic blood pressure $\geq$ 140 mmHg or diastolic blood pressure $\geq$ 90 mmHg. High glycated haemoglobin (HbA$_{1c}$) was defined as self-reported diabetes or diabetes therapy or HbA$_{1c}$ $\geq$ 48 mmol mol^{-1}. Obesity was defined as body mass index $\geq$ 30 kg m^{-2}. Smoking was defined as current use. Alcohol excess was defined as > 21 units per week for men and > 14 units per week for women.

risk = 31%, proportion at high risk over 10 years = 0% and proportion at high risk over a lifetime = 4% (Table S3; see Supporting Information)] and the NNTs were considerably higher.

Discussion

Main findings

Screening patients with psoriasis recruited from primary care showed that 37% of those not defined by NICE to be at 'high risk' (such as those with prior myocardial infarction) had a high 10-year CVD risk and that those with self-reported PsA were at highest risk, mainly because they were older. At least one screen-detected (previously unknown) CVD risk factor was found in 48% of patients. The age- and sex-adjusted prevalence of hypertension was higher than in the general population and a high proportion of patients with known CVD risk factors had suboptimal control of those risk factors. Finally, we showed that optimization of modifiable CVD risk factors would be predicted to yield clinically relevant reductions in CVD event rates particularly in those with self-reported PsA.

Table 2 QRISK2-predicted 10-year and lifetime cardiovascular disease (CVD) risks by the presence of severe psoriasis and psoriatic arthropathy before and after theoretical CVD risk factor optimization in participants not considered to be high risk by National Institute for Health and Care Excellence criteria[a]

	All patients n = 221	Severe psoriasis			Psoriatic arthropathy		
		Yes n = 47	No n = 174	P-value	Yes n = 76	No n = 145	P-value
10-year risk							
Proportion with high 10-year CVD risk (> 10%)	37	28	39	0·15	51	29	0·001
Proportion with high 10-year CVD risk (> 20%)	17	17	15	0·7	26	12	0·006
Mean (SD) risk before risk factor optimization	10·0 (11·3)	8·9 (11·5)	10·3 (11·3)	0·5	14·0 (13·8)	7·9 (9·1)	0·001
Mean (SD) risk after risk factor optimization	8·4 (10·0)	7·2 (10·1)	8·7 (10·0)	0·4	11·8 (12·2)	6·6 (8·1)	0·001
Absolute change in predicted risk through risk factor optimization, absolute percentage	−1·6	−1·8	−1·6		−2·2	−1·4	
Estimated number needed to treat to prevent one CVD event over 10 years	61	57	61		45	73	
Lifetime risk							
Proportion with lifetime risk > 50%	13	15	12	0·6	17	10	0·15
Mean (SD) risk before risk factor optimization	35·2 (13·3)	38·7 (16·1)	34·2 (12·2)	0·1	36·6 (14·9)	34·4 (12·3)	0·4
Mean (SD) risk after risk factor optimization	32·3 (11·7)	35·0 (14·0)	31·6 (10·9)	0·13	33·4 (13·4)	31·8 (10·7)	0·6
Absolute change in predicted risk through risk factor optimization, absolute percentage	−2·8	−3·7	−2·6		−3·2	−2·6	
Estimated number needed to treat to prevent one CVD event over a lifetime	36	26	38		31	38	

Data are the proportion (%) of people predicted to develop myocardial infarction, angina, stroke or transient ischaemic attack over 10 years (upper section of the table) over a lifetime (lower section of the table) unless stated. Lifetime risk is projected to age 95 years. Optimization of risk factors: absence of smoking, cholesterol/high-density lipoprotein ratio = 5, systolic blood pressure = 140 mmHg and body mass index = 25. Improvement in CVD risk is determined using the QRISK2 website calculators http://qrisk.org and http://www.qrisk.org/life-time/. Absolute change in predicted risk through risk factor optimization has been calculated as predicted risk after risk factor optimization minus predicted risk before risk factor optimization. Number needed to treat has been calculated as 100 divided by the absolute percentage risk reduction. Severe psoriasis was defined as patients with Psoriasis Area and Severity Index score > 10, and those receiving psoralen–ultra-violet A, methotrexate, ciclosporin, acitretin, fumaric acid esters, etanercept, adalimumab, infliximab or ustekinumab. Psoriatic arthropathy was defined as positive responses to any three of the first five Psoriasis Epidemiology Screening Tool questions[7] or a positive response to the question 'Have you ever been told that you have arthritis associated with psoriasis?'. [a]Patients with self-reported myocardial infarction, stroke, transient ischaemic attack, coronary artery bypass surgery, coronary angioplasty, carotid endarterectomy, estimated glomerular filtration rate < 60 mL min^{-1}, familial hypercholesterolaemia or type 1 diabetes mellitus were excluded from the analysis.

Prior population-based and primary care-based studies

This is the first primary care-based study reporting that CVD risk factor screening augments the estimated prevalence of CVD risk factors in psoriasis. It is the first to assess lifetime CVD risk and the potential benefits of optimizing modifiable CVD risk factors.

The only previous European population-based CVD risk factor prevalence study in psoriasis, was part of the larger Rotterdam study. It involved 262 participants with psoriasis aged over 55 years (mean age 64 years) recruited from a suburb of Rotterdam.[14] Those with psoriasis had higher smoking prevalence (32% vs. 22%), higher body mass index (27·1 kg m^{-2} vs. 26·5 kg m^{-2}), higher diastolic blood pressure and greater use of lipid-lowering medication compared with study participants without psoriasis.

Three population-based studies from the U.S. National Health and Nutrition Examination Survey (NHANES) compared the prevalence of selected CVD risk factors in people with and without psoriasis.[15–17] One of these studies showed that psoriasis was linked to a higher likelihood of prevalent metabolic syndrome (driven by obesity and hypertension) but with no higher risk for dyslipidaemia or diabetes, which was largely confirmed in subsequent studies focusing on individual risk factors.[16,17]

Prior studies in highly selected cohorts

A small number of studies have reported the prevalence of screen-detected CVD risk factors in patients with psoriasis in highly selected patient groups.[18–21] These studies included trial participants,[20] disease registry participants[18] and hospitalized patients,[19,21] who are unlikely to be representative of patients recruited from primary care.

Several large studies, some of which had been population-based studies,[22–25] have reported the prevalence of known CVD risk factors.[22,24–30] When compared with control populations

(see below), patients with psoriasis had a higher likelihood of hypertension,[22,25–28,31,32] dyslipidaemia,[22,25,28,29,31,32] diabetes,[22,23,25,26,28,31,32] obesity[22,26,31] smoking,[22,26,32] renal disease[23,25,28] and metabolic syndrome.[24,28,30] However, control groups in these studies included people with 'forms of dermatitis',[26] other hospitalized patients[21,28] and people taking part in other research projects,[21] which makes interpretation, comparison and clinical implications uncertain.

Several other large studies have simply reported the prevalence of known CVD risk factors in patients with psoriasis without a control group.[33,34] While these studies have provided valuable data, they do not inform about the value of primary care screening. Our study demonstrated that using a standard approach to CVD screening of patients with psoriasis who attend primary care is an effective means of identifying individuals with CVD risk factors who would have been otherwise missed.

Age, psoriasis severity and psoriatic arthritis

We showed that the proportion of patients with screen-detected CVD risk factors was unrelated to age, psoriasis severity or the presence of self-reported PsA, suggesting that these factors are unlikely to be clinically useful in increasing the yield of abnormal risk factors from screening.

However, compared with patients without self-reported PsA, those reporting PsA had a higher 10-year CVD risk largely because they were older. For this reason, older patients, including those with self-reported PsA, may particularly benefit from CVD screening and risk factor intervention.

Comparison with Health Survey for England data

When known and screen-detected risk factors were considered, hypertension was more prevalent in patients with psoriasis, which is in keeping with data from the Rotterdam study and NHANES.[14,17]

We showed a lower prevalence of hypercholesterolaemia in patients with psoriasis than in the general population that could be explained by use of methotrexate. Even if the prevalence of hypercholesterolaemia is lower in patients with psoriasis than in the general population, this might not diminish the importance of the condition because more than one-third of these patients had screen-detected hypercholesterolaemia.

Although we had an adequate sample size, our results did not show statistically significant differences in the prevalence of obesity, smoking or diabetes compared with the general population.

Suboptimal management of known risk factors

We observed many patients with suboptimal management of known risk factors. Previous studies have shown undertreatment of CVD risk factors in patients with psoriasis[20,35] and

one study suggested that hypertension is more difficult to manage in these patients,[29] perhaps because psoriasis or its treatment somehow increases blood pressure or reduces compliance with therapy.

Estimated lifetime cardiovascular disease risk and the benefits of intervention

We considered lifetime CVD risk because younger high-risk patients could be missed out using 10-year risk estimates, as age dominates risk calculation. However, after excluding those automatically designated as high risk, we found that a high lifetime risk was present in only one in eight (13%) participants overall [and only one in 25 (4%) of those aged < 40 years]. However, more than one in three participants (37%) were at high 10-year CVD risk. The majority (20 of 28, 71%) of those at high lifetime risk would be detected by having a high (> 10%) 10-year CVD risk. Therefore, the estimation of lifetime risk does not appear to be particularly beneficial in patients with psoriasis.

Risk identification and risk reduction

'Health checks' have recently come under criticism for failing to improve long-term health outcomes,[36,37] perhaps because of overmedication or social class biases in those attending.[38] An alternative explanation has been made by our research team in a parallel study that recorded and analysed CVD consultations. They found that risk information was seldom discussed with patients and instead practitioners prioritized information collection.[39] Thus, while the current study has shown that screening identifies modifiable CVD risk factors, caution is required before recommending this as a strategy.

Strengths and limitations

Strengths of this study include the following: (i) we reported how CVD risk factor screening influenced the detected prevalence of CVD risk factors; (ii) our data can inform policy on primary care-based CVD screening; (iii) psoriasis severity was assessed; (iv) the prevalence of important CVD risk factors was established with clinically meaningful precision in important subgroups; (v) we compared prevalence data with population-based controls matched for age, sex and ethnicity; and (vi) we assessed the benefits of optimizing risk factors within 10-year and lifetime time frames.

The limitations of this study include the following: (i) risk factors were measured on one occasion, which may have led to some misclassification, (ii) our cohort was largely white limiting the generalizability of findings, (iii) the participation rate was 20%; we suspect that patients who did not participate would be more likely to have an adverse risk factor profile than those who enrolled, and (iv) we did not validate diagnoses of psoriasis or PsA.

Clinical implications

Cardiovascular risk factor screening is a means of identifying a high proportion of patients at high CVD risk, with screen-detected risk factors and with suboptimally managed known risk factors. However, these findings need to be considered alongside those showing the limited response of clinicians to identified risk before universal CVD screening for people with psoriasis can be recommended.[39]

Conclusion

Screening for CVD risk factors in patients with psoriasis identified a high proportion of high-risk individuals with potentially modifiable CVD risk factors in addition to a high proportion with suboptimally managed known risk factors. These data provide valuable augmenting information about the prevalence of CVD risk factors and the potential value of primary care-based screening of patients with psoriasis.

Acknowledgments

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Appendix 1:

Read codes and Read terms used to identify study participants

M161.00	Other psoriasis
M161000	Psoriasis unspecified
M161600	Guttate psoriasis
M161A00	Psoriasis palmaris
M161B00	Psoriasis plantaris
M161D00	Pustular psoriasis
M161E00	Psoriasis universalis
M161F00	Psoriasis vulgaris
M161F11	Chronic large plaque psoriasis
M161H00	Erythrodermic psoriasis
M161z00	Psoriasis NOS
M16y.00	Other psoriasis and similar disorders
M16y000	Scalp psoriasis
M16z.00	Psoriasis and similar disorders NOS
Myu3000	[X]Other psoriasis

Appendix 2:

Medication used to identify patients with severe psoriasis

Psoralen and ultraviolet A therapy, methotrexate, ciclosporin, acitretin, fumaric acid esters, etanercept, adalimumab, infliximab or ustekinumab.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table S1. Proportion (%) of patients with screen-detected abnormal risk factors by age, psoriasis severity and the presence of psoriatic arthritis.

Table S2. Proportion of Identification and Management of Psoriasis Associated ComorbidiTy study participants with known abnormal risk factors (on treatment) that fail to achieve target levels for risk factors.

Table S3. Characteristics of included randomized controlled trials and summary of results.

Video S1. Author Video.