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Validity of Self-Reported Psoriasis in a General Population: The HUNT Study, Norway

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TO THE EDITOR

A high prevalence of psoriasis has been reported in Norway, ranging from 4.8% to 11.8% (Bo et al., 2008; Danielsen et al., 2013; Kavli et al., 1985; Parisi et al., 2013). Prevalence estimates depend crucially on the validity of questionnaires (Jagou et al., 2006; Kurd and Gelfand, 2009; Lima et al., 2013; Plunkett et al., 1999; Rea et al., 1976; Wolkenstein et al., 2009). We aimed to validate self-reported psoriasis in a large population-based study in Norway using clinical skin examination performed by dermatologists as the gold standard and also to estimate the validation-based prevalence of psoriasis in a general Norwegian population.

Among adult participants of the third survey of the Nord-Trøndelag Health Study (HUNT3, 2006–8) (Krokstad et al., 2013), we invited random samples of 150 with and 700 without self-reported psoriasis, of whom 110 and 434 participated in the validation study, respectively (see Supplementary Figure S1 online). Validation was done by comparing the result of the self-reported question "Have you had or do you have psoriasis?" in HUNT3 to the outcome of the clinical interview and extensive skin examination performed by three dermatologists (EHM, IS, and MS). Because the diagnosis is based on clinical signs and symptoms (Boehncke and Schon, 2015), psoriasis was defined as having a positive history in combination with clinical findings present at the day of skin examination. In cases of complete remission on examination day, diagnostic confirmation had to be obtained either from a previous medical record collected from a dermatological clinic or by a former skin biopsy. To obtain estimates representative for the total HUNT3 population, appropriate weights were applied to account for differences in sampling probability. An age-standardized prevalence estimate according to the European standard population distribution for adults > 20 years was calculated (Pace et al., 2013) (see Supplementary Materials and Methods online).

General characteristics of the 544 participants did not differ substantially from the total HUNT3 study population or from the nonresponders (see Supplementary Tables S1 and S2 online). Compared with all people with self-report of psoriasis in HUNT3, participants in the validation study reported essentially similar characteristics of their psoriasis but slightly more often nail changes, psoriasis arthritis, and having the diagnosis confirmed by a dermatologist (see Supplementary Table S3 online).

The overall self-reported prevalence of psoriasis in HUNT3 was 5.8% (95% confidence interval [CI], 5.6–6.0%), and the validated prevalence was estimated to 8.0% (95% CI, 6.4–9.9%) (Table 1). Self-reported psoriasis had an estimated sensitivity of 56% (95% CI, 44–68%), a specificity of 99% (95% CI, 98–99%), a positive predictive value of 78% (95% CI, 69–85%), and a negative predictive value of 96% (95% CI, 94–98%) (Table 2). The positive predictive value increased to 84% if the psoriasis question was combined with the additional question, "Have you been diagnosed with psoriasis by a dermatologist?"

Four participants diagnosed with psoriasis in the period between the HUNT3 and the validation study were classified as true negatives. True-positive participants ($n = 86$) had a mean psoriasis area and severity index of 2.9, whereas false-negative participants ($n = 16$) had a mean psoriasis area and severity index of 0.9. Among false-negative participants, most had scalp psoriasis only ($n = 12$). The group of false positives ($n = 24$) consisted of subjects whose history of psoriasis could not be verified by a dermatologist or pathologist ($n = 10$); people with unspecified dermatitis ($n = 5$), benign skin tumors ($n = 2$), and urticaria ($n = 1$); and 6 individuals without any history of psoriasis or other relevant

Abbreviation: HUNT study, Nord-Trøndelag Health study

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Table 1. Self-reported and validation-based prevalence estimates (%) of psoriasis in the HUNT3 study (2006–8)

	Self-reported		Validation-based	
	Prevalence estimate	95% CI	Prevalence estimate	95% CI
Total HUNT3	5.8	5.6–6.0	8.0	6.4–9.9
Total HUNT3[1]	NA	NA	5.2	4.3–6.2
Men	6.0	5.7–6.4	9.3	6.7–12.8
Women	5.5	5.3–5.8	7.0	5.2–9.3
20–40 y	3.8	3.5–4.2	6.1	3.4–10.8
40–60 y	6.4	6.1–6.8	8.9	6.5–12.1
60+ y	6.2	5.9–6.6	8.1	5.6–11.6

[1]Excluding subjects with scalp psoriasis only. NA, not applicable.

dermatological disease. The age-standardized validation-based prevalence estimate according to the European standard population distribution for adults > 20 years was 8.0% (Pace et al., 2013).

Major strengths of this study are the random selection of participants from a large population-based study (HUNT3) and the clinical interview and skin examination carried out by dermatologists to confirm the diagnosis. Consequently, we were able to measure the full spectrum of diagnostic test validity, including the specificity, sensitivity, and positive and negative predictive values, as well as estimate the "true" prevalence in a general population.

Compared with most previous studies, the estimated prevalence of psoriasis in this study is high (Parisi et al., 2013). This is in part due to detection of previously undiagnosed scalp psoriasis, but it also reflects our ability to include milder forms of psoriasis less often included in hospital-based samples. Recent prevalence estimates from Denmark and northern Norway are in line with our study or even higher (Danielsen et al., 2013; Jensen et al., 2013).

In general, the psoriasis diagnosis is clinical and based on recognition of typical psoriatic lesions with a classical pattern of distribution, but particularly scalp psoriasis may be challenging to distinguish from other skin disorders like seborrheic dermatitis and pityriasis amiantacea. Of the 16 false-negative cases, 12 were diagnosed with scalp psoriasis only. Factors in favor of scalp psoriasis were a convincing history in combination with a sharp demarcation of the psoriasis lesion against normal skin, positive Auspitz's sign, and characteristic scaling. A diffuse distribution in combination with affection of the eyebrows and nasolabial folds suggested seborrheic dermatitis, whereas thick scales forming layers along the hair strands and bundles of hair favored pityriasis amiantacea. When excluding subjects with scalp psoriasis only, the validation based prevalence estimate was 5.2%.

A limitation to this study is that dermatologists knew what participants had answered to the psoriasis question in HUNT3. Furthermore, any skin complaint could be a motivation for participation, and this could potentially have led to a bias in the validation-based prevalence. Still, the risk of diagnostic misclassification seems small because the diagnostic inference was based on a thorough clinical interview and extensive skin examination. Of the 24 false-positive cases, 10 subjects had a history of psoriasis that could not be verified (for example, guttate psoriasis) and were not included as cases in the validation-based prevalence estimate. According to our findings, major bias because of non-participation in the validation study seems unlikely. In addition, the participants in HUNT3 are shown to be fairly representative of a general Norwegian population (Langhammer et al., 2012).

This study indicates that self-report of psoriasis is a valid instrument for further studies of psoriasis in HUNT3. Furthermore, it suggests that self-report of psoriasis may underestimate the prevalence of psoriasis in a general population, largely because of a considerable number of people with undiagnosed scalp psoriasis. Finally, this study estimates that almost 1 of 12 in the adult Norwegian population may have psoriasis.

ETHICS

The HUNT3 study and the validation study of psoriasis were approved by the Regional Committee for Medical and Health Research Ethics in Mid-Norway (4.2006.250 and 2009/2259). Written informed consent was obtained from all participants in the HUNT3 study and the validation study.

Table 2. Validation of self-reported of psoriasis in HUNT3 (2006–8)

	Sensitivity (%)		Specificity (%)		Positive predictive value (%)		Negative predictive value (%)	
	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Total HUNT3	56	44–68	99	98–99	78	69–85	96	94–98
Total HUNT3[1]	83	65–93	98	98–99	75	66–82	99	98–100
Men	51	35–67	99	98–99	78	64–88	95	91–97
Women	62	44–77	99	98–99	78	66–87	97	94–99
20–40 y	52	25–78	99	95–100	83	32–98	97	91–99
40–60 y	59	40–75	99	98–99	81	70–89	96	92–98
60+ y	56	36–74	98	97–99	73	57–84	96	92–98

[1]Excluding subjects with scalp psoriasis only.

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CONFLICT OF INTEREST
The authors state no conflict of interest.

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SUPPLEMENTARY MATERIAL
Supplementary material is linked to the online version of the paper at www.jidonline.org, and at http://dx.doi.org/10.1038/JID.2015.386.

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Identification and Characterization of a Recessive Missense Mutation p.P277L in *SERPINB7* in Nagashima-Type Palmoplantar Keratosis

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TO THE EDITOR
Hereditary palmoplantar keratodermas are a heterogeneous group of keratinization disorders characterized by hyperkeratosis of the palms and soles with or without other ectodermal abnormalities. Nagashima-type palmoplantar keratosis (NPPK; MIM 615598) is a recently established autosomal recessive palmoplantar keratoderma caused by mutations in the gene encoding SERPINB7, a member of the serine protease inhibitor superfamily (Kubo, 2014; Kubo et al., 2013). NPPK is characterized by a well-demarcated reddish, diffuse, and mild non-epidermolytic palmoplantar keratoderma extending to the dorsal surface of the hands and feet, inner wrists, and Achilles tendon area. To date, a highly prevalent mutation of c.796C>T (rs142859678; p.R266*) has been reported in 39 of 46 alleles of Japanese individuals with NPPK, and in 10 of 14 alleles of Chinese individuals with NPPK (Kubo et al., 2013; Mizuno et al., 2014; Yin et al., 2014). The c.796C>T mutation was found only among Japanese and Chinese populations but not Western and African populations in the 1000 Genomes project database (Kubo et al., 2013). Single nucleotide polymorphisms (SNPs) observed within the *SERPINB7* genomic lesion were identical for the c.796C>T allele in the Chinese population (Yin et al., 2014), suggesting a founder effect of the mutation.

SERPINB7 is expressed in the stratum granulosum and stratum corneum. To

Abbreviations: NPPK, Nagashima-type palmoplantar keratosis; SNP, single nucleotide polymorphisms

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