

A comparison between a mole check performed by a nurse and by a dermatologist

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ABSTRACT

With health care services struggling with high volume of patients with concerning skin lesions, nurses' contribution to early recognition of skin cancer could be valuable. The aim was to study whether specially trained nurses are capable of identifying suspicious potentially malignant skin lesions as reliably as an experienced dermatologist. Patients who scheduled an appointment with a counseling nurse had a total body skin examination, performed independently first by a nurse and immediately thereafter by a dermatologist who prescribed further procedures, if warranted. Skin cancer risk factors, the agreement between nurses' and dermatologist's clinical judgements, and predictive factors for referrals were investigated. Histopathological data were collected from medical records. 300 patients (77% women) with the mean age of 56 years (range 19-91) were included. Nurses' clinical suspicion rate (referral to a physician's examination) was 52% (n = 156). The dermatologist recommended further management to 54 patients (18%), most of whom (n = 39) warranted a skin biopsy. The nurses were able to recognise 89% of those to whom the dermatologist prescribed further procedures. In multivariate analysis, nurse's referral was the only significant predictor of dermatologist's recommendation for further management (OR 8.2, 95% CI 3.07-21.91, p < 0.001). Ten patients were diagnosed

histopathologically with skin cancer (nine basal cell carcinomas, two cutaneous squamous cell carcinomas and one melanoma), yielding a detection rate of 3.3%. For the dermatologist, the positive predictive value for skin cancers was 31%. It can be concluded that specially educated nurses can reliably screen skin cancer and save medical resources.

KEYWORDS: keratinocyte cancer, melanoma, mole check, skin cancer detection, total body skin examination.

INTRODUCTION

Skin cancers are a growing burden to health care systems in the Western world. Over the past decades, the incidence rates of cutaneous melanoma and keratinocyte cancers (KC: basal cell carcinoma, BCC and cutaneous squamous cell carcinoma, SCC) have increased significantly in Caucasian populations. BCC incidence exceeds that of any other cancer in white populations [1]. Early detection of skin cancer is crucial to a favourable outcome. KC have substantially better prognoses than melanoma but with early detection, excellent cure rates can be achieved in melanoma too [2]. Skin tumours can be recognised with the naked eye. Total body skin examination (TBSE) increases the likelihood of identifying skin cancers early [3-5]. There is not enough evidence to recommend skin cancer screening with TBSE at the population level but risk-based screening appears justifiable [4, 6].

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Registered nurses are in optimal position to encourage individuals in sun-safe behaviour and provide education in the early detection of skin cancers. In a pilot study, nurses showed an improvement in skin cancer screening skills and made fewer specialty referrals after a training programme [7].

In a Finnish retrospective study with over 10 000 participants, educated counseling nurses performed skin examinations as a daily routine activity or within short intensive campaigns [8]. Within routine activity, the nurses referred 52% of the participants to a physician for a removal of lesion, suggesting fairly good sensitivity but rather poor specificity.

Our aim was to study whether nurses who are specially educated to perform mole checks are able to distinguish potentially malignant from benign skin lesions when compared to an examination performed by an experienced dermatologist (the gold standard).

PATIENTS AND METHODS

Study procedure

Eligible individuals were informed about the study when booking a nurse appointment for a mole check at the Pirkanmaa Cancer Society. A total of 302 patients (≥ 18 years of age) gave a written informed consent for participation in the study between December 2017 and May 2018. Two patients were excluded: one patient missed the nurse's appointment and the other had the nurse's and dermatologist's appointments three weeks apart. Before the appointments, participants completed a questionnaire on their sociodemographics, skin cancer risk factors, the motivation for a mole check, and they were asked to assess their individual skin cancer risk.

The study was approved by the Regional Ethics Committee of the Expert Responsibility area of Tampere University Hospital.

Nurses' examinations

Skin examinations were executed by five registered nurses (aged 27-60 years; three with a 15-20 years' experience on mole checks, of whom two with advanced training in oncology, two with 1-2-year experience only). These nurses

carry out skin examinations routinely. (The annual number of nurse-conducted mole checks at the present society has been approximately 2700 over the last few years). All of the nurses had taken at least once a 2-day training course, including didactic dermato-oncological lectures, clinical apprenticeship, and an examination consisting of theoretical questions and photographs of skin lesions.

The nurses performed a head-to-toe TBSE by naked eye and using a magnifying lens and a focused light. A dermatoscope was allowed as an accessory tool, but the judgement was to be made without it. Twenty-five minutes were allocated for each patient for the mole check, including counseling on sun protection.

The nurses completed a nurse's questionnaire on each patient which included: the type of skin examination, the level of skin cancer risk, cutaneous symptoms, the total mole count, the number and anatomic site of suspicious moles, and the outcome of the examination as further action, if any. The nurses were to assess which patients require a physician's investigation (defined as clinical suspicion or referral rate). At the end of the examination, the nurse did not give away the outcome of her assessment to the patient but directed him/her to the immediate dermatologist's appointment.

The dermatologist's examination

The dermatologist was blinded as to the preceding nurse's assessment. A single dermatologist with more than three decades of practice in clinical dermatology performed TBSE using a dermatoscope. He completed a dermatologist's questionnaire inquiring the type of skin examination, an evaluation of the total number of nevi, atypical moles and other clinically relevant cutaneous findings, and further action, if any (no further action, surgical removal, incisional or punch biopsy, or other management). If histopathological diagnosis was warranted, the patient was advised to schedule an appointment with a general practitioner at a health care center or with a private specialist. (In Finland, general practitioners commonly operate suspicious skin lesions and if a histopathological diagnosis of malignancy is confirmed the patient is referred to a specialised

health care). Histopathological data on the patients referred to surgery were later collected from medical records.

Statistical analysis

The data were described with descriptive statistics, class and age differences were investigated with cross tabulations (χ^2 , kappa) and mean comparisons (ANOVA). Predictors of the nurse's referral to a physician's examination, and the dermatologist's referral for further management were analysed with multivariate logistic regression analyses. P-values of less than 0.05 were considered statistically significant. The data were analysed using the software STATA 15 (StataCorp LCC, College Station, TX, USA) and SPSS 25 (IBM Corp. Armonk, NY, USA).

RESULTS

Patient characteristics

Out of the 300 participants, 230 (77%) were women and 70 (23%) were men. The age range was 19-91 years (mean 56.1, median 59.5 years). Sociodemographic characteristics of the patients are shown in Table 1 and patient-reported skin cancer risk factors and their association with age and gender are shown in Table 2. Men classified themselves more often in higher Fitzpatrick classification of their skin type and women had used sunscreens more often than men. Older patients reported higher Fitzpatrick category, more skin malignancies, and more often family history of KC. The younger had more often used sunscreens. Fifty-six percent did not have mole-related symptoms. However, 44% reported that the motivation for the mole check was a change in a mole or other mole-related symptoms, and for 31%, the reason was multiple moles. Forty-two percent of the patients assessed their skin cancer risk as moderate or high. However, 39% of the patients were not able to evaluate their risk.

Nurses' examinations

TBSE was conducted on 290 patients, while 10 patients had partial examination only due to their own request. The nurses evaluated that 49% belonged to a moderate or high risk group. The patients' evaluation of their skin cancer risk and that of the nurses' were strongly associated

Table 1. Sociodemographic characteristics of patients.

	%
Sex	
Women (n = 230)	77
Men (n = 70)	23
Age^a	
Range 19-91 years mean 56.1 (SD 16.7), median 59.5	
≤ 30 years	10
31-40 years	12
41-50 years	14
51-60 years	18
61-70 years	27
≥ 71 years	20
Employment status	
Employed or student	50
Retired	43
Unemployed	7
Educational level	
Primary	12
Secondary	31
College	35
University	23

^aWomen mean 55.5 (SD 16.7), men mean 58 (SD 16.6) years. Women median 59.0, men median 60.5 years.

($p < 0.0001$). The nurses evaluated that 34% of the patients had a total mole count below 50, 46% had 50-100, and 20% of patients had over 100 moles.

The nurses evaluated that 156 patients (52%) should have a physician's examination. There was variation in the individual nurse's referral rate from 32% to 69%. (The proportion of the examined patients varied between 12% and 24% among the nurses.) The referral rate did not differ significantly according to the patients' age group ($p = 0.54$).

Table 2. Skin cancer risk factors and their association with gender and age of patients.

Risk factor	N	%	Difference by gender	Difference by age
			Chi ² p-value	F(ANOVA), p-value
Eye colour				
blue/blue-grey	170	57		
green/blue-green	67	22		
grey	25	8		
brown/hazel	38	13		
Hair colour				
red	7	2		
blond	78	26		
light brown	89	30		
brown	102	34		
dark brown/black	24	8		
Fitzpatrick skin type, patient-reported			0.002 ^a	F = 8.16, <0.0001 ^c
I	5	2		
II	78	26		
III	116	39		
IV	88	29		
Was unable to classify	13	4		
Exposure to UV radiation			0.15	F = 2.85, 0.09 ^d
no	229	76		
yes	71	24		
work	24	34		
recreational	38	54		
not specified	9	13		
Use of tanning beds			0.11	F = 2.01, 0.16
no	177	59		
yes	123	41		
Use of sunscreens			<0.0001 ^b	F = 4.76, 0.01 ^e
no	24	8		
occasionally	185	62		
always when exposed	91	30		
Personal history of skin cancer			0.84	F = 5.81, 0.003 ^f
no history	273	91		
melanoma	6	2		
keratinocyte cancer	21	7		
Family history of melanoma, no/yes	32	11	0.50	F = 0.04, 0.84
Family history of keratinocyte cancer, no/yes	30	10	0.17	F = 5.89, 0.02 ^g

^aMen reported higher classification. ^bWomen used sunscreens more often. ^cThe older reported higher classification. ^dThe exposed were older. ^eThe younger used sunscreens more often. ^fThe older had more often both keratinocyte cancer and melanoma. ^gMore often in the older.

A referral was recommended somewhat more often to men than to women (61% vs. 49%, $p = 0.07$).

The dermatologist's examination

The dermatologist's assessment of the total nevus count was below 50 nevi in 84% of the patients, 50-100 nevi in 11%, and over 100 nevi in 4%. His assessment of the total nevus count was lower than that of the nurses ($p = 0.02$ when the number was divided into two groups: <50 vs. ≥ 50). Fourteen percent of the patients had at least one atypical nevus. Actinic keratosis was the most frequent clinical diagnosis, with 20 patients having one or more lesions. Suspicion of BCC was raised in 12 patients, of SCC in 2 patients, and of melanoma, in five patients.

According to the dermatologist's clinical judgement, 246 patients (82%) did not warrant any further actions while 54 (18%) required some management. There was no significant difference as to age ($p = 0.20$) or gender: further procedures were recommended to 24% of men and to 16% of women ($p = 0.12$).

The proportion that warranted a histopathological diagnosis of a skin lesion was 13%: 31 patients (10%) were referred to a total surgical removal and eight patients (3%) to obtain a punch or incisional biopsy. In addition, further management, mostly cryotherapy, was recommended to eight patients, and close monitoring to seven patients.

A comparison between nurses' and dermatologist's examinations

The agreement between the clinical judgements of the nurses and the dermatologist was fair

(kappa = 0.26) (Table 3). For the nurses, there were six false negative cases (with the dermatologist's assessment as a reference), thus the nurses recognised 89% (48/54) of those patients the dermatologist prescribed further procedures or close follow-up. Out of the nurses' referrals, 69% (108/156) were false positive.

In multivariate analysis (with patient sociodemographics, skin cancer risk factors and nurse-conducted risk evaluation adjusted) nurse's referral to a physician's examination was predicted by younger age, male gender, no sunscreen usage, family history of KC, high number of moles, and nurse's evaluation of high skin cancer risk (Table 4). Dermatologist's recommendation for further management was predicted only by nurse's referral recommendation (all previous variables adjusted).

Histopathological diagnoses

Histopathological diagnosis was available for 82% ($n = 32$) of the patients who were referred for surgical removal or biopsy by the dermatologist. At least four patients did not comply with the referral recommendation. Of those referred to obtain a biopsy, ten patients had a histopathological diagnosis of malignancy. Thus, the detection rate for any skin cancer was 3.3% (10/300). In total, 12 skin cancers were detected (nine BCCs, one invasive SCC, one Bowen disease, and one superficial spreading melanoma with a Breslow thickness of 0.3 mm). One patient had two BCCs and one patient had BCC and Bowen disease concomitantly. In addition, three patients had a histopathological diagnosis of a dysplastic nevus and three patients had actinic keratosis. The most

Table 3. Agreement between nurses' and dermatologist's judgements (kappa = 0.26).

Dermatologist's judgement	Nurses' judgements		
	No referral	Referral	Total
No further management	138 (96%)	108 (69%)	246 (82%)
Further management	6 (4%)	48 (31%)	54 (18%)
Total	144 (100%)	156 (100%)	300 (100%)

Table 4. Factors predicting nurses' referral to a physician and the dermatologist's recommendation for further management.

Predictor	Nurses' referral to a physician		Dermatologist's recommendation, without nurse evaluation variables		Dermatologist's recommendation for further management	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	0.97 (0.94-0.99)	0.02	1.0 (0.97-1.04)	0.75	1.01 (0.97-1.05)	0.56
Gender, female	0.34 (0.17-0.69)	0.003	0.52 (0.24-1.12)	0.09	0.51 (0.22-1.18)	0.12
Eye colour						
- brown/hazel	1					
- grey	0.25 (0.06-1.09)	0.07	0.40 (0.06-2.57)	0.33	1.0 (0.13-7.49)	0.99
- green/blue-green	0.91 (0.32-2.57)	0.86	0.50 (0.15-1.70)	0.27	0.68 (0.18-2.58)	0.57
- blue/blue-grey	1.44 (0.53-3.95)	0.47	1.05 (0.36-3.03)	0.93	1.42 (0.43-4.67)	0.56
Fitzpatrick skin type						
- type IV	1		1		1	
- type III	1.19 (0.59-2.42)	0.62	2.22 (0.965-1.6)	0.06	2.43 (0.95-6.18)	0.06
- type I-II	1.24 (0.52-2.97)	0.63	1.63 (0.56-4.72)	0.36	1.69 (0.52-5.51)	0.38
Use of sunscreens						
- always when exposed	1		1		1	
- occasionally	0.64 (0.34-1.21)	0.17	0.73 (0.33-1.58)	0.43	0.85 (0.37-1.97)	0.71
- no	3.61(1.04-12.50)	0.04	1.65 (0.50-5.49)	0.41	1.42 (0.39-5.15)	0.59
Family history of KC	6.21 (2.05-18.83)	0.001	1.24 (0.40-3.83)	0.70	0.82 (0.24-2.73)	0.74
Family history of melanoma	0.57 (0.22-1.52)	0.26	0.95 (0.30-3.04)	0.94	0.63 (0.16-2.46)	0.51
Patient evaluation of risk, no/yes	0.85 (0.46-1.58)	0.61	1.53 (0.74-3.14)	0.25	1.37 (0.60-3.12)	0.45
Nurse's evaluation of nevus count						
- <50	1		-		1	
- 50-100	3.09 (1.6-5.96)	0.001	-		0.89 (0.36-2.19)	0.80
- >100	5.36 (2.24-12.82)	<0.001	-		0.58 (0.17-1.97)	0.38

Table 4 continued..

Predictor	Nurses' referral to a physician		Dermatologist's recommendation, without nurse evaluation variables		Dermatologist's recommendation for further management	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Personal history of KC	1.81 (0.51-6.45)	0.36	2.13 (0.69-6.60)	0.19	1.90 (0.56-6.45)	0.30
Skin cancer risk by nurse, no/yes	3.34 (1.77-6.30)	<0.001	-	-	1.50 (0.63-3.57)	0.35
Nurse's referral to a physician	-	-	-	-	8.20 (3.07-21.91)	<0.001
Dermatologist's evaluation of nevus count	-	-	-	-	-	-
- <50	-	-	1	1	1	1
- 50-100	-	-	2.74 (0.95-7.85)	0.06	1.99 (0.61-6.47)	0.25
- >100	-	-	2.94 (0.75-11.5)	0.12	1.87 (0.35-9.93)	0.46

OR, odds ratio; CI, confidence interval. All variables adjusted by each other and patients' employment status and hair colour (which was not statistically significant in any model). KC, keratinocyte cancer.

frequent benign diagnoses were compound nevus and seborrhoeic keratosis.

The nurses' referrals covered all the patients who were later diagnosed with skin cancer. There were six patients whom the nurses did not refer further, as opposed to the dermatologist's referral to obtain a skin biopsy: one had grade three dysplastic nevus, one had actinic cheilitis with mild dysplasia, one had seborrhoeic keratosis, and for three patients, further clinical data were not available.

The positive predictive value (PPV) of TBSE for skin cancer was 6.4% (10/156) for the nurses (i.e. those with confirmed skin cancer among all referred patients). For the dermatologist, PPV was 31% (10/32) (i.e. those with confirmed skin cancer among the referred patients for whom a histopathological diagnosis was available).

DISCUSSION

Early diagnosis of skin cancer depends, in part, on the accessibility of public to health care professionals who are capable of conducting skin examinations reliably. Inclusion of nurses in this activity may ease the workload in primary health care. We investigated the reliability of mole checks for detection of skin malignancies performed by registered nurses with a special training. The study was open to general public irrespective of symptoms, history or skin cancer risk. To our knowledge, there are no studies with the current sample size with a head-to-head comparison between the nurse's and dermatologist's performance in TBSE.

Women are usually more health-concerned than men [9]. The vast majority of the participants were women (77%), which is consistent with other reports with a female preponderance of 62-76% in open skin cancer screening activities [8, 10].

In our study, 28% of patients reported having a sun-sensitive skin (Fitzpatrick category of I or II) which is consistent with previously reported data on Nordic population [11]. However, almost one third of participants in our study – and significantly more often men and older adults – classified themselves into class IV as opposed to 10% reported by Berg [11]. On the other hand,

patient-reported evaluation of sun sensitivity may be inaccurate [12]. In our study, women and younger participants used sunscreens more often which is consistent with other reports [13, 14].

In the present study, 39% of participants were not able to assess their skin cancer risk. As to those who did, their judgement and that of the nurse were strongly associated. Self-assessment is influenced by many factors [15]. German investigators found that there was considerable optimism among general public: 43% believed they have a lower risk than those of the same age and sex [16]. However, they also found that individuals with increased skin cancer risk recognised the risk realistically.

TBSE performed by the nurses was well received by the participants in the present study. A referral recommendation was made to 52% of the patients. Oliveria and coworkers found that individual nurse's referral rates to a dermatologist's assessment varied from 16% to 46% [7]. DeKoninck and Christenbery reported that advanced practice nurses discovered worrisome lesions in 46% of patients in an open skin screening programme among the medically underserved population [17]. In an Australian study, nurses' performance on skin cancer screening was compared to that of plastic surgeons, and it was found that the surgeons referred 30% of participants to further management and nurses were able to identify 95% of these cases [18].

In the present study, the nurses managed to cover 100% of those who were later diagnosed with skin cancer and 89% of those to whom the dermatologist recommended further management. There was considerable interobserver variation between the nurses' and the dermatologist's judgements with 52% (156/300) and 18% (54/300) of patients, respectively, referred for further measures. Thus, the agreement was fair only. One has to bear in mind that the nurses' role in performing TBSE is not to diagnose skin cancer but rather not to miss the lesions that might harbour malignancy. Thus, the nurses were meticulously sensitive in selecting patients for further investigation, and that proved unnecessary in about two thirds of referred patients. Indeed, the challenge with the nurses' performance lies in

rather poor accuracy. Nurse competency in skin cancer screening can be improved with further education and training opportunities [7, 19].

In the present study, the skin cancer detection rate was 3.3% (3% for KC and 0.3% for melanoma) which is consistent with the literature. Detection rates of 2.3-3.2% have been reported with total, partial or lesion-directed examination of the skin performed by nurses or dermatologists [8, 20, 21]. In an Australian trial, TBSE performed by general practitioners resulted in PPV of 29% for all skin cancers [20] which is consistent with the dermatologist's PPV of 31% in the present study.

The limitation of the present study is that histopathological data were traced of the patients referred for that purpose only. Thus, the number of possible false negative cases is not known.

CONCLUSION

In summary, our results suggest that specially educated nurses can reliably screen skin cancer and save medical resources. For a remarkable number of patients, nurse's examination is sufficient.

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CONFLICT OF INTEREST STATEMENT

U-S. Lehto reports no conflict of interest. Other authors report conflict of interest outside the submitted work: M-S. Vuoristo reports travel support and a consultancy fee from Novartis. O. Maslennikova reports travel support from Pfizer, Pierre Fabre and Roche. T. Rantanen reports support related to psoriasis: attendance at advisory boards for AbbVie, Janssen, Leo Pharma, Lilly, Novartis and UCB, personal fees for lecturing and consultancy from AbbVie, Almirall, Janssen, Lilly, Novartis, UCB, the Finnish Psoriasis Association and travel support from AbbVie, Celgene, Galderma, Janssen, Lilly, Novartis, Sanofi and UCB.

REFERENCES

1. Peris, K., Fagnoli, M. C., Garbe, C., Kaufmann, R., Bastholt, L., Seguin, N. B., Bataille, V., Marmol, V. D., Dummer, R., Harwood, C. A., Hauschild, A., Höller, C., Haedersdal, M., Malvey, J., Middleton, M. R., Morton, C. A., Nagore, E., Stratigos, A. J., Szeimies, R. M., Tagliaferri, L., Trakatelli, M., Zalaudek, I., Eggermont, A. and Grob, J. J. 2019, *Eur. J. Cancer*, 118, 10.
2. Baade, P. D., Whiteman, D. C., Janda, M., Cust, A. E., Neale, R. E., Smithers, B. M., Green, A. C., Khosrotehrani, K., Mar, V., Soyer, H. P. and Aitken, J. F. 2020, *Int. J. Cancer*, 147, 1391.
3. Aldridge, R. B., Naysmith, L., Ooi, E. T., Murray, C. S. and Rees, J. L. 2013, *Acta Derm. Venereol.*, 93, 689.
4. Nahar, V. K., Mayer, J. E. and Grant-Kels, J. M. 2016, *JAMA Oncol.*, 2, 999.
5. Ali, Z. and Todd, P. M. 2020, *Clin. Exp. Dermatol.*, 45, 86.
6. Johnson, M. M., Leachman, S. A., Aspinwall, L. G., Cranmer, L. D., Curiel-Lewandrowski, C., Sondak, V. K., Stemwedel, C. E., Swetter, S. M., Vetto, J., Bowles, T., Dellavalle, R. P., Geskin, L. J., Grossman, D., Grossmann, K. F., Hawkes, J. E., Jeter, J. M., Kim, C. C., Kirkwood, J. M., Mangold, A. R., Meyskens, F., Ming, M. E., Nelson, K. C., Piepkorn, M., Pollack, B. P., Robinson, J. K., Sober, A. J., Trotter, S., Venna, S. S., Agarwala, S., Alani, R., Averbook, B., Bar, A., Becevic, M., Box, N., Carson III, W. E., Cassidy, P. B., Chen, S. C., Chu, E. Y., Ellis, D. L., Ferris, L. K., Fisher, D. E., Kendra, K., Lawson, D. H., Leming, P. D., Margolin, K. A., Markovic, S., Martini, M. C., Miller, D., Sahni, D., Sharfman, W. H., Stein, J., Stratigos, A. J., Tarhini, A., Taylor, M. H., Wisco, O. J. and Wong, M. K. 2017, *Melanoma Manag.*, 4, 13.
7. Oliveria, S. A., Nehal, K. S., Christos, P., Sharma, N., Tromberg, J. S. and Halpern, A. C. 2001, *J. Prev. Med.*, 21, 214.
8. Oivanen, T., Kojo, K., Pylkkänen, L., Holli, K. and Auvinen, A. 2008, *Prev. Med.*, 46, 160.
9. Ek, S. 2013, *Promot. Int.*, 30, 736.

10. Okhovat, J-P., Beaulieu, D., Tsao, H., Halpern, A. C., Michaud, D. S., Shaykevich, S. and Geller, A. C. 2018, *J. Am. Acad. Dermatol.*, 79, 884.
11. Berg, M. 1989, *Photodermatol.*, 6, 80.
12. Falcon, K., Fors, M., Palacios Alvarez, S., Veintimilla, K., Lasso, N. and Navas, C. 2019, *Dermatology*, 235, 400.
13. Luong, J., Davis, R. E., Chandra, A., White, A. E., Harber, I. D., Engel, A. A., Shields, N. P., York, T. J. and Nahar, V. K. 2020, *Arch. Dermatol. Res.*, Apr. 9, Online ahead of print.
14. Nahar, V. K., Wilkerson, A. H., Pearlman, R. L., Ferris, T. S., Zardoost, P., Payson, S. N., Aman, I., Quadri, S. S. A. and Brodell, R. T. 2020, *Arch. Dermatol. Res.*, 312, 533.
15. Drugge, E. D., Okundaye, O. I., Sarac, R. M. and Drugge, R. J. 2019, *Dermatol. Online J.*, 25, 1.
16. Diehl, K., Görig, T., Osenbrügge, N., Schilling, L., Greinert, R. and Schneider, S. 2019, *J. German Society Dermatol.*, 17, 786.
17. DeKoninck, B. and Christenbery, T. 2015, *J. Am. Assoc. Nurse Pract.*, 27, 501.
18. Katris, P., Donovan, R. J. and Gray, B. N. 1998, *Aust. N. Z. J. Public Health*, 22(3 Suppl.), 381.
19. Loescher, L. J., Stratton, D., Slebodnik, M. and Goodman, H. 2018, *J. Am. Assoc. Nurse Pract.*, 30, 43.
20. Aitken, J. F., Janda, M., Elwood, M., Youl, P. H., Ring, I. T. and Lowe, J. B. 2006, *J. Am. Acad. Dermatol.*, 54, 105.
21. Hoorens, I., Vossaert, K., Pil, L., Boone, B., De Schepper, S., Ongenae, K., Annemans, L., Chevolet, I. and Brochez, L. 2016, *JAMA Dermatol.*, 152, 27.