

INVESTIGATIVE REPORT

Comparison of Self-reported Skin Complaints with Objective Skin Signs Among Adolescents

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Adolescents' skin problems can be studied at the population level. The aim of this study was to validate five questions on skin complaints for use in population surveys among adolescents. Of the 260 adolescents aged 18–20 years invited to participate, 217 were included in the study. The prevalence of the adolescents' self-reported complaints were higher than those found during clinical examination by a dermatologist. The overall agreement between the adolescents' answers and recorded clinical signs was: 74% (pimples/signs of acne), 40% (dry skin/xerosis), 81% (rash/signs of dermatitis) and 83% (other skin complaints/other skin findings). No corresponding objective skin sign was recorded for "itch". Repeatability of the adolescents' answers and inter-agreement between the investigators had an overall agreement of 77–97% and a kappa of 0.29–0.93. When using the dermatologist's findings as gold standard, the sensitivity and specificity were best for "signs of acne", 93% and 43%, respectively. *Key words: adolescents; validation; skin complaints; acne; itch.*

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Adolescence is a vulnerable and important period for most people. Experiences during this time may have long-term consequences, since health behaviours are laid down in adolescence and maintained into adulthood and thus influence lifelong health (1). Skin problems are common among adolescents (2–4). Epidemiological studies can be a helpful tool to identify risk factors in a community, quantify the burden of skin diseases and contribute to healthcare planning (5).

A questionnaire-based study to explore somatic and mental health among adolescents in Oslo, Norway, was planned (6), which included some questions about skin problems. This provided an opportunity to study

skin problems among adolescents from a broad health perspective.

There is a lack of instruments for questionnaire-based studies in this age group. No validated questionnaires were found that had a clear adolescent focus and at the same time covered many aspects of skin problems. There are instruments for specific diseases, such as atopic eczema, which are validated in many languages (7–10). Furthermore, as regards the assessment of acne, there are many different scoring systems (3, 11–16), but they all depend on thorough examination of the subjects and, to our knowledge, are not validated for use in questionnaire-based studies among adolescents. Since no short and simple instrument was available for use in the general adolescent population, new questions on skin complaints were formulated based on our clinical experience, a pilot study and a newly validated questionnaire on self-reported skin complaints for adults (15).

Choosing self-reported skin complaints rather than objective skin findings as outcome variables seems to be particularly relevant in the case of adolescents, as it may help us to understand their views and illness behaviour (17). However, it is also interesting to compare whether the adolescents' answers correspond with observed objective skin findings. This connection makes it possible to perform statistical analysis, which also more directly reflects objective skin signs.

There is a need for further epidemiological surveys, since many features of adolescents' skin problems have not been mapped at the population level. Since some adolescents do not seek help for their skin problems, such studies may also be performed in non-healthcare-seeking populations.

The objective of this study was to validate questions on self-reported skin complaints for use in population surveys of adolescents. The reported answers were compared with the recording of skin findings by dermatologists. The skin findings were regarded as gold standard. A further aim of the study was to explore the repeatability of the adolescents' answers and the inter-observer variability between two dermatologists examining the adolescents.

MATERIALS AND METHODS

Study population

The study population comprised adolescents aged 18–20 years in Oslo, Norway, chosen from classes in the last compulsory year of schooling in 2006. To ensure variation in the sample, 8 out of 25 schools were selected as a convenience sample with different curricula (theoretical, vocational, arts), socioeconomic location (east/west and centrally/suburban) and presence of ethnic minorities. In classes selected by the head teachers all pupils were invited to participate in the study. The subjects were given oral and written information about the study in the classroom and their written consent was obtained.

Of the 260 pupils approached, 220 returned the questionnaire. Of these, 3 were excluded because they were over 20 years of age. The total number of participants was therefore 217 (83%); 109 females, 107 males and one participant whose gender was not recorded. There were 135 participants aged 18 years, 75 aged 19 years and 7 aged 20 years. The majority of participants ($n = 145$) had parents from Norway, 21 had parents from Pakistan, 17 had parents from other non-Western countries, and in 54 cases the parent's country of origin was not recorded. All the adolescents were fluent in Norwegian.

Questions and examination

The aim was to validate five questions covering self-reported skin complaints. The questions were chosen from a newly validated questionnaire for adults on self-reported skin complaints (15) and adjusted after being piloted on 5 adolescents without skin disease (Oslo, Norway) and 5 adolescents with skin disease from a dermatological department (Odense, Denmark). The pilot study indicated that it was important to use linguistically simple terms. The questions included five different complaints (pimples, dry skin, itch, rash and other skin complaints) and the answers were scored on a 4-point scale: "no"; "yes, a little"; "yes, quite a lot" and "yes, very much" (Table I). The adolescents were informed about the study and answered the questions in the classroom. Immediately afterwards they were taken to an adjacent room where a standardized clinical examination was performed on a one-to-one basis. The dermatological examination was performed with no knowledge of the adolescents' answers to the questions. The objective items registered by the dermatologist on clinical signs were in correspondence with items recently completed by the adolescent. The self-reported complaint "pimples" corresponds to "signs of acne" i.e. comedones and pustules, "dry skin" corresponds to "xerosis", "rash" corresponds to "signs of dermatitis", i.e. erythema with desquamation, papules and lichenification, and "other skin complaints" corresponds to "other skin signs", e.g. herpetic vesicles, sun-burn or pigmentation disorders. No equivalent clinical sign of itch was recorded, because this complaint is regarded as purely subjective. A grading of the skin findings was performed by the dermatologist, in which

"yes, a little" was equivalent to trivial, "yes, quite a lot" was equivalent to moderate, justifying medical attention and "yes, very much" was equivalent to severe, needing early medical attention (3, 15). The face, the scalp, the upper extremities and the back were examined systematically and an additional non-compulsory examination was performed if necessary, for example if a person had atopic dermatitis the skin behind the knees was examined. Dermatological diagnoses, treatments, age, sex and parents' country of origin were also assessed by the investigator.

The repeatability of the answers was explored by asking 44 adolescents at one of the schools to answer the questions on two consecutive days and the response rate was 70% ($n = 31$). Inter-observer variability was studied by two dermatologists performing the clinical examination independently. Pupils in one class were approached and 18 (90%) out of 20 agreed to be examined twice on the same day.

The study protocol was approved by the Regional Committee for Medical Research Ethics in Southern Norway.

Statistics

With an assumed prevalence of any given skin problem of 40%, we wanted to estimate the sensitivity with an uncertainty of $\pm 10\%$. With an assumed sensitivity of 70% this gives a sample size of 203.

The variables were dichotomized into "no" and "yes" (including "yes, a little", "yes, quite a lot" and "yes, very much") and sensitivity, specificity and predictive values were calculated using objective signs recorded by a dermatologist as gold standard. Overall agreement between self-reported complaints (e.g. pimples) and corresponding objective skin signs (e.g. "signs of acne") is the percentage of cases in which there was perfect agreement. For repeatability and inter-observer variability similar, non-dichotomized variables were used and overall agreement and kappa calculated. Kappa has the maximum value of 1.00 and a value of zero indicates no agreement better than chance (18). SPSS statistical package version 14.0 was used.

RESULTS

The prevalence of self-reported skin complaints were as follows: pimples 80%; dry skin 74%; itch 28%; rash 18%; and other skin complaints 13%. The prevalence of objective skin signs were as follows: signs of acne 62%; dry skin 34%; signs of dermatitis 13%; and other skin complaints 11%. Table II compares the self-reported skin complaints with objective skin signs and calculations of agreement, sensitivity, specificity and predictive values. The agreement between the subjective and objective variables ranges from 40% to 83% and sensitivity was highest for pimples (93%). Separate analyses on agreement, sensitivity and specificity were performed for both genders, and no obvious differences were identified.

A comparison of severity of self-reported skin complaints and objective skin is presented in Fig. 1. Regarding the question on pimples, 145 of the adolescents answered "yes, a little", 24 "yes, quite a lot" and 2 "yes, very much" compared with the assessment of signs of acne by the dermatologist, in which 94 were assessed as "yes, a little", 38 "yes, quite a lot" and 2 "yes, very much".

Table I. Questions on skin complaints among adolescents

In the last week, have you had:	No	Yes, a little	Yes, quite a lot	Yes, very much
Pimples?	☐	☐	☐	☐
Dry skin?	☐	☐	☐	☐
Itchy skin?	☐	☐	☐	☐
Rash?	☐	☐	☐	☐
Other skin complaints?	☐	☐	☐	☐

Table II. Adolescents' self-reported skin complaints compared with objective skin signs recorded by dermatologist ($n = 217$)

Self-reported complaints ^b		Objective signs ^a		Overall agreement (%)	Sensitivity % (CI)	Specificity % (CI)	PPV % (CI)	NPV % (CI)
		Yes	No					
Pimples	Yes	124	47	74	93 (88–98)	43 (36–50)	73 (67–79)	80 (76–85)
	No	9	35					
Dry skin	Yes	52	107	40	70 (63–76)	25 (19–31)	33 (24–42)	61 (56–66)
	No	22	35					
Rash	Yes	13	26	81	46 (39–53)	86 (81–91)	33 (27–39)	92 (88–96)
	No	15	162					
Other skin complaints	Yes	8	21	83	35 (29–41)	89 (85–93)	28 (22–32)	92 (88–96)
	No	15	171					

^aObjective signs are respectively: signs of acne, xerosis, signs of dermatitis and other skin signs, see the method section.

^bBased on 217 adolescents, 2 missing on pimples and other skin complaints, one missing on dry skin and rash.

CI: 95% confidence interval; PPV: positive predictive values; NPV: negative predictive value.

Diagnoses were registered during examination and the prevalence of acne vulgaris was 62%, xerosis/lichenification 33% and atopic dermatitis 5%. Other diagnoses were: hand eczema ($n=6$), hyper- or hypo-pigmentation ($n=6$), seborrhoea ($n=6$), psoriasis ($n=4$) and herpes labialis ($n=3$). Less common diagnoses found were folliculitis, cheilitis, keratosis pilaris, male pattern baldness, pityriasis alba, warts and sunburn. In 13 participants the use of local or systemic treatments for skin diseases was registered.

Repeatability of the adolescents' answers is shown in Table III and was best for pimples, with a kappa agreement of 0.93 and overall agreement of 97%. Inter-observer variability between the two dermatologists performing the study is from 0.29 to 0.68 (kappa) and from 78% to 89% (overall agreement) (Table IV).

DISCUSSION

In this survey the prevalence of self-reported complaints was higher than the prevalence of corresponding

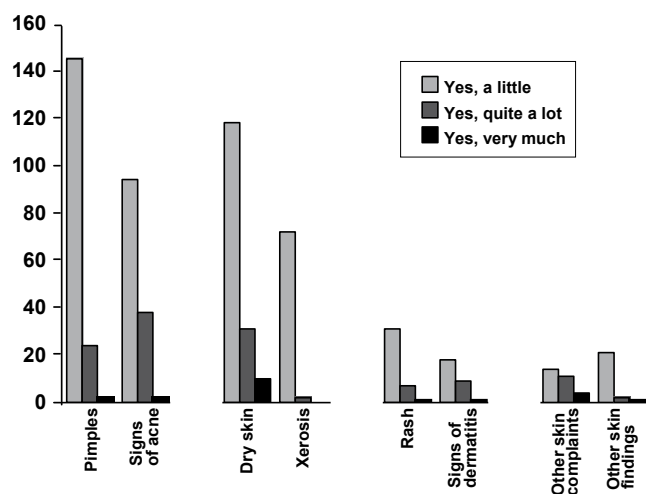


Fig. 1. Comparison of severity of self-reported complaints (pimples, dry skin, rash, other skin complaints) with objective signs (signs of acne, xerosis, signs of dermatitis, other skin findings) among 217 adolescents.

Table III. Repeatability of adolescents' answers on two consecutive days ($n = 31$)

Self-reported complaints	Overall agreement (%)	Kappa (CI)
Pimples	97	0.93 (0.80–1.0)
Dry skin	90	0.83 (0.64–1.0)
Itch	77	0.32 (–0.08–0.72)
Rash	90	0.68 (0.35–1.0)
Other skin complaints	87	0.45 (–0.01–0.91)

CI: 95% confidence interval for kappa.

skin signs recorded by the dermatologist. Both over- and under-reporting of skin disease prevalence among adults using questionnaires has been shown (19–22). Also, when comparing severity, the general trend is that the adolescents scored their skin problems worse than the ratings by the physician. Our study shows that adolescents seem to regard their skin problems as more serious than the dermatologist.

Self-reported pimples was the most frequent skin complaint in our study sample and acne the most frequent skin finding, and this is in coherence with population studies in which adolescents are included (2–4). Agreement in the present study between self-reported acne and objective assessment of acne is similar to the findings in other studies. In one study the agreement was 60% for 84 patients with acne (23). In another study the agreement was 86% for 2491 non-healthcare-seeking individuals under 18 years of age (24).

When assessing the validity of questions intended to be used in an epidemiological study, sensitivity and spe-

Table IV. Inter-observer variability between two dermatologists examining adolescents ($n = 18$)

Objective signs	Overall agreement (%)	Kappa (CI)
Signs of acne	78	0.63 (0.31–0.96)
Xerosis	89	0.68 (0.28–1.0)
Signs of dermatitis	89	0.29 (–0.02–0.61)
Other skin signs	89	0.31 (0.01–0.61)

CI: 95% confidence interval for kappa.

cificity are of primary concern. The present results show a high sensitivity and a relatively low specificity, and this is in contrast to a validation study in which 98 non-healthcare-seeking adults were asked the same question and the sensitivity was low at 50% and the specificity high at 96% (14). When calculating sensitivity based on the results of a study in Australia, the sensitivity of the question on acne was 70% (24).

When we assessed severity, there was both an over- and under-reporting of pimples compared with the dermatologists who graded the acne. The under-reporting of serious acne among some adolescents is in correspondence with other studies (12, 24), and it is important to be aware of this in clinical practice.

There is an interesting mismatch between the adolescents' answers and the clinical findings on the item "dry skin". Xerosis is one of the classical minor criteria of atopic dermatitis (25), but since there were only 11 such cases in our sample, this cannot explain the very high prevalence of self-reported dry skin in the study. We have not identified any studies that assess self-reported dry skin in a general adolescent population, but the prevalence is surprisingly high and should be studied further. The two last items, "rash" and "other skin complaints", have such a low prevalence that it is difficult to interpret the results.

The chance corrected agreement kappa in the repeatability and the inter-observer studies are, according to Altman (18), considered fair to very good. The overall agreement is generally quite high. This emphasizes one of the weaknesses of kappa, since it is influenced by the prevalence (18, 26). In xerosis the cases are prevalent and evenly distributed and kappa is high, even though overall agreement is the same as in "signs of dermatitis".

The variation in overall agreement, kappa, sensitivity, specificity and predictive values in the present survey can be attributed to small study samples, others to low associations between self-reported complaints and objective signs. Results from comparable studies are also sometimes quite low, for example, in a validation study on skin complaints among 98 adults the sensitivity ranged from 22% to 100% (15). Other studies show sensitivities of 65% and 62% in assessing skin diseases (22, 22). Since dermatology uses visual inspection as an important tool and the same signs are visible to the adolescent, this discrepancy maybe surprising. But this study illustrates that skin problems are perceived individually. Such a discrepancy is known from the literature. Self-rated health and professional rating of health coincided in about 60% of the cases in one study (27). Quality of life is also known to have a low correlation with disease severity in skin disease (28).

A limitation of the study is the few questions included. The reason for this is the limited space available, since the instrument should be a part of a questionnaire

covering many aspects of adolescents' health. However, there were no alternative questionnaires found in the literature. Another limitation is the lack of stringent definitions in the terms used, both in the questions and in the descriptions of the objective skin findings.

The strength of the study is that it is validated in a representative non-healthcare-seeking population, because of equal number of females and males, presence of ethnic populations, different schools included and an expected prevalence of various skin diseases.

In this study questions on skin complaints for use in population studies have been validated among 260 adolescents aged 18–20 years. The adolescents' answers have been compared with findings at clinical examination by dermatologists. The item on pimples had a good validity and will be used in further studies. The adolescents reported skin complaints more frequently than dermatologists found on examination. In a forthcoming population survey this instrument will be used to explore the health and dermatological needs of adolescents.

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