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CLINICAL REPORT

Clinical Characterisation at Onset of Childhood Psoriasis – A Cross Sectional Study in Sweden

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Epidemiological data in childhood psoriasis are accumulating. However, reliable information captured at onset is lacking. In a cross sectional study we recruited 109 children <16 years within 12 months of psoriasis onset and explored the clinical characteristics. Pre-pubertal children, especially boys, more often had inverse involvement (OR = 2.8, 95% CI = 1.1, 7.1, $p \leq 0.05$). *HLA-C*06* was positively associated with facial lesions (OR = 3.8, 95% CI = 1.5, 9.7, $p < 0.01$) and guttate phenotype and was more common in pubertal children. A high PASI score was not associated with overweight or early age at onset, and gender did not influence disease onset. Psoriasis can be difficult to diagnose in children, especially in pre-pubertals. Thorough examination of facial and genital areas can help in establishing the diagnosis. Our published genetic data in combination with the clinical findings presented herein indicate that puberty may separate different populations of childhood psoriasis. *Key words: psoriasis; puberty; children; HLA-C; overweight.*

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Psoriasis is a common inflammatory disease displaying a broad clinical spectrum. Onset of disease may occur at any age and childhood psoriasis is relatively common (1). The peak age of onset in childhood psoriasis varies among studies, possibly reflecting different inclusion criteria in particular concerning diaper rash psoriasis (2–4). Skin involvement in childhood psoriasis is often mild with atypical presentation and a confident diagnosis may be difficult and delayed. Especially differential diagnosis for eczema and the rare disease pityriasis rubra pilaris (PRP) can be challenging. As in the adult psoriasis population, clinical heterogeneity is substantial, possibly reflecting differences in genetic and environmental background.

In adult psoriasis, there is solid epidemiological evidence for increased cardiovascular and metabolic comorbidity, particularly in severe disease (5, 6). Studies of the paediatric and adolescent populations also suggest an increased risk for metabolic dysfunction (7–10), but with no evidence that onset in childhood *per se* would predispose for overweight and cardio-metabolic comorbidity in adulthood (11, 12). However, the difficult issue of causality has not been clarified and studies of body mass index (BMI) and lipoprotein profiles at onset of disease are lacking.

Epidemiological data in childhood psoriasis are accumulating (13–19). However, most studies are retrospective and reliable information captured at onset is lacking. We have previously reported that psoriasis onset before puberty is genetically distinct from adolescent onset (20, 21). The overall aim of this study was to examine whether such differences would translate into phenotypic differences and indeed, we found that depending on the age of onset, the clinical disease presentation displayed significant variations. Herein we also present phenotype traits in relation to *HLA-C*06* status, which in part confirm previous findings (22).

METHODS

Subjects

Cases were included through consecutive recruitment from new referrals and follow-up visits at the department of dermatology at Karolinska University Hospital and from the psoriasis patient association care units in Stockholm. Recruitment mainly occurred between 2007 and 2013. Inclusion criteria were: a confident clinical diagnosis of psoriasis, age between 0–15 years and onset of disease within the past 12 months ($n = 109$, 51 girls, 58 boys). Median time to inclusion after onset was 6 months (range 0.5–12 months). Only scalp involvement or diaper rash was not regarded as sufficient for diagnosis. Diaper rash psoriasis was not included because of the difficulty in separating psoriatic diaper rash from other diaper rashes.

Mean ± SD age was 8.4 ± 3.7 years. Patients were stratified for puberty with pre-pubertal onset (0–9 years) and pubertal onset (10–15 years). Puberty constitutes a significant biological transition and a cut-off at 10 years of age was considered a valid and stringent approximation (23). Almost all patients (100/109) were of Caucasian descent and all patients, and at least one of their parents, were in command of the Swedish language. Oral and written informed consent was obtained from parents. The study was approved by the Regional Committee of Ethics and performed according to the Declaration of Helsinki Principles.

Structured interview and clinical examination

All patients were examined by a dermatologist (> 80% by JL). A structured, physician-led interview was performed in all cases

including present and past medical history. Past or present asthma/allergy and/or eczema (24) were thoroughly penetrated for severity, type and distribution. Positive history of asthma was defined as prescribed inhaled glucocorticoids, including infectious asthma in the younger children. A positive history of flexural eczema was a history of dry, itchy skin lesions in flexural areas and prescription of topical glucocorticoids. Allergy was regarded positive only if the child had a doctor's diagnosis of allergy to food, pollen or furred pets. All patients underwent a thorough clinical examination. Nail, scalp and genital regions were inspected in all patients. Psoriasis Area Severity Index (PASI) was assessed at inclusion. Guttate psoriasis was defined as acute onset of widespread small lesions, often associated with a throat infection. A rheumatologist examined all children with joint complaints. Weight (kg) and height (cm) were measured and BMI was classified according to the International Obesity Taskforce criteria (25).

Laboratory investigation

Biochemistry. Blood was drawn for biobanking and for measuring gluten antibodies (anti-transglutaminase antibodies [tTG]) IgA, lipids and glucose. Plasma lipids were taken after at least 4 h of fasting and analysed at the laboratory at Karolinska University Hospital using standard reference values for children in Sweden (Triglycerides < 1.2 mmol/l, cholesterol < 5.2 mmol/l, HDL-cholesterol 1.0–2.7 mmol/l (boys), 0.8–2.1 mmol/l (girls), LDL-cholesterol 1.2–4.3 mmol/l, LDL/HDL-cholesterol 0.4–6.6 mmol/l).

Cultures. Cultures for streptococci in the throat and additional localisations when relevant was performed.

Genotyping

*HLA-C*06:02* typing was carried out as described and referred to as positive when the *HLA-C*06:02* allele was present (26).

Statistical analysis

Descriptive analysis was used to determine mean and SD for normally distributed data and median and inter-quartile range for skewed data. Percentages were reported for categorical variables. Bivariate associations were examined using Chi-square tests for categorical variables. Multivariable analyses were conducted using linear and logistic regression to examine the associations between outcome variables and clinical and demographic explanatory variables. Associations in the multivariable logistic models were presented as odds ratios (OR) with 95% confidence interval (CI). The model-building procedure has been described (27, 28). The Box-Tidwell transformation was employed to test linearity of the logit because of the inclusion of PASI as numerical variable in the binary logistic regression. The significance level was specified at 0.05 for all tests. All statistical analyses were performed using IBM®SPSS®Statistics software (version 22, 2013; IBM Corporation, New York, USA).

RESULTS

Clinical characteristics

A total of 109 children (< 16 years) with psoriasis, recruited within 12 months after onset of psoriasis were included in the study. Sixty-three of the patients were regarded as pre-pubertal with a median age of 5.8 years (Table I). Gender did not influence the age of onset. Plaque psoriasis was the most common (71%) and guttate psoriasis the second most common phenotype (26%). Fig. 1 shows the age onset of the various phenotypes. Most guttate cases were associated with streptococcal throat infection but in 6 children the infection was located in the skin. Inverse involvement (groins, genital area, umbilicus and axillae) was present in 41% and was more common in pre-pubertal children (56%; $p < 0.001$). In all male patients but one, inverse phenotype included genital involvement which overall was the most common inverse manifestation. Facial lesions, usually around the eyes, were common (Table I). Koebner phenomena were present in 14 (13%) children. Seven children were initially diagnosed with possible psoriatic arthritis (PsA) by a rheumatologist, but subsequently the diagnosis was verified in only 4. Nail involvement was present in 2 of 7 children with joint complaints.

Median (min–max) PASI was 5.0 (0.3–18.7). Table II shows the results for multiple linear regression with PASI as outcome variable. Topical treatment was the most common therapy. UVB therapy was given in 18 cases (17%) and systemic treatment in 5 cases.

Only one child, with a family history of hypercholesterolaemia, had elevated blood lipids. We did not observe any abnormalities in antibodies to gluten. One child showed a decreased level of total IgA.

Genotype–phenotype correlation

Homozygosity for *HLA-C*06* was present in 6 cases and only in one of the 5 cases treated with systemic therapy. *HLA-C*06* was associated with age of onset controlling for family history (data not shown) and phenotype (Table III) with a higher proportion of *HLA-C*06* positive patients in the pubertal children. *HLA-C*06* was

Table I. *Subject characteristics and bivariate analyses of clinical characteristics by group (pre-pubertal [2–9 years] vs. pubertal [10–15 years])*

	All ($n = 109$)	2–9 years ($n = 63$)	10–15 years ($n = 46$)	*p*-value
Median age, years (range)	8.0 (2–15)	5.8 (2–9)	12.1 (10–15)	
Female, *n* (%)	55 (51)	27 (43)	28 (61)	0.06
Positive family history, *n* (%)				
1st degree relative	46 (42)	25 (40)	21 (46)	0.63
*HLA-C*06* positive	71 (65)	35 (56)	36 (78)	0.008
Phenotype, *n* (%)				
Plaque	77 (71)	48 (76)	29 (63)	0.052
Guttate	29 (26)	12 (19)	17 (37)	
Pustular	3 (3)	3 (5)	0 (0)	
Facial lesions, *n* (%)	50 (46)	33 (52)	17 (37)	0.11
Scalp lesions, *n* (%)	96 (88)	55 (87)	41 (89)	0.77
Inverse lesions, *n* (%)	45 (41)	35 (56)	10 (22)	< 0.001
Nail changes, *n* (%)	11 (10)	9 (14)	2 (4)	0.07
Arthritis, *n* (%)	4 (4)	3 (5)	1 (2)	
Overweight/Obese, *n* (%)	16 (15)	11 (17)	5 (11)	0.32
History of/present, *n* (%)				
Flexural eczema	16 (15)	10 (16)	6 (13)	0.68
Allergy	15 (14)	7 (11)	8 (17)	0.35
Asthma	18 (17)	10 (16)	8 (17)	0.83

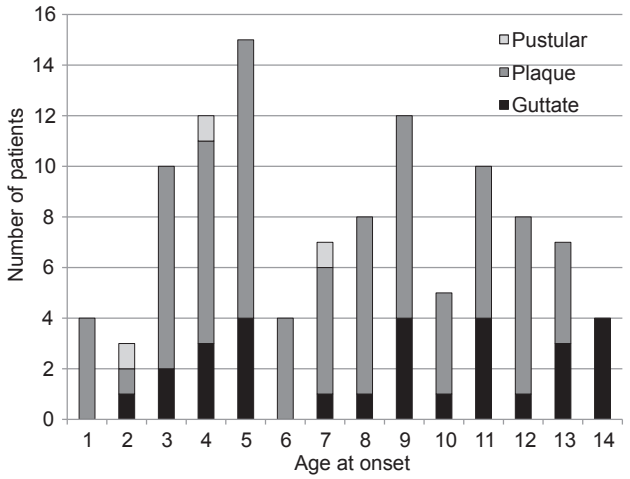

Fig. 1. Age at onset and phenotype distribution ($n = 109$).

associated with the guttate phenotype (OR = 3.4, 95% CI = 1.1, 10.7, $p \leq 0.05$) and facial lesions (OR = 3.8, 95% CI = 1.5, 9.7, $p < 0.01$) controlling for demographic variables (Table III). Inverse involvement was significantly more common in pre-pubertal children (OR = 2.8, 95% CI = 1.1, 7.1, $p \leq 0.05$) especially in boys (OR = 2.5, 95% CI = 1.1, 6.1, $p \leq 0.05$) independent of phenotype and *HLA-C*06* (Table III). We did not observe any gender difference between *HLA-C*06* positive vs. negative patients (OR = 1.5, 95% CI = 0.68, 3.4, $p = 0.31$).

We did not observe multicollinearity problem or violation of the assumption of linearity to the logit of the dependent variables. Homser and Lemeshaw test indicated that there was goodness of fit for the final models (29).

DISCUSSION

Psoriasis in children is frequently reported to be mild and atypical at onset and the diagnosis may be difficult in early stages. This was obvious in the present study with several patients failing to fulfill the inclusion criteria, onset < 12 months, due to delayed diagnosis. An initial period of discrete genital lesions, diagnosed as eczema or fungal infection, was frequently reported. This scenario was more common in pre-pubertal children whereas the diagnosis in the older children was more secure. Forty-one percent had inverse involvement and this was significantly more common in pre-pubertal children and in boys (Fig. 2 and Table III). These findings underscore the importance of examining the genital area in childhood psoriasis. Thus, presence of genital lesions may be the only manifestation, especially in pre-pubertal boys, and can strengthen the diagnosis of psoriasis in atypical cases. It is important to differentiate between fungal infection, eczema and psoriasis in these patients since fungal infection is treated differently and psoriasis often requires more potent topical glucocorticoids or tacrolimus to obtain effect (30–32).

Previous studies have reported earlier age of onset in girls (33). This was not the case in our material where gender did not influence age of onset. We have no

Table II. *Multiple linear regression for the dependent variable PASI*

Variable	B	SE	*t*-value	*p*-value	95% CI of the B
Age	0.08	0.10	0.78	0.44	–0.13 to 0.30
Sex	–1.1	0.78	–1.4	0.17	–2.6 to 0.47
Overweight	1.6	1.1	1.5	0.15	–0.56 to 3.7
*HLA–C*06*	0.49	0.83	0.59	0.56	–1.2 to 2.1
Phenotype	0.75	0.87	0.86	0.39	–0.98 to 2.5

B: regression coefficient; CI: confidence interval; SE: standard error.

Table III. *Logistic regression for the dependent variable* HLA-C*06 *and inverse involvement*

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
*HLA-C*06*		
Age at onset		
Pre-pubertal	0.31 (0.13, 0.76)*	0.28 (0.10, 0.74)*
Pubertal	Reference	
Phenotype		
Guttate	3.5 (1.2, 10.1)*	3.4 (1.1, 10.7)*
Plaque	Reference	
Sex		
Male	0.66 (0.3, 1.5)	0.62 (0.25, 1.6)
Female	Reference	
Facial lesions		
Yes	2.9 (1.2, 6.7)*	3.8 (1.5, 9.7)**
No	Reference	
Inverse involvement		
Age at onset		
Pre-pubertal	4.5 (1.9, 10.6)**	2.8 (1.1, 7.1)*
Pubertal	Reference	
*HLA-C*06*		
Yes	0.39 (0.17, 0.88)*	0.51 (0.20, 1.3)
No	Reference	
Phenotype		
Guttate	0.48 (0.19, 1.2)	0.57 (0.20, 1.6)
Plaque	Reference	
Sex		
Male	2.8 (1.3, 6.2)*	2.5 (1.1, 6.1)*
Female	Reference	

*$p \leq 0.05$. **$p < 0.01$. ***$p < 0.001$.
OR: odds ratio; CI: confidence interval.

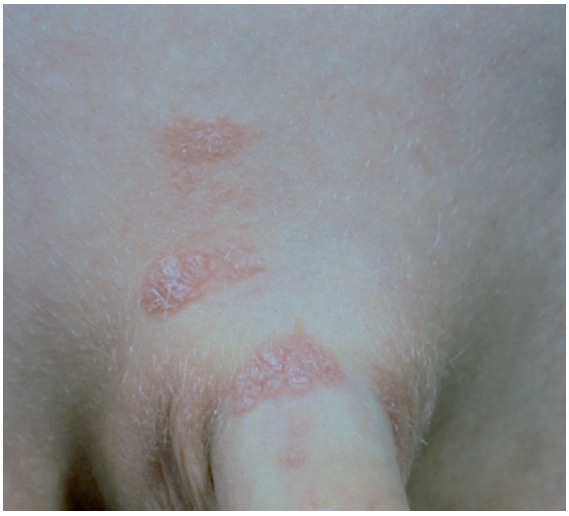

Fig. 2. Genital lesions in a pre-pubertal boy.

explanation for this discrepancy. However, our methodology capturing data should be more reliable than retrospective information when establishing age of onset. Also difficulties in establishing a correct diagnosis in pre-pubertal boys with mild, genital involvement may entail a risk of underestimating the contribution from this group of patients in studies.

Several children showed an overlap with "eczema like" lesions, excoriated, not well-circumscribed plaques without typical Auspitz's sign or psoriatic scaling. In a recent study (30) of childhood psoriasis and eczema, 80% ($n=51$) of patients with psoriasis were referred with a tentative diagnosis of atopic dermatitis. We recognise the difficulties in diagnosing psoriasis in children, especially in the early phase of the disease, and several patients were not included because of difficulties in establishing a definite diagnosis. Two children initially included were re-evaluated due to atypical presentation and response to treatment and a subsequent diagnosis of juvenile PRP was proposed. Clinical as well as genetic overlap is known for psoriasis and PRP (34) implying shared underlying pathobiology. Most patients with "eczema-like" overlap and both patients with PRP where pre-pubertal.

In the adult population, severe psoriasis associates with a higher risk for cardiovascular disease. Studies of childhood psoriasis indicate an increased risk for metabolic co-morbidities (7–10, 35). In our material 13% of the children were overweight and 1.8% obese in the whole material according to the definition by Cole et al. (25). Only one child, with a family history of hypercholesterolaemia, had elevated blood lipids. In the county of Stockholm 9.1 % of 4-year-old children born in 2007 were classified as overweight and 1.8% as obese (36). In the most comprehensive study of children in Sweden, including both rural and urban areas, BMI was measured in all 10-year-old children in one county ($n=5,517$) and the prevalence of overweight was found to be 22% in both boys and girls, of which 4% and 5%, respectively, were obese (37). An even higher prevalence of overweight/obesity has been reported from more rural areas in Sweden (38, 39). A weakness of the present study is the lack of a control group for BMI and therefore we compared with the reported prevalence of overweight and obesity in Swedish 4-year and 10-year-old children. Thus, the prevalence of overweight and obesity in the 10–15-year group is lower compared with reported numbers (37, 38) but higher in the 2–9-year group compared with the published 4-year Stockholm group (36). Our pre-pubertal group includes a broader age span, which in combination with the limited number of patients may explain the difference. In contrast to previous reports, PASI was not associated with overweight in our material, bearing in mind that our study is focusing on the early disease phase (10, 35). Taken together, our data do not indicate that children with psoriasis are more overweight/obese or have elevated lipid profiles compared to the general childhood population at onset of disease. The limited number of patients obviously necessitates a cautious interpretation.

In 2006, Gudjonsson et al. (22) reported that *HLA-C*06* positive patients have earlier onset, higher incidence of guttate psoriasis, more frequent exacerbations with throat infections and more extensive disease. Previous studies from our group using puberty as cut-off indicate differences in the genetic background between pre-pubertal and pubertal children with a stronger association to *HLA-C*06* in pubertal children (20, 21). In contrast to the findings of Gudjonsson et al. (22) a younger age of onset was not associated with more severe disease (higher PASI) in our material (see Table II).

An obvious strength of our study is that most patients were examined by the same dermatologist (JL). The relatively small number of patients is the most important limitation, but underscores that we adhered to stringent inclusion criteria, which is critical to enable relevant and reliable stratifications. Family doctors may refer the more difficult cases to a dermatology clinic which implies a risk for inclusion bias in our study.

In conclusion, psoriasis can be difficult to diagnose in children, in our opinion most often in the young, pre-pubertal children where a period of mild, atypical skin involvement may precede a typical disease presentation. Genital lesions were significantly more common in pre-pubertal onset, especially in boys. The pubertal children on the other hand more often carried *HLA-C*06* with association to the guttate phenotype and facial lesions. To better understand the full spectrum of childhood psoriasis, further studies are needed to investigate if these differences will translate into differences in clinical development between children with pre-pubertal vs. pubertal onset.

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REFERENCES

1. Farber EM, Nall ML. The natural history of psoriasis in 5,600 patients. Dermatologica 1974; 148: 1–18.
2. Kumar B, Jain R, Sandhu K, Kaur I, Handa S. Epidemiology of childhood psoriasis: a study of 419 patients from northern

India. Int J Dermatol 2004; 43: 654–658.
3. Nyfors A, Lemholt K. Psoriasis in children. A short review and a survey of 245 cases. Br J Dermatol 1975; 92: 437–442.
4. Morris A, Rogers M, Fischer G, Williams K. Childhood psoriasis: a clinical review of 1262 cases. Pediatr Dermatol 2001; 18: 188–198.
5. Mehta NN, Azfar RS, Shin DB, Neimann AL, Troxel AB, Gelfand JM. Patients with severe psoriasis are at increased risk of cardiovascular mortality: cohort study using the General Practice Research Database. Eur Heart J 2010; 31: 1000–1006.
6. Gelfand JM, Azfar RS, Mehta NN. Psoriasis and cardiovascular risk: strength in numbers. J Invest Dermatol 2010; 130: 919–922.
7. Augustin M, Glaeske G, Radtke MA, Christophers E, Reich K, Schafer I. Epidemiology and comorbidity of psoriasis in children. Br J Dermatol 2010; 162: 633–636.
8. Zhu KJ, He SM, Zhang C, Yang S, Zhang XJ. Relationship of the body mass index and childhood psoriasis in a Chinese Han population: a hospital-based study. J Dermatol 2012; 39: 181–183.
9. Boccardi D, Menni S, La Vecchia C, Nobile M, Decarli A, Volpi G, et al. Overweight and childhood psoriasis. Br J Dermatol 2009; 161: 484–486.
10. Koebnick C, Black MH, Smith N, Der-Sarkissian JK, Porter AH, Jacobsen SJ, et al. The association of psoriasis and elevated blood lipids in overweight and obese children. J Pediatr 2011; 159: 577–583.
11. de Jager ME, de Jong EM, Meeuwis KA, van de Kerkhof PC, Seyger MM. No evidence found that childhood onset of psoriasis influences disease severity, future body mass index or type of treatments used. J Eur Acad Dermatol Venereol 2010; 24: 1333–1339.
12. Mahe E, Maccari F, Beauchet A, Lahfa M, Barthelemy H, Reguiai Z, et al. Childhood-onset psoriasis: association with future cardiovascular and metabolic comorbidities. Br J Dermatol 2013; 169: 889–895.
13. Chiam LY, de Jager ME, Giam YC, de Jong EM, van de Kerkhof PC, Seyger MM. Juvenile psoriasis in European and Asian children: similarities and differences. Br J Dermatol 2011; 164: 1101–1103.
14. De Jager ME, Van de Kerkhof PC, De Jong EM, Seyger MM. Epidemiology and prescribed treatments in childhood psoriasis: a survey among medical professionals. J Dermatolog Treat 2009; 20: 254–258.
15. Benoit S, Hamm H. Childhood psoriasis. Clin Dermatol 2007; 25: 555–562.
16. Wu Y, Lin Y, Liu HJ, Huang CZ, Feng AP, Li JW. Childhood psoriasis: a study of 137 cases from central China. World J Pediatr 2010; 6: 260–264.
17. Raychaudhuri SP, Gross J. A comparative study of pediatric onset psoriasis with adult onset psoriasis. Pediatr Dermatol 2000; 17: 174–178.
18. Stefanaki C, Lagogianni E, Kontochristopoulos G, Verra P, Barkas G, Katsambas A, et al. Psoriasis in children: a retrospective analysis. J Eur Acad Dermatol Venereol 2011; 25: 417–421.
19. Fan X, Xiao FL, Yang S, Liu JB, Yan KL, Liang YH, et al. Childhood psoriasis: a study of 277 patients from China. J Eur Acad Dermatol Venereol 2007; 21: 762–765.
20. Lysell J, Padyukov L, Kockum I, Nikamo P, Ståhle M. Genetic association with ERAP1 in psoriasis is confined to disease onset after puberty and not dependent on HLA-C*06. J Invest Dermatol 2013; 133: 411–417.
21. Nikamo P, Cheuk S, Lysell J, Enerbäck C, Bergh K, Xu Landen N, et al. Genetic variants of the IL22 promoter associate to onset of psoriasis before puberty and increased IL-22 production in T cells. J Invest Dermatol 2014; 134: 1535–1541.
22. Gudjonsson JE, Karason A, Runarsdottir EH, Antonsdottir AA, Hauksson VB, Jonsson HH, et al. Distinct clinical differences between HLA-Cw*0602 positive and negative psoriasis patients – an analysis of 1019 HLA-C- and HLA-B-typed patients. J Invest Dermatol 2006; 126: 740–745.
23. Parent AS, Teilmann G, Juul A, Skakkebaek NE, Toppari J, Bourguignon JP, The timing of normal puberty and the age limits of sexual precocity: variations around the world, secular trends, and changes after migration. Endocr Rev 2003; 24: 668–693.
24. Johansson SG, Bieber T, Dahl R, Friedmann PS, Lanier BQ, Lockey RF, et al. Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization, October 2003. J Allergy Clin Immunol 2004; 113: 832–836.
25. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ (Clinical research ed) 2000; 320: 1240–1243.
26. Nikamo P, Stahle M. Cost-effective HLA-Cw06:02 typing in a Caucasian population. Exp Dermatol 2012; 21: 221–223.
27. Ghezeljeh TN, Momtahen M, Tessma MK, Nikravesh MY, Ekman I, Emami A. Gender specific variations in the description, intensity and location of angina pectoris: a cross-sectional study. Int J Nurs Stud 2010; 47: 965–974.
28. Lang TA, Secic M. How to Report Statistics in Medicine: Annotated Guidelines for Authors, Editors and Reviewers. American College of Physicians, 2006.
29. Homser D.W, Lemeshow S, Applied Logistic Regression. Wiley, New York, 2000: p. 143–167.
30. Kapila S, Hong E, Fischer G. A comparative study of childhood psoriasis and atopic dermatitis and greater understanding of the overlapping condition, psoriasis-dermatitis. Australas J Dermatol 2012; 53: 98–105.
31. Brune A, Miller DW, Lin P, Cotrim-Russi D, Paller AS. Tacrolimus ointment is effective for psoriasis on the face and intertriginous areas in pediatric patients. Pediatr Dermatol 2007; 24: 76–80.
32. Wang C, Lin A. Efficacy of topical calcineurin inhibitors in psoriasis. J Cutan Med Surg 2014; 18: 8–14.
33. Nyfors A. Psoriasis in children: characteristics, prognosis and therapy. A review. Acta Derm Venereol 1981; Suppl. 95: 47–53.
34. Fuchs-Telem D, Sarig O, van Steensel MA, Isakov O, Israeli S, Nousbeck J, et al. Familial pityriasis rubra pilaris is caused by mutations in CARD14. Am J Hum Genet 2012; 91: 163–170.
35. Paller AS, Mercy K, Kwasny MJ, Choon SE, Cordoro KM, Girolomoni G, et al. Association of pediatric psoriasis severity with excess and central adiposity: an international cross-sectional study. JAMA Dermatol 2013; 149: 166–176.
36. Annual report on child health, Stockholm County Council; 2012. Available from: http://www.webbhotell.sll.se/Global/Bhv/Dokument/Rapporter/BHV_SLL_2012_Rapport.pdf.
37. Angbratt M Eriksson E, Funcke S, Nilsson U, Säterskog C, Söderlind M. [Survey of children's weight and development of weight in the county Östergötland]. Report 2013: 2. Available from http://www2.lio.se/pages/28480/2003_2_Karlaggn_barns_vikt.pdf: Centre for Public Health): Linkoping, Sweden; 2003 (in Swedish).
38. Berg C, Rosengren A, Aires N, Lappas G, Toren K, Thelle D, et al. Trends in overweight and obesity from 1985 to 2002 in Goteborg, West Sweden. Int J Obesity 2005; 29: 916–924.
39. Neovius M, Janson A, Rossner S. Prevalence of obesity in Sweden. Obes Rev 2006; 7: 1–3.