Clinico-epidemiological profile, including body mass index of Malaysian children with psoriasis

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ABSTRACT

Background: Limited information exists regarding paediatric psoriasis and its association with body mass index (BMI) in Asia.

Objectives: To determine the clinico-epidemiological profile and to compare the BMI of children with and without psoriasis.

Methods: A case-control study of 92 children with psoriasis versus 59 with atopic eczema and 56 with non-inflammatory skin conditions.

Results: Psoriasis was more common in Malay and Indian children when compared to Chinese with odds ratios (OR) of 4.30 (95% CI, 1.85-9.99) and 3.00 (95% CI, 1.02-8.81) respectively. Prevalence of psoriasis was similar between Malay and Indian children (OR 1.43, 95% CI, 0.63-3.25). Male:female ratio was 1:1.09. The mean onset age of psoriasis was 7.9 years. Median onset age was earlier in males (6.5 years versus 9.0 years in females, p=0.05). Plaque psoriasis was the most common phenotype (89.1%) and 94.5% had scalp lesions. Arthritis was seen in 4.3%. Odds of excess adiposity, defined as BMI ≥85th percentile, was higher in children with psoriasis versus non-inflammatory controls (OR 2.35, 95% CI 0.99-5.56, p= 0.052). No increased risk of adiposity was noted between children with psoriasis and eczema (OR 1.14, 95% CI 0.5-2.62, p=0.753). More children with psoriasis (17.4%) and eczema (20.3%) were underweight (BMI <5th percentile) compared to non-inflammatory controls (10.7%).

Conclusion: Malays and Indians are three to four times more likely than Chinese to have psoriasis in multi-ethnic Malaysia. Plaque psoriasis is the most common phenotype. Odds of excess adiposity is about two times higher in children with psoriasis compared to non-inflammatory controls although this observation just missed conventional statistical significance.

KEY WORDS:
Psoriasis, adolescent, children, body mass index, Malaysia

INTRODUCTION

Psoriasis is a chronic inflammatory disease that affects about 2% of adults and 0.6% to 1.4% of children.[1-3] Onset during childhood was reported in 20-30% of affected adults.[1-3] However, the clinico-epidemiological profile of multi-ethnic Asian children with psoriasis is largely unknown.[4] Several studies had shown that adults with psoriasis are more prone to obesity, diabetes, hypertension, myocardial infarct, stroke and mortality.[5-6] Although recent studies have also suggested an increased risk of obesity and its related complications in paediatric psoriasis, only very limited data is available on the association of psoriasis and obesity in Asian children.[3,7-9]

An international, multi-centre, cross-sectional study of 409 patients with paediatric psoriasis which included 84 Asians revealed that globally, children with psoriasis, regardless of severity, had significant risk of being either overweight or obese (OR 2.65, 95% CI 1.70-4.15).[9] In this study, increased adiposity, defined as a body mass index (BMI) percentile ≥ 85%, was observed in American and European children with mild psoriasis (MP) and severe psoriasis (SP). However, excess adiposity was only seen in Asian children with MP.

The objectives of this study are to analyse the clinico-epidemiological characteristics of Malaysian children with psoriasis and to compare the risk of excess adiposity in children with and without psoriasis.

MATERIALS AND METHODS

Setting

The Department of Dermatology in Hospital Sultanah Aminah is a tertiary referral centre for the Johor Bahru district in the state of Johor. Documentation of care is fully electronic since November 2004 and diagnosis capture is by "point and click", mandatory and coded based on ICD10 CM (International Classification of Diseases, 10th revision, Clinical Modification).

A total of 29148 visit records from 8425 patients were documented in 2012. The racial composition of our clinic attendees was Malays 52.8%, Chinese 28.9%, Indians 14.5% and others 3.6%, with a male to female ratio of 1.01:1. Children aged 5 to 17 years accounted for 1131 (13.8%) of all clinic attendees and comprised 70.7% (800) Malay, 17.5% (198) Chinese, and 15.6% (133) Indian children, with a male to female ratio of 1.10:1.

Study design and population

This is a case-control study comparing the clinico-epidemiological characteristics and BMI of children, aged 5 to 17 years, with and without psoriasis. A projected sample of 94 children per group (inclusive of 20% dropouts) provided 80% power to detect a 15% increase in excess adiposity in

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Table I: Demographic and anthropometric characteristics of children with psoriasis in comparison to controls

	Psoriasis (n=92)	Inflammatory Controls (n=59)	p-value	Non-inflammatory Controls (n=56)	p-value	All Controls (n=115)	p-value
Age in years, median (IQR)	13.5 (6.0)	11.0 (6.0)	0.006*	14.0 (6.5)	0.678*	12.0 (6.0)	0.055*
Gender, n (%)							
Male	44 (47.8)	36 (61.0)	0.113	32 (57.1)	0.271	68 (59.1)	0.105
Female	48 (52.2)	23 (39.0)		24 (42.9)		47 (40.9)	
Ethnicity, n (%)							
Malay	72 (78.3)	36 (61.0)	0.005	31 (55.4)	0.005	67 (58.3)	0.002
Chinese	8 (8.7)	17 (28.8)		15 (26.8)		32 (27.8)	
Indian	12 (13.0)	6 (10.2)		10 (17.89)		16 (13.9)	
Height(cm), median (IQR)	151.5 (21.5)	146.0 (35.0)	0.122*	153.5 (31.0)	0.451*	149.0 (33.0)	0.616*
Weight(kg), median (IQR)	46.5 (22.0)	39.0 (25.0)	0.034*	40.5 (26.0)	0.540*	40.0 (25.0)	0.097*
BMI percentile, median (IQR)	49.3 (82.0)	42.6 (85.0)	0.73*	37.2 (73.0)	0.37*	39.2 (77.4)	0.46*
Weight category, n (%)							
Underweight	16 (17.4)	12 (20.3)	0.946†	6 (10.7)	0.330†	18 (15.7)	0.850
Normal weight	48 (52.2)	29 (49.2)		38 (67.9)		67 (58.3)	
Overweight	6 (6.5)	3 (5.1)		3 (5.4)		6 (5.2)	
Obese	22 (23.9)	15 (25.4)		9 (16.1)		24 (20.9)	

*Wilcoxon rank-sum test, †Fisher's exact test
IQR=interquartile range
BMI percentile = age- and sex-specific body mass index (BMI) percentile based on WHO (2007) growth reference for children aged 5-17 years

Table II: Ethnic distribution of children with psoriasis in comparison with control groups

	Psoriasis (n=92)	Inflammatory Controls (n=59)			Non-inflammatory Controls (n=56)			All Controls (n=115)		
		n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value
Ethnicity, n (%)										
Malay	72 (78.3)	36 (61.0)	4.25 (1.68-10.78)	0.002	31 (55.4)	4.36 (1.67-11.33)	0.003	67 (58.3)	4.30 (1.85-9.99)	0.001
Chinese	8 (8.7)	17 (28.8)	1.00	-	15 (26.8)	1.00	-	32 (27.8)	1.00	-
Indian	12 (13.0)	6 (10.2)	4.25 (1.17-15.45)	0.028	10 (17.89)	2.25 (0.68-7.47)	0.185	16 (13.9)	3.00 (1.02-8.81)	0.046

patients with psoriasis when compared to controls. This was based on a 5.5% prevalence rate of excess adiposity in children <18 years old in the state of Johor, as reported in the Malaysian National Health and Morbidity Survey 2011.[10] Cases were children with at least a six month history of psoriasis, diagnosed by dermatologists. Two control groups were chosen. The first control group comprised children without psoriasis or any other inflammatory skin or systemic disorder. The second control group consisted of children with moderate to severe atopic dermatitis, which is an inflammatory skin disorder that differs in its pathogenesis from psoriasis. Cytokines that are increased in psoriasis, which have been linked to obesity such as TNF-α, are not increased in atopic dermatitis.[11] We hypothesised that the risk of excess adiposity in children with psoriasis will be greater than children in either the non-inflammatory or inflammatory control groups.

All children with psoriasis and eligible controls who attended the Dermatology Clinic, Hospital Sultanah Aminah Johor Bahru were recruited consecutively between January and November 2012. This study was approved by the Malaysian Ministry of Health Institutional Review Board and Medical Research Ethics Committee. Written consent was given by all parents. A standard study questionnaire was used to record demography, height and weight, characteristics of psoriasis (age of onset, type and duration of psoriasis, presence of arthritis, percentage of body surface area/sites involved, assessment of disease severity, treatment), personal and family history of atopy and history of psoriasis, obesity, diabetes mellitus, hypertension and hyperlipidemia in immediate family members.

Determination of excess adiposity and disease severity

BMI was calculated by dividing weight in kg by height in m^2. Gender-specific BMI-for-age percentile was assigned by using

Table III: Characteristics of patients by psoriasis severity

Variables	Psoriasis (n=92)		p-value
	Mild psoriasis (n=38)	Severe psoriasis (n=54)	
Agein years, median (IQR)	13.0 (6.0)	14 (6.0)	0.714*
Gender, n (%)			
Male	18 (47.4)	26 (48.2)	0.941
Female	20 (52.6)	28 (51.9)	
Ethnicity n (%)			
Malay	27(71.1)	45 (83.3)	0.307†
Chinese	5 (13.2)	3 (5.6)	
Indian	6 (15.8)	6 (11.1)	
Family history of psoriasis, n (%)	13(34.2)	20 (37.0)	0.781
Age at onset of psoriasis in years, mean (SD)	8.7 (3.7)	7.4 (4.5)	0.15
Psoriasis duration in years, median (IQR)	3 (5)	5 (7)	0.045*
BMI percentile, median (IQR)	62.7 (85.6)	45.2 (73.0)	0.27*
Weight category, n (%)			
Underweight	6 (15.8)	10 (18.5)	0.364†
Normal weight	17 (44.7)	31 (57.4)	
Overweight	4 (10.5)	2 (3.7)	
Obese	11 (29.0)	11 (20.4)	

*Wilcoxon rank-sum test, †Fisher's exact test
IQR=interquartile range
Mild Psoriasis defined as PGA score of 1or 2 or PGA score of 3 plus BSA <10%
Severe Psoriasis defined as PGA score of 4 or 5 or PGA score of 3 plus BSA ≥10%

Table IV: Weight categories of children with psoriasis compared to inflammatory control and non-inflammatory control

Weight categories	Psoriasis (n=92) n (%)	Inflammatory Control (n=59)			Non-inflammatory Control (n=56)			All Controls (n=115)		
		n (%)	OR (95% CI)*	p-value	n (%)	OR (95% CI)*	p-value	n (%)	OR (95% CI)*	p-value
Underweight	16 (17.4)	12 (20.3)	0.77 (0.30 - 1.98)	0.594	6 (10.7)	2.35 (0.78 - 7.06)	0.128	18 (15.7)	1.27 (0.56 - 2.86)	0.569
Normal weight (reference)	48 (52.2)	29 (49.2)	1.00	-	38 (67.9)	1.00	-	67 (58.3)	1.00	-
Overweight	6 (6.5)	3 (5.1)	1.35 (0.28 - 6.45)	0.708	3 (5.4)	2.36 (0.49 - 11.41)	0.287	6 (5.2)	1.61 (0.48 - 5.68)	0.458
Obese	22 (23.9)	15 (25.4)	1.10 (0.46 - 2.66)	0.833	9 (16.1)	2.34 (0.91 - 6.00)	0.078	24 (20.9)	1.65 (0.79 - 3.48)	0.186
Excess adiposity (Overweight and obese)	28 (30.4)	18 (30.5)	1.14 (0.5 - 2.62)	0.753	12 (21.5)	2.35 (0.99 - 5.56)	0.052	30 (26.1)	1.64 (0.82 - 3.26)	0.160

*Adjusted for age, gender and ethnicity
BMI=Body mass index

WHO AnthroPlus software, a global application of the World Health Organization (WHO) 2007 growth reference for children aged 5-17 years.[12] Subjects were classified as underweight if BMI was <5th percentile, overweight when BMI was ≥85th and <95th percentile, and as obese if BMI >95th percentile. Excess adiposity was defined as BMI ≥85th percentile and thus included both overweight and obese subjects. BMI was chosen to define excess adiposity because it is a well-established measure, recommended by several recent evidence-based guidelines and expert committees as a method of choice for diagnosing overweight and obese children/adolescents.[13] Furthermore, a recent systematic review concluded that the utilisation of a high BMI for age and sex with national reference data and percentile-based cut-offs (e.g. BMI ≥95th percentile) to define obesity, identified the fattest children adequately, with moderately high sensitivity and high specificity.[14] This systematic review also found no evidence that use of waist circumference for age improved the diagnosis of obesity, or the associated cardio-metabolic co-morbidities, in children and adolescents.

Psoriasis severity was assessed primarily with Physician Global Assessment (PGA) score and secondarily with percentage of body surface area (BSA) involvement. Psoriasis is classified as mild if the PGA score was one or two, and severe if PGA score was four or five. A PGA score of three is

classified as mild if BSA was ≤10% and severe if the BSA was >10%. Eczema severity was classified based on the recommendations of the National Institute of Health and Care Excellence (United Kingdom).[15]

Statistical analysis
Descriptive statistics were presented as counts and percentages for categorical variables. Mean with standard deviation (SD) was used for normally distributed data while median with interquartile range (IQR) was used for data which were not normally distributed. We used chi-squared test, Fisher's exact test or Wilcoxon rank-sum test for univariate analysis depending on data distribution. Binary logistic regression was used to compare the ethnicity and BMI of psoriasis patients with both control groups and MP versus SP, adjusted for age, gender, and race. Statistical significance was set at $p<0.05$.

RESULTS

Of the 207 subjects enrolled, 92 had psoriasis (38 MP, 54 SP), 59 had atopic eczema and served as inflammatory controls while 56 were non-inflammatory controls (19 acne vulgaris, 17 viral warts, 14 healthy controls who accompanied siblings/parents to our clinic, 3 vitiligo, 2 alopecia areata, 1 keloid). Table I shows the demographic and anthropometric characteristics of enrollees with psoriasis in comparison to both control groups. Of the 92 children with psoriasis, 89.1% had chronic plaque psoriasis, 7.6% had guttate psoriasis and 3.2% had pustular psoriasis. Nail and scalp involvement were seen in 65.2% and 94.5% respectively. Only 4 patients had associated arthritis. A positive family history of psoriasis was present in 33 patients (35.9%). Of the 54 SP patients, two had received phototherapy and only eight patients had received and were still on systemic therapy (4 methotrexate, 2 acitretin, 1 cyclosporine and 1 adalimumab).

The median age of patients with psoriasis was 13.5 years (IQR 6) with a male to female ratio of 1:1.09. Psoriasis was more common in Malay and Indian children when compared to Chinese. (Table II). The mean ± SD age at onset of psoriasis was 7.9 ± 4.2 years (range: 2 months to 16 years) while the median duration of psoriasis was four years (IQR 6). Children with SP had a significantly longer duration of disease than those with MP (median ± IQR, years: 5 ± 7 versus 3 ± 5, p=0.045) (Table III). Disease onset is significantly earlier in males with a median onset-age of 6.5 years (IQR 6.5) versus 9.0 years (IQR 6) in females (p=0.05). Onset-age was not dependent on family history of psoriasis (7.1 years versus 8.4 years, p=0.14), disease severity (MP versus SP: 8.7 years versus 7.4 years, p=0.15) and ethnicity (Malay : Chinese : Indian; 7.7:10:6.5, p=0.5).

The median BMI percentile was higher in children with psoriasis (49.3) and eczema (42.6) compared to non-inflammatory controls (37.2) but the difference was not statistically significant (Table I). The higher median BMI percentile observed in MP (62.7) compared to SP (45.2) was also not statistically significant (Table III). Odds of excess adiposity was higher in children with psoriasis versus non-inflammatory controls (OR 2.35, 95% CI 0.99-5.56, p=0.052) (Table IV). The risk of excess adiposity was not influenced by gender, ethnicity, age group (5-11 year-old versus 12-17 year-old) and severity of psoriasis. No increased risk of adiposity was noted between children with psoriasis and eczema (OR 1.14, 95% CI 0.5-2.62, p=0.753). The proportion of underweight patients in both psoriasis (17.4%) and eczema, which served as the inflammatory controls (20.3%) were much higher than those in the non-inflammatory control group (10.7%).

Family history of the following conditions was present in children with psoriasis, atopic eczema and non-inflammatory disorders respectively; obesity (31.9%, 29.3%, 20.0%), diabetes (50.5%, 45.8%, 44.4%), hypertension (54.9%, 62.7%, 69.1%) and hyperlipidemia (27.5%, 39%, 45.5%). There was no significant difference in the distribution of family history of the above comorbidities among the three groups. Family history of obesity was associated with prevalence of obesity in our subjects where 31.6% and 18.4% of children with and without a positive family history were found to be obese respectively (OR 2.05, 95% CI 1.02-4.12, p=0.041). However, family history of obesity, present in 31.9% of psoriasis patients, 29.3% of inflammatory controls and 20.0% of non-inflammatory controls, did not influence the risk of obesity between patients with and without psoriasis (p=0.29).

DISCUSSION

In this study, children with psoriasis were significantly older than the inflammatory controls with atopic eczema. This is not unexpected since atopic eczema starts before the age of 5 years in 90% of patients and resolved before adolescence in 70%.[15-16] Proportion of Malay children with psoriasis (78.3%) was higher than those in both inflammatory (61%) and non-inflammatory (58.3%) controls.

Psoriasis is found worldwide but its frequency varies among different ethnic groups. In an analysis of 1350 cases of psoriasis among children aged 2 to 19 years in Southern California, prevalence of paediatric psoriasis although low, was highest in non-Hispanic whites (30/10000) and lowest in blacks (6/10000).[17] In this study, Asians were the second most affected group with a prevalence of 20/10000. However, ethnic variation among Asians with psoriasis is not clear. In a study of 315 Singaporean children with psoriasis which comprised 45.7% Chinese, 26.4% Malay and 19.4% Indian, the higher proportion of Indians affected compared to Singapore's general ethnic distribution of 9.2% Indians was highlighted.[4] But this observation could be due to variation in health-seeking behaviour.

The ethnic distribution of our paediatric psoriasis (Malay 78.3%, Chinese 8.7%. Indian 13%) reflected the distribution among 677 paediatric psoriasis (Malay 70.6% Chinese 8.9%, Indian 12.3% and others 8.1%), notified to the Malaysian psoriasis registry from 2007 to 2012.[18] This ethnic distribution, which differed from Malaysia's general ethnic distribution of 54.6% Malays, 24.6% Chinese and 7.3% Indians suggested variation in risk for psoriasis among our multi-ethnic population.[19] Our case-control study showed that Malay and Indian children are three to four times more likely to have psoriasis compared to Chinese with OR of 4.30

(95% CI, 1.85-9.99) and 3.00 (95% CI, 1.02-8.81), respectively. Based on the ethnic composition of our clinic attendees aged 5 to 17 years (70.7% Malay, 17.5% Chinese, 15.6% Indian), this observation is unlikely to be due to variation in care-seeking among the ethnic groups. No difference in prevalence of psoriasis was noted between Malay and Indian children (OR 1.43, 95% CI, 0.63-3.25).

Several studies have shown a female predominance in paediatric psoriasis.[4,20,21] However, boys and girls were equally affected by psoriasis in our study, a finding consistent with studies from India and Minnesota, United States.[2,3] Like most studies worldwide, chronic plaque psoriasis was the most common phenotype observed.[4,7,8,20-22] The earlier age at onset of psoriasis in our patients at 7.9 years compared to a mean onset age of 10 to 11 years in other studies may be due to recall bias.[3,17,20,22] Several studies documented more severe disease in obese children.[20,21] Disease severity was not dependent on age of patient, ethnicity, onset age of psoriasis, family history and BMI in our study.

Children with psoriasis are more likely to be overweight and obese in Europe and the United States of America.[9-11] In recent years, limited data have emerged for Asian children where a similar preponderance has been found in Chinese Han children and a small subset of Asian children with mild psoriasis, but not those with severe psoriasis.[9,22] In this study, the higher odds of excess adiposity observed in children with psoriasis versus non-inflammatory controls just missed conventional statistical significance with a p-value of 0.052. Based on priori hypothesis, paediatric atopic dermatitis, which has recently been shown to be associated with central obesity and hypertension, was included as a control group.[23] Perhaps, a statistically significant difference in the rate of excess adiposity between children with and without psoriasis could be detected if all the controls were totally healthy or only had non-inflammatory skin disorders.

Rate of excess adiposity was very similar in our children with psoriasis (30.4%) and eczema (30.5%). It could be postulated that use of systemic corticosteroids in the inflammatory control group with eczema contributed to the high rate of excess adiposity seen. However, the risk of excess adiposity in children with psoriasis was not increased when compared to children with eczema, even after excluding all 16 children with systemic corticosteroid exposure from analysis (OR before and after adjustment: 1.14, 95% CI, 0.5-2.62 and 1.65, 95% CI, 0.64-4.23). Psychosocial factors such as avoidance of social and physical activities may explain the increased rate of excess adiposity in both children with psoriasis and eczema, suggesting a less significant role of biologic factors such as TNF-α in driving obesity.

Interestingly, the proportion of underweight children with psoriasis (17.4%) and atopic eczema (20.3%) was much higher than our non-inflammatory controls (10.7%) although the difference observed was not statistically significant. The prevalence of underweight children in our non-inflammatory control group reflects the prevalence of underweight children in the State of Johor (11.6%) based on the Malaysian National Health and Morbidity Survey 2011.[10] The increased rate of thinness seen in children with psoriasis and eczema may be due to diet restrictions imposed on children with skin disorders. From our experience, parents frequently exclude seafood, chicken, red meat and eggs from children with skin disorders that they believe are consequences of food allergies although dietary intake was not explored in this study. Dietary exclusions as an attempt to control atopic eczema had been reported; among Chinese, the foods frequently avoided were seafood or fish, eggs, beef and cow's milk.[24,25]

Our study is limited by the possibility of recall bias of caregivers during administration of the questionnaire. We also did not address socioeconomic status, cultural practices such as diet restrictions and psychosocial issues such as avoidance of physical activities, which may influence the BMI of children with psoriasis and eczema. A larger study which explores these aspects would help to address the association of excess adiposity/thinness with psoriasis in Malaysian children.

CONCLUSION

Malays and Indians are three to four times more likely than Chinese to have psoriasis in multi-ethnic Malaysia. Plaque psoriasis is the most common phenotype. Odds of excess adiposity is about two times higher in children with psoriasis compared to non-inflammatory controls although the difference observed was not statistically significant (p=0.052).

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