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ORIGINAL RESEARCH

Prevalence of obesity in paediatric psoriasis and its impact on disease severity and progression

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ABSTRACT

Background/Objectives: The current literature suggests there is a possible connection between paediatric psoriasis and obesity. However, there is a paucity of research on the influence of increased adiposity on the severity of paediatric psoriasis and disease progression. We aimed to compare the prevalence of being overweight or obese in paediatric psoriasis patients and controls and assess the potential impact of being overweight/obese on disease severity and progression of disease.

Methods: This multicentre prospective case-control study included 289 psoriasis patients (aged < 18 years) treated and followed up by one of the four university hospitals in Turkey. The control group consisted of 151 consecutive age-matched and sex-matched children who lacked a personal or family history of psoriasis. The participants' characteristics, psoriasis-related parametres (e.g., initial subtype, psoriasis area and severity index, presence of psoriatic arthritis) and body mass index were determined.

Results: The difference between the prevalence of being overweight/obese among psoriatics (28%) and the control group (19%) was significant ($P = 0.024$). Being overweight/obese had no significant impact on disease severity and unresponsiveness to topical treatment. Within a median follow-up time of 12 months, 23% of our patients with localised disease at disease onset progressed to generalised disease. The impact of being overweight/obese on disease progression was found to be non-significant; however, disease duration was found to have a significant impact on disease progression ($P = 0.026$).

Conclusions: Although it is not associated with disease severity and course, increased bodyweight may be a health problem for psoriatic children.

Key words: disease progression, disease severity, obesity, paediatric psoriasis.

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Abbreviations:

BMI	body mass index
BMI-pctile	body mass index percentile
PASI	psoriasis area and severity index
PsA	psoriatic arthritis
TNF	tumour necrosis factor

INTRODUCTION

Paediatric psoriasis is a relatively common disorder found in nearly 4% of all dermatoses in patients younger than 16 years of age.[1,2] Several studies have provided compelling evidence on an increased risk of cardiovascular disease and metabolic syndrome in adult patients with psoriasis.[3–6] Although comorbidities of paediatric psoriasis have been less extensively studied, current data point to a possible association with obesity and metabolic syndrome.[7–14] The odds ratio (OR) for obesity in patients with paediatric psoriasis versus healthy or diseased controls has been found to vary between 1.31 and 4.92 in different studies.[7,8,10] However, few studies address the link between increased adiposity and disease severity.[10] Furthermore, the impact of obesity on the progression of psoriasis has not been investigated.

The primary aim of this multicentre case-control study was to investigate the prevalence of being overweight or obese among paediatric psoriasis patients as compared to controls. The secondary aims were to analyse the influence of being overweight/obese on disease severity, joint involvement and unresponsiveness to topical therapy. We also aimed to analyse the influence of increased adiposity on progression of disease. As overweight and obesity are defined by the World Health Organization (WHO) as abnormal or excessive fat accumulation that may impair health, and various clinical and epidemiological studies aiming to analyse the link between increased bodyweight and chronic diseases like diabetes or cardiovascular disease enroll both obese and overweight groups, we also investigated being overweight and obese among the participants.[15–19] Accordingly, 289 psoriatic children and 151 children with various disorders were analysed.

PATIENTS AND MATERIALS

Paediatric age was defined according to the WHO definition[20] and 289 paediatric psoriasis patients under the age of 18 years who were being treated and followed up by one of the four university hospitals along three diverse geographical areas of the country were enrolled. In total, 151 consecutive age-matched and sex-matched children, without any skin disease or family history of psoriasis, attending a paediatrics outpatient clinic for various disorders (e.g., asthma or allergic rhinitis, upper respiratory tract infection, urticaria, abdominal pain and constipation) served as controls. In addition to their personal characteristics, a family history of psoriasis, initial disease subtype, age of onset, triggering factors and presence of itching were also determined.

Psoriasis was diagnosed by one of the authors, who are dermatologists, and its severity was classified according to psoriasis area and severity index (PASI). Accordingly, a PASI score of < 10 was classified as mild, whereas a score of ≥ 10 was classified as moderate to severe disease. Generalised plaque psoriasis was defined as involvement of $\geq 10\%$ body surface area with plaque morphology. Subsequently, patients with generalised plaque, erythrodermic and generalised pustular psoriasis were classified as having severe disease. Disease progression was defined as progression from localised disease (involvement of $< 10\%$ of body surface area) to generalised disease (involvement of $\geq 10\%$ body surface area), or progression of guttate psoriasis to generalised plaque psoriasis within the study period. Diagnosis of psoriatic arthritis (PsA) was established by a rheumatologist. Patients had regular follow ups, at least twice yearly or more often, as required and at each visit the disease characteristics, severity and general health parametres were evaluated.

Bodyweight was assessed at baseline using a TBF-310GS Body Composition Analyzer (Tanita Corporation, Tokyo, Japan). The body mass index (BMI) percentiles (BMI-pctile) of all the children were determined and they were categorised as overweight ($85\text{th} \leq \text{BMI-pctile} < 95\text{th}$) or obese ($\text{BMI-pctile} \geq 95\text{th}$).

The primary objective was to compare the prevalence of obesity and being overweight among groups. The secondary objectives were to investigate the association of disease severity: (i) with BMI; (ii) with the existence of psoriasis among first-degree and second-degree relatives; and (iii) with the presence of PsA. Moreover, they were to investigate: (i) the prevalence of arthritis and its association with nail involvement; (ii) the number of patients experiencing emotional stress as the initiating factor; (iii) the prevalence of psoriasis subtypes at disease onset; (iv) the impact of being overweight/obese on the progression of psoriasis in patients with localised disease at onset; and (v) the impact of being overweight/obese on an nadequate response to topical treatments.

The study was reviewed and approved by the Marmara University School of Medicine Ethics Committee (Protocol no. 09.2016.142).

Statistics

The statistical analysis of the data was done using the Statistical Package for Social Sciences (SPSS) vers. 21.0 (IBM, Armonk, NY, USA) software. The Kolmogorov–Smirnov test was used to assess the normality of distribution of variables. Values displaying normal distribution were expressed as the mean ± SD, and values not displaying normal distribution were expressed as medians (interquartile range). Differences between the numeric variables of two groups were tested with independent samples Student's t-test for continuous variables displaying a normal distribution and the Mann–Whitney U test for continuous variables not displaying normal distribution. Differences between the categorical variables of the two groups were tested using Pearson's χ^2 test for variables displaying a normal distribution. P values less than 0.05 were considered significant.

RESULTS

In total, 289 paediatric psoriasis patients (171 females and 118 males) with a mean age of 11.6 years, and 151 controls

(70 females and 81 males) with a mean age of 10.2 years were included. The median age of psoriasis onset was 8 (5–10) and 9 (6–11) years for females and males, respectively, and was statistically insignificant ($P = 0.12$). The mean disease duration was 3.6 ± 3.5 years and the median follow-up period was 12 (6–24) months. Reliable family history data were available in 284 patients, of whom 36% said they had a first-degree or second-degree relative with psoriasis (Table 1).

Of the psoriasis and control patients, 28% ($n = 76$) and 19% ($n = 28$) were overweight/obese, respectively. This difference was significant ($P = 0.024$) and was mainly attributable to a higher number of psoriatic children being overweight ($P = 0.01$), as the prevalence of obesity was not statistically different between the groups ($P = 0.739$) (Table 2). Being overweight/obese bore no relation to disease severity as 22% ($n = 17$) and 20% ($n = 38$) of overweight/obese and healthy weight psoriatic patients had severe psoriasis, respectively ($P = 0.652$). Likewise, the frequency of arthritis, age of disease onset and presence of family history were not different among patients with healthy bodyweight versus overweight/obese patients (Table 3).

Arthritis, detected through rheumatological evaluation with or without an ultrasound examination, was found in 15 (5%) children with psoriasis. Although the presence of arthritis was not related to sex or disease severity, it was found to have a relationship with nail changes. Nail involvement was seen in 67% ($n = 10$) and 38% ($n = 100$) of patients with and without arthritis, respectively, and this difference was significant ($P = 0.027$).

Among the triggering factors, 63 patients and/or their parents (39% of the 161 patients/parents with available data) claimed that a stressful event had initiated the psoriasis. Although data on infectious events at disease onset were not analysed due to recall bias, 25% of the psoriatic children were reported to have frequent upper respiratory tract infections. The Koebner phenomenon and pruritus were observed in 17 and 56% of patients with available data ($n = 168$ and 244), respectively.

Among disease forms, plaque psoriasis (localised and generalised plaque) was the most common subtype and was seen in 215 (74%) of the children, followed by guttate and pustular psoriasis (palmoplantar and generalised pustular), seen in 33 (11%) and 13 (4%) of the patients, respectively. Of the 278 patients with available data, 40% had nail involvement (Table 1).

Over the disease course, 77% of patients with limited disease at onset remained stable with no progression, whereas in 23% progression to generalised disease was observed. Although most of the patients with guttate psoriasis at initial presentation continued to have mild disease, three (9%) developed generalised plaque psoriasis within a follow-up time of 8–11 months. When factors affecting disease progression were analysed, the impact of sex ($P = 0.096$), the presence of family history ($P = 0.735$), BMI ($P = 0.49$) and being overweight/obese ($P = 0.825$) were not significant, whereas patients with a longer disease duration had a greater risk of progression ($P = 0.026$).

All paediatric cases had used topical treatments including moisturisers, corticosteroids and topical vitamin D analogues, with variable success. Patients with mild disease were treated using topical calcipotriol betamethasone

Table 1 Characteristics and disease-related parametres of the psoriasis patients ($n = 289$).

	Mean ± SD/% (n)
Age (years)	11.59 ± 3.61
Sex	
Female	59 (171)
Male	41 (118)
Age at onset of psoriasis (years)	8.04 ± 3.74
Family history (+) ($n = 284$)	36 (103)
Psoriasis subtypes	
Localised plaque	69 (200)
Generalised plaque	5 (15)
Guttate	11 (33)
Palmoplantar pustular	4 (11)
Generalised pustular	1 (2)
Palmoplantar plaque	7 (19)
Inverse	1 (3)
Erythrodermic	1 (2)
Nail involvement ($n = 278$)	40 (110)
Itching ($n = 244$)	56 (137)
Koebner (+) ($n = 168$)	17 (28)
Stressful event at disease onset ($n = 161$)	39 (63)

Table 2 Bodyweight data among psoriasis patients and control group.

	Psoriasis patients ($n = 267$) Mean ± SD/% (n)	Controls ($n = 151$) Mean ± SD/% (n)	P value
Body mass index	20 ± 4.24	18.33 ± 3.70	0.0001
Overweight	16 (43)	7 (11)	0.010
Obese	12 (33)	11 (17)	0.739
Overweight/obese	28 (76)	19 (28)	0.024

Table 3 Mean age of disease onset, presence of family history and psoriasis severity defined according to psoriasis subtype (severe forms; generalised plaque, erythrodermic and generalised pustular psoriasis) among overweight/obese and healthy weight psoriatics.

	Overweight/obese ($n = 76$) Mean ± SD/% (n)	Healthy weight ($n = 191$) Mean ± SD/% (n)	P value
Mean age of onset (years)	8.46 ± 3.81	7.88 ± 3.76	0.256
Family history			
Present	42 (32)	36 (69)	0.323
Absent	57 (43)	64 (122)	
Psoriasis severity			
Severe forms	22 (17)	20 (38)	0.652
Mild forms	78 (59)	80 (153)	
Only topical treatment			
Yes	33 (25)	37 (71)	0.511
No	67 (51)	63 (120)	

dipropionate ointment in addition to moisturisers. Among those using topical therapy, 25% of patients achieved a satisfactory improvement over the course of 14.3 ± 17.34 (0–84) months, whereas 61% discontinued topical agents due to their inefficacy. A PASI ≥ 75 response was obtained in 15%, whereas the worsening of psoriasis was seen in 2% of children using topical agents. When we compared the number of patients responding inadequately to topical treatment modalities among the healthy weight versus overweight/obese psoriatic patients, no significant difference was found ($P = 0.51$) (Table 3).

DISCUSSION

Owing to the paucity of data on the prevalence of obesity, its impact on disease severity and progression in children with psoriasis, we conducted this study on 289 psoriatic children. We have found there is a significantly higher risk of being overweight/obese among psoriatic children (28%) than in controls (19%). The former ratio is higher than the overweight/obese prevalence of Turkish children (19%),[21] and it is also higher than the percentage estimated for 25 European states by the European Association for the study of Obesity, which was stated to be 16–22%.[22] Several studies, with different methodologies, have shown obesity to be more prevalent among psoriatic children.[7,13,23,24] Augustin and colleagues[7] analysed German Health Insurance Organisation data and reported an increased risk of obesity (evaluated by ICD-10 diagnoses) in psoriatic children (8%) than in controls (5%). Paller and colleagues[10] analysed 614 children aged 5–17 years from nine countries and found that psoriasis increased the risk of being overweight/obese (OR = 2.65). The OR for obesity in patients with mild psoriasis and severe psoriasis versus controls was 3.60 and 4.92, respectively. Zhu and colleagues[23] studied 332 patients with plaque psoriasis and 142 controls, all under 15 years of age, and found that the psoriatic children were more likely to be overweight (OR = 2.4) or obese (OR = 2.6). Although the age group and method of data collection differ among the studies, our results also revealed there was an increased risk of being overweight/obese in our group. The lack of significant risk in our obese patients may be explained by the relatively small number of obese patients among the groups. Nevertheless, both overweight and obesity in the paediatric age group are considered excess adiposity and have been found to be associated with an increased risk for chronic health conditions such as type 2 diabetes, coronary heart disease, nonalcoholic fatty liver disease and a range of cancers, and also the potential for shortened life expectancy,[24,25] thus, patients and their parents should be informed and closely monitored for the emergence of such comorbidities.

We investigated the impact of BMI on the risk of having severe disease and have been unable to find such a risk. Likewise, arthritis was not more prevalent among overweight/obese patients. In contrast to our findings, Paller and colleagues[10] and Zhu and colleagues[23] found a correlation between obesity and disease severity, which can be explained by adipose tissue production of proinflammatory cytokines like tumour necrosis factor (TNF)-α and adipokines like leptin potentiating TNF-α and interleukin-6 production and possibly, contributing to increased disease severity.[12,26] Nevertheless, no data on biomarkers of severity in obese/overweight versus healthy weight children are available, and contradictory results can be explained by study populations and the criteria for disease severity, which vary among studies.

Arthritis was detected in 5% of patients. The reported prevalence of arthritis in children with psoriasis is 6–11%.[10,27] As expected, nail involvement was significantly higher in patients with PsA (67%) than in those without PsA (38%). This finding supports the view that nail involvement is related to joint disease in paediatric psoriasis, as is the case with adults.

Overall 161 patients or their parents were able to define triggering factors reliably, of whom 63 (39%) claimed that a major stressful event was the initiator of their disease. Although emotional stress is a well-known precipitating factor, its role as a trigger for disease onset has not been addressed adequately. In this context, psychological interventions and their potential benefit in the management of stressful events in children with psoriasis deserve further investigation.

Among clinical forms, plaque psoriasis, which was seen in 74% of our patients, was the most common psoriasis subtype, followed by guttate psoriasis, seen in 11% of patients (Table 1). Although clinical characteristics of childhood psoriasis have been conclusively described, data on its natural course and progression risk are sparse. Within a median follow-up time of 12 months, 77% of our patients with localised disease at disease onset remained stable, whereas 23% progressed to generalised disease. In the current study, being overweight/obese had no impact on disease progression. Factors influencing the natural course and severity of psoriasis and the impact of early agressive treatment on its future course have not yet been addressed. Even so, as adipose tissue is an endocrine organ producing proinflammatory cytokines and chemokines capable of augmenting inflammatory response, one might expect a higher progression rate among patients with excess adiposity. Nevertheless, disease course and progression may be determined by multiple and as-yet-unidentified factors like genotype, sex, ethnicity, smoking, environmental factors, comorbid conditions, age of onset and early treatment, and thus considering adiposity as a major determinant may be an oversimplistic approach.[28]

In the context of guttate psoriasis, the risk of transformation to generalised plaque psoriasis was lower in our study (9%) compared to the data by Ko and colleagues,[29] who reported that 39% of their patients progressed. Various studies have shown this to occur in 33–68% of patients.[29–31] These differences can be explained by the follow-up time, which varies between 1 and 10 years, and also variation in the age of the study population. Another explanation may be heterogeneity of the disease in an mmunogenetic, epigenetic and clinical context, leading to great variability in disease characteristics and course.

Finally, we analysed the proportion of healthy weight versus overweight/obese patients responding inadequately to topical treatment, and found the difference to be non-significant. Although topical corticosteroids are first-line medications in the management of psoriasis, data on their long-term performance in daily practice are lacking. Topical treatment modalities including moisturisers, corticosteroids and topical vitamin D analogues are mainstay treatments, and patients with mild psoriasis can have acceptable disease control through their use. Within a follow-up time of 14.3 ± 17.34 (0–84) months, 25% of patients achieved satisfactory disease control, whereas 61% discontinued topical agents due to their inefficacy. Given this, one can estimate the time interval to second-line therapy to be < 1 year in most of the paediatric patients, which also has important implications from a pharmacoeconomic point of view.

There are several limitations of the present study, one of which is the lack of direct comparison with the general population. Another limitation is the risk of recall bias for historical data such as triggering factors, including stress. Moreover, the data on the adherence to treatment were obtained from the patients and not measured objectively. Finally, a mean follow-up period of 12 months may not be sufficient to evaluate the progression of disease. Nevertheless, all data were gathered through direct examination and measurements were performed by dermatologists, which eliminates major limitations of registry and database studies. As such, the current study highlights the influence of being overweight/obese on disease severity and course.

In conclusion, although it does not affect disease severity and progression, the risk of being overweight/obese was found to be higher among psoriatic patients. Although most patients with localised psoriasis at disease onset remained stable, 23% progressed to generalised disease. Progression to generalised plaque psoriasis was seen in 9% of patients with guttate psoriasis. Topical treatment modalities failed to provide satisfactory disease control in more than 60% of patients. Large-scale multicentre studies to elucidate the comorbidities and course of psoriasis in the paediatric age group are needed.

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