INTRODUCTION

Lichen planus (LP) is an idiopathic, chronic inflammatory autoimmune disease that affects the skin, mucous membranes, nails, and scalp. It commonly affects the adults. Although rarely described in the Western literature, childhood LP is noticed much more frequently in the Indian subcontinent. Age of onset is earlier in Indian population (20–40 years) than in Westerners (30–60 years).[1] There are a few studies in the literature describing the clinical patterns, histopathological features, and the course of this disease in pediatric patients. The frequency of LP varied from 2.1% to 11.2% of the pediatric population.[2] The treatment of childhood LP is not yet standardized. Systemic steroids are fraught with various unacceptable side effects in children. Our study tries to evaluate various treatment modalities in pediatric patients of LP attending a tertiary care center and especially with acute widespread and generalized childhood LP.

METHODS

This is an interventional, longitudinal, nonrandomized, and unblinded study carried out in a tertiary care center.

All patients of age <12 years attending the dermatology outpatient department, presenting with clinical features of LP were included in the study after obtaining informed consent from their parents or guardians.

A detailed history was taken, and patients underwent thorough general, cutaneous, and systemic examination. Information regarding the age, sex, initial site of onset, duration of illness, morphology and distribution of the lesions, family history, drug history, hepatitis B vaccination, and precipitating or aggravating factors was noted. Biopsy was performed in three-fourth of metronidazole-treated patients by 20 weeks. Remaining 11 patients who were treated oral, topical, or intralesional therapy also showed improvement as predicted. Dapsone and metronidazole therapy did not result in any side effects in this study.

Conclusion: Dapsone can be utilized as an effective steroid-sparing agent in the treatment of childhood LP.

Key Words: Childhood lichen planus, dapsone, metronidazole
diagnosed cases of LP of <12 years of age of either sex were included in the study. When dapsone therapy was initiated, patients with hemoglobin >10 g% and with normal G6PD activity were included in the study. All patients fulfilling the inclusion criteria for dapsone were started on 1.5–2 mg/kg/day of dapsone given at night. It was continued till 12 weeks or until complete remission, whichever was earlier. Patients were assessed fortnightly and evaluated for symptoms of itching, appearance of new lesions, and flattening of lesions. Complete hemogram and liver function tests were repeated at monthly intervals.

RESULTS

Forty-nine patients were included in our study. The age of the patients ranged from 2 to 12 years, with a mean age of 8.77 years. Most cases were in the age group of 10–12 years (51%) [Table 1]. The youngest patient was a 2-year-old boy.

Males (63.3%) outnumbered females (37.6%), the ratio of male to female being 1.68:1. Only one patient had a positive family history of LP affecting elder sister. The age at onset was between 2 and 12 years with a mean of 8.38 years [Table 2]. The duration of the disease was <2 months in 36.73% of the patients. Most common type of LP seen was of the classical type. Classical generalized LP was seen in 29 patients (57.14%), localized LP was seen in 13 patients (24.48%), and a total of 7 patients (14.28%) had hypertrophic LP (14.28%). A total of 7 patients had concomitant oral LP. One patient had acute onset of LP with eczematization secondary to irritant application. Although koebnerization was most common in acute generalized type of LP, it was also noted in 50% patients with chronic generalized LP. No history of any precipitating factors was found in any of the patients except one male who gave a history of exacerbations following periods of examination stress. G6PD enzyme levels were found to be low in one of the male patients (2.0%).

Out of the 49 patients, five patients did not follow up after the initial visit. A total of 25 patients were started on dapsone. Four patients were treated with metronidazole as they had anemia. Details of patients who were treated with various treatment modalities are given in Table 2.

Seven patients had concomitant oral mucosal involvement. Three out of these patients were treated with dapsone. Dapsone and topical isotretinoin gel were given in one patient. One of the metronidazole cohorts, patient had mucosal involvement. The rest two were given topical steroids.

Dapsone in childhood lichen planus

A total number of patients of acute generalized LP treated with dapsone were 14, out of which 12 completed therapy. Itching was controlled in 83.3% of the patients within 2–4 weeks. In 66.6% of the patients, new lesions stopped appearing within 2–4 weeks. Flattening started within 8–10 weeks in 91.6%. Complete response was achieved in 75% of the patients within 14–16 weeks of treatment [Figure 1a-c]. Only one patient did not show any significant improvement after 12 weeks of therapy, and so dapsone was discontinued. All three patients of chronic generalized LP completed dapsone therapy. Itching was controlled in all patients of chronic generalized LP within 2–4 weeks. Complete response was seen by 23–25 weeks in all of these patients.

A total number of patients of acute localized LP treated with dapsone were 3, out of which 2 completed therapy. Itching was controlled within 4 weeks in 66.7% of the patients. Complete response was seen by 20–22 weeks in the patients who completed the therapy. All three patients of chronic localized LP completed dapsone therapy. Flattening of the lesions in patients with chronic localized LP started at 8–10 weeks. Complete response was seen in all the three patients at 13, 20, and 24 weeks, respectively.

Two patients of hypertrophic LP were started on dapsone. One patient was lost to follow-up. In the other patient though...
itching responded there was no significant flattening seen. Three patients showed recurrences of the lesions after 2–6 months of stopping dapsone. They developed few lesions at the sites of previous affection. These recurrences were managed with topical steroids alone.

None of the patients in our study who were started on dapsone developed any adverse effects or any idiosyncratic reactions.

**Metronidazole in lichen planus**

Metronidazole (10 mg/kg/dose, tid) was given to four patients with low hemoglobin (two with acute generalized LP, one with acute localized LP, and one with hypertrophic LP). Itching was controlled in all the patients within 3–6 weeks of therapy. Complete response was seen in three patients by 20 weeks [Figure 2]. One patient out of the four did not show a complete response.

**Corticosteroids in lichen planus**

A total of 12 patients with only localized lesions were treated with topical steroids and emollients. Only four patients completed the treatment, rest all were lost to follow-up. Itching was controlled within 2–4 weeks, new lesions stopped appearing after 2–4 weeks, and a complete response was seen in three patients after 20–24 weeks. Intralesional triamcinolone acetonide (10–20 mg/ml) every three weekly was given in two patients of hypertrophic LP who did not respond to other modalities. Although painful, it was effective in causing flattening of the lesions in three sittings.

Oral prednisolone (1 mg/kg/day) was used in two patients; both with eczematized lesions. It was tapered over a period of 6 weeks. One patient was lost to follow-up, the other showed recurrence of few lesions after tapering off the steroids.

**Nonsteroidal topical therapies**

Topical isorretinoin gel was given to one of the patients with buccal mucosal lesions. It was found to be effective in giving symptomatic relief as well as in achieving response earlier (within 16 weeks). Topical tacrolimus was given in one patient of mucosal LP and one with hypertrophic LP who had local steroid side effects. The patient with LP lesions on the lips showed marked improvement of the lip lesions within 10 weeks. It did not cause any significant response in the case of hypertrophic LP.

**DISCUSSION**

We observed a total of 49 patients of childhood LP over a period of 2 years. Of the 49 patients observed, there were 31 boys and 18 girls. The male to female ratio was 1.68:1. This was in range with the study done by Sharma et al.[3] Only one study by Kumar et al.[4] had noticed an inverse ratio. Our study was conducted over a period of 2 years, as against all other studies which ranged from a period of 3–12 years [Table 3].

There are no randomized controlled trials with respect to treatment of childhood LP, and hence our data have been compared with reports from various small case series and case reports. Treatment modalities that were used in our

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**Figure 1:** (a-c) Excellent response to oral dapsone in childhood lichen planus.

**Figure 2:** (a and b) Excellent response to oral metronidazole in childhood lichen planus.
Table 3: Comparative analysis of demographic profile of various studies of childhood lichen planus

| Study region | Total number of patients | Study duration (years) | Sex distribution (%) | Male | Female | Male to female ratio |
|--------------|--------------------------|------------------------|----------------------|------|--------|---------------------|
| Present study 2006 | 49 | 2 | 63.3 | 37.6 | 1.68:1 |
| Kumar et al., 1993 | 25 | 3 | 36 | 64 | 0.56:1 |
| Sharma and Maheshwari, 1999 | 50 | 4 | 64 | 36 | 1.77:1 |
| Handa and Sahoo, 2002 | 87 | 12 | 52.9 | 47.1 | 1.12:1 |
| International studies | | | | | |
| Rybojad et al., 1998 | 12 | 2 | 58.3 | 41.7 | 1.39:1 |
| Nanda et al., 2001 | 23 | 7 | 52 | 48 | 1.08:1 |

The response in cases of LP of mucous membranes was better as compared with that of cutaneous LP. There are few case reports of the use of dapsone in the treatment of childhood LP. Kumar et al. treated 11 patients with dapsone in the dose of 1–2 mg/kg/day.[11]

Itching had subsided completely in all within a month, flattening had started after 3 months of treatment, and healing was complete in all cases within 6 months. Nanda et al. treated two patients with moderate severity of LP with dapsone 1–2 mg/kg and found it to be effective and safe.[7] Sharma and Singhal also used dapsone in one of their patients with good response.[12] Basak and Basak treated one patient of generalized LP with dapsone initially in the dose of 1.5 mg/kg/day later on increased to 2.5 mg/kg/day, and response was noted at the end of 5 months.[8] No adverse effects of dapsone were found in any of the pediatric patients who were treated with dapsone in the above studies. Results of various other studies or case series are given in Table 4.

Thus, like all above-mentioned studies or case series, dapsone was found to be safe and efficacious treatment modality for childhood LP. We did not come across any comparative studies of dapsone with any other routinely used treatment modalities in childhood LP. These findings necessitate the need of blinded and controlled studies to prove beyond doubt the therapeutic efficacy of dapsone in the treatment of childhood LP.

Metronidazole was given in four of our patients, one of which had mucosal LP. All these patients had a low hemoglobin as a result of which dapsone could not be initiated in them. One patient did not show any significant response to metronidazole. Complete response was seen in three patients within 12–20 weeks. None of the patients showed any side effects of metronidazole. We did not come across any reports on the use of metronidazole in the treatment of childhood LP. Hence, we have compared our results with the two studies involving adult LP. Although study included dapsone, oral metronidazole, systemic corticosteroids, topical steroids, topical tacrolimus, topical isotretinoin, and intralesional steroids. Emollients were given to all the patients.

We treated a total of 25 patients (14 with acute generalized, 3 with chronic generalized, 3 with acute localized, 3 with chronic localized, and 2 with hypertrophic LP). Three of these patients had concomitant mucosal involvement as well. We had five dropouts among the patients treated with dapsone. They failed to follow up after variable period during the study. All the patients tolerated the drug well. None of the patients started on dapsone developed any adverse effects or any idiosyncratic reactions.

We observed that dapsone controlled itching remarkably in all the patients irrespective of whether they achieved a complete response or not. Itching decreased within 2 weeks of therapy and subsided completely in most of the patients of all types of LP by 4 weeks. Antihistamines were not given in patients on dapsone, so dapsone was solely responsible for the antipruritic effect. A similar observation of the antipruritic efficacy of dapsone was made by Basak and Basak.[8]

Dapsone was initially found to be effective in the treatment of erosive LP. It was subsequently found to be dramatically effective in a small number of patients with cutaneous and mucosal lesions as well. Since then, dapsone is being used in the treatment of adult as well as pediatric LP cases. Kumar et al. used dapsone in 92 adult patients in the dose of 100 mg twice daily for 16 weeks.[9]

They observed complete healing with hyperpigmentation in 65.3% of the patients within 16 weeks, partial response in 18.7%, and treatment failure in 12% after 4 weeks of therapy. There was a relapse in four patients, but they responded quickly to reinitiation of therapy. Chopra et al. also observed a similar response in their patients where 52% of their patients responded well to dapsone.[10]
this is not appropriate, still it can be used as a rough guide for the use of metronidazole in children.

There are few case reports of the use of metronidazole in treatment of LP. Wabha-Yahav had used metronidazole 250 mg thrice daily for 2–3 weeks and observed complete cure of pruritus and subsidence of new lesions after the first course of therapy. They also used four monthly courses of metronidazole for 12 months in one of their female patients who cleared completely after 1 year. However, their only male patient was completely unresponsive to the treatment. The results of this study indicated that metronidazole may be effective in at least some patients with idiopathic LP.

Büyük and Kavala treated 19 patients of idiopathic LP with metronidazole in the dose of 500 mg twice daily for 20–60 days. Improvement was seen in 78.9% of the patients. Complete response was observed in 13 patients (7 women and 6 men). Two patients responded partially. Worsening of the lesions was observed in one of the four nonresponding patients.

Thus, though the exact mechanism of action of metronidazole in idiopathic LP is not known, it has definitely been proved to be effective in some of the patients. Its immunomodulatory activity seems to be a possible mechanism of action besides its antimicrobial activity. Although we tried metronidazole in only four of our patients, the response seen in three out of these four patients was quite significant. Thus, metronidazole can also be tried as an alternative therapy in the treatment of childhood LP.

A total of 12 patients with only localized lesions were treated with topical steroids and emollients. Only four patients completed the treatment, rest all were lost to follow-up. Itching was controlled within 2–4 weeks, new lesions stopped appearing after 2–4 weeks, and a complete response was seen in three patients after 20–24 weeks. Hypopigmentation was the side effect seen in all. Moderate-to-high potency topical steroids are used on the affected areas for a variable duration (4–6 months) depending on the response.

We used systemic corticosteroids in only in three patients, one with generalized and eczematized LP and two patients with acute generalized LP. There was a recurrence of lesions in one patient on stopping systemic steroids. Prednisolone at an initial dose of 1 mg/kg/day, tapered over 4 months had been shown to be effective, but relapses were common on tapering the dose or withdrawal of the treatment. This treatment needs careful monitoring for the steroid side effects which can be unacceptable in children.

Topical isotretinoin gel has been found to be effective in atrophic-erosive forms of oral LP. We too found isotretinoin gel to be effective in the management of mucosal LP. It caused earlier healing (16 weeks) of the mucosal lesions as against the cutaneous lesions (24 weeks). Topical tacrolimus 0.1% was found to be effective by Laeijendecker et al. in the management of erosive oral LP with relapses after discontinuation of the treatment.

Table 4: Comparative data about the use of dapsone in childhood lichen planus

|               | Present study | Kumar et al. | Chopra et al. | Nanda et al. | Sharma et al. | Basak et al. | Handa and Sahoo[5] | Kwee et al.[13] |
|---------------|---------------|--------------|---------------|--------------|---------------|--------------|-------------------|----------------|
| Number of cases | 25            | 11           | 3             | 2            | 1             | 1            | 5                 | 1              |
| Type of LP    | Classic LP, hypertrophic LP, and mucosal LP | Classic LP | Classic LP and mucosal LP | Classic LP | Cutaneous and mucosal LP | Generalized LP | Mucosal LP | Bullous LP |
| Dosage        | 1.5-2 mg/kg | 1-2 mg/kg | 50 mg tds | 1-2 mg/kg | - | 1.5 mg/kg initially later increased to 2.5 mg/kg | - | 1 mg/kg |
| Duration of treatment | 12 weeks or till complete response | 3-6 months | 3 months | 4-6 months | 12 weeks | 13 months | - | 4 weeks |
| End point     | Complete flattening of lesions with no new lesions | - | - | - | - | Complete flattening of lesions with no new lesions | - | Complete clearing of the lesions |
| Response      | Good         | Good         | Good         | Good         | Good         | Good         | Good              | Good |
| Relapse       | -            | In 2 patients | -            | -            | No relapse   | -            | -                | No relapse |
| Drop-out      | 5            | -            | -            | -            | -            | -            | -                | - |
| Effect on itching | Subsided completely within 2–4 weeks | Subsided completely within 1 month | Subsided completely within 1 month | Subsided completely within 1–2 months | |
| LP: Lichen planus |             |              |              |              |              |              |                   |               |

LP: Lichen planus
Similarly, it was found to be effective in many other studies.\[18\]

In our study, the patient with mucosal LP showed a marked improvement within 10 weeks of topical tacrolimus. However, the lesions of hypertrophic LP in the other patient did not show any response. Thus, topical tacrolimus can be used as a substitute to topical steroids in the treatment of mucosal LP in children as well. Although we used topical tacrolimus in a single patient, its efficacy noted in our case should encourage more controlled studies.

**CONCLUSION**

Thus, our study of various treatment modalities in childhood LP demonstrates that dapsone can be effective alternative to systemic corticosteroids in acute and chronic generalized LP in children. Double-blind randomized controlled studies of sufficient sample size are required to establish efficacy and safety of nonsteroidal systemic agents such as dapsone and metronidazole in LP.

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**Conflicts of interest**

There are no conflicts of interest.

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