



## Research Article

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### EXPLORATORY STUDIES ON THE THERAPEUTIC EFFECTS OF PATOLADI SYRUP IN THE MANAGEMENT OF CHRONIC TONSILLITIS IN CHILDREN AT A TERTIARY CARE HOSPITAL OF SOUTHERN INDIA

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#### ABSTRACT

To assess the effectiveness of Patoladi syrup in the management of chronic tonsillitis (Tundikeri) in children. 30 patients of chronic tonsillitis satisfying diagnostic criteria and in age group of 7-14 years were selected from outpatient and inpatient department of Kaumarabhritya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. The subjects were treated with Patoladi syrup in the dose of 10 ml three times a day after food for 15 days. The assessment of the signs and symptoms were done once in 7 days during the study and then 15 days after the study i.e., on the 30<sup>th</sup> day. The patients underwent laboratory investigations before and after the treatment. Statistically significant effect ( $p < 0.001$ ) of Patoladi syrup in reduction of all signs and symptoms of chronic tonsillitis except in Mukhadourgandhya after treatment were observed. Patoladi syrup is effective in reducing most signs and symptoms of chronic tonsillitis.

**Keywords:** Patoladi syrup, Chronic tonsillitis, Tundikeri, Mukhadourgandhya

#### INTRODUCTION

Tundikeri (tonsillitis) is a common childhood infection and most often diagnosed in children from preschool age through their midteens<sup>1,2</sup>. Tonsillitis is an infection of tonsils that are glands on either side of the back of the throat<sup>3</sup>. The infectious agents are most often viral in origin, although bacterial tonsillitis is also frequently diagnosed<sup>4</sup>. The tonsils help in the immune system to protect the body from infections that may enter through the mouth by producing antibodies that fight infection. When the tonsils become infected they become inflamed and red, and have a yellow or white coating. When this happens, they lose their effectiveness in helping the immune system and become a source of recurrent infection. The recurrent attack of tonsillitis makes the disease chronic and vulnerable for various diseases such as peritonsillar abscess, rheumatic fever, laryngeal edema, acute otitis media, rheumatic heart diseases etc. are frequently seen as systemic complications. Hence, appropriate intervention is most important.

As per Ayurvedic literature, Tundikeri is one among the Urdhvajatrugata roga<sup>5</sup>. In the present study it was planned to evaluate the effectiveness of Patoladi syrup in the management of

chronic tonsillitis in children. Patoladi Kashaya Yoga<sup>6</sup> is mentioned in Bhaishajya ratnavali under Mukharoga Prathishedha Adhyaya. Patoladi Kashaya Yoga<sup>6</sup> consists of Patola (*Trichosanthes dioica* Roxb.)<sup>7</sup>, Shunti (*Zingiber officinalis* Roscoe)<sup>8</sup>, Haritaki (*Terminalia chebula* Retz.)<sup>9</sup>, Vibhitaki (*Terminalia bellerica* (Gaertn.) Roxb.)<sup>10</sup>, Amalaki (*Emblica officinalis* Gaertn.)<sup>11</sup>, Vishala (*Citrullus colocynthis* (L.) Schrad.)<sup>12</sup>, Brahmi (*Bacopa monnieri* (L.) Pennell)<sup>13</sup>, Daruharidra (*Berberis aristata* DC)<sup>14</sup>, Haridra (*Curcuma longa* L.)<sup>15</sup>, Guduchi (*Tinospora cordifolia* (Thunb.) Miers)<sup>16</sup> and Katuki (*Picrorhiza kurroa* royle ex benth.)<sup>17</sup>.

#### MATERIALS AND METHODS

##### Method of collection of data

##### Source of data

Patients were selected successively from the outpatient department of Kaumarabhritya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. Ethics clearance was obtained from Institutional Ethic committee of Sri Dharmasthala Manjunatheshwara College of Ayurveda and

Hospital, Hassan (IEC No. SDMCAH/IEC/153/13-14 dated 05-04-2014).

### Research design

Total 47 patients were screened for chronic tonsillitis. Among them, 30 patients were enrolled into the study and in that 3 got dropped out. Convenient sampling technique was adopted for the same. These patients were treated with Patoladi syrup in the dose of 10 ml three thrice a day after food for 15 days. The assessment of the signs and symptoms were done once in seven days during the study and then 15 days after the study i.e., on the 30<sup>th</sup> day. The patients underwent lab investigations before and after the treatment.

### Diagnostic criteria

Diagnosis was made based on symptoms of Tundikeri i.e. Katina Shotha (enlargement of tonsils), Ragata (hyperaemia), Galoparodha (dysphagia), Mukha daurgandhya (halitosis), Lasikagranthi vriddhi (enlargement of lymph nodes). The participants presenting with any one or more of the above-mentioned symptoms were initially included, fulfilling the inclusion criteria<sup>1</sup>.

### Inclusion criteria

Children of both gender between 7-14 years of age, who were suffering from repeated attacks of tonsillitis (chronic) in past year.

### Exclusion criteria

Patients with acute tonsillitis, peritonsillar abscess, tonsillar cyst, tonsillolith or with any other systemic disorders. Also, the patients who have taken systemic steroids and/or antibiotics in the past four weeks.

### Method of preparation of Patoladi syrup

The genuine raw drugs were collected from local market of Calicut district, Kerala state and authenticated from department of Dravyaguna, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan, Karnataka. Later the study drug was prepared at Sri Dharmasthala Manjunatheshwara Teaching Pharmacy, Hassan, Karnataka. The ingredients with Sanskrit and botanical name, form and proportion is detailed in table 1.

### Method of preparation

Equal parts (700 grams) of above ingredients are made into coarse powder and 16 parts of water is added to these and heated over low flame, reduced into 1/8<sup>th</sup> part and made into Kwatha. After the filtration of Kwatha, two parts of sugar is added and heated on low flame till the mixture attains thread like consistency. After complete cooling, it was stored in air tight bottle of 450 ml.

### ASSESSMENT CRITERIA

Suitable scores were assigned to assess changes in clinical features of tonsillitis such as Kathinashotha (enlargement of tonsils) (figure 1), Ragata (hyperemia), Galoparodha (dysphagia), Mukhadaurgandhya (halitosis) and Lasikagranthivridhi (enlargement of lymph nodes).

Sl. No.	Domain	Criteria	Grade
1.	Enlargement of tonsils (Kathinashotha)	No Enlargement	1
		Enlarged within anterior pillars	2
		Enlarged within posterior pillars	3
		Enlarged beyond pillars	4
		Kissing tonsils with sleep apnoea	5
2.	Hyperemia (Ragatwa)	No Hyperaemia	1
		Hyperaemia of tonsil surface	2
		Pinkish appearance of pillars	3
		Reddish appearance of surroundings	4
		Reddish appearance of surroundings and pharynx	5
3.	Dysphagia (Galoparodha)	No pain while swallowing	1
		Pain during swallowing solid food substances	2
		Pain during swallowing semi-solid food substances	3
		Pain during swallowing liquid food substances	4
		Continuous pain/unable to swallow	5
4.	Halitosis (Mukhadaurgandhya)	No halitosis	1
		Foul breathe experienced by patient only	2
		Foul breathe is experienced by patient and friends/parents	3
		Foul breathe is experienced by a group of surrounding people	4
		Foul breathe is experienced as soon as the patient opens the mouth	5
5.	Enlargement of lymph nodes (Lasikagranthi Vriddhi)	No palpable lymph nodes	1
		Palpable lymph nodes unilateral/warm	2
		Palpable lymph nodes bilateral/soft/fluctuant	3
		Palpable lymph nodes bilateral which are hard	4
		Palpable lymph nodes bilateral with tenderness	5

### Statistical analysis

Statistical Package for the Social Sciences version 20 was made use of Paired Samples t-Test and Wilcoxon Test (t-Test for within subjects' designs) was done.

### OBSERVATIONS AND RESULTS

The data collected were classified as follows for easy assessment.

A. Demographic data and clinical status of children with chronic tonsillitis

B. Data related to response of treatment

A. Demographic data

Age wise distribution of registered subjects shows that 10 patients were of 7 years, 4 patients each were of 8 years, 11 years and 12 years, 03 patients each were of 10 years and 14 years. 01 patient each was 9 years of age and 13 years of age. Gender wise distribution showed that 20 patients (66.7%) were males and 10 patients (33.3%) were female. The religion based distribution showed that 26 patients (86.7%) were Hindu, 04 patients (13.3%) were Muslims. The socio-economic status based distribution showed that 1 patient (3.3%) was of upper class, 10 patients (33.3%) were of upper middle class, 19 patients (63.3%) were of lower middle class. Diet based distribution showed that 22 patients (73.3%) were of mixed food habits and 08 patients (26.7%) were vegetarian. 4 patients (13.3%) were having duration of onset of tonsillitis for a period of three years or more, 07 patients (23.3%) were having duration of onset of tonsillitis for a period of two years or more and 19 patients (63.3%) were having duration of onset of tonsillitis for a period of one year or less than that. Maximum numbers of 12 patients (40%) were having poor oral hygiene, 10 patients (33.3%) were having moderate oral hygiene and only 08 patients (26.7%) were having good oral hygiene. 04 patients (13.3%) were habituated to bakery items/junk food, 02 patients (6.7%) patients were consuming excess of Dadhi (curd), 07 patients (23.33%) were consuming sweets/chocolates, 06 patients (20%) were taking ice creams, 11 patients (36.7%) were excessively using cold drinks. 15 patients (50%) were having the history of exposure to Raja (dust), 07 patients (23.33%) were having the history of Diwaswapna (day time sleep) and 8 patients (26.7%) were having the history of Avakshyaya. 30 patients (100%) reported with Kathina Shodha, 30 patients (100%) with Ragatva, 27 patients (86.7%) with Galoparodha, 04 patients (13.3%) reported with Mukha Dourgandhya, 21 patients (70%) were having Lasikagranthi Vriddhi. 20 patients (66.7%) were diagnosed as chronic

parenchymatous tonsillitis, 10 patients (33.3%) were diagnosed as chronic follicular tonsillitis. Majority of the subjects 09 patients (30%) were of Vishamagni, 16 patients (53.3%) were of Mandagni, and 05 patients (16.7%) were of Samagni type. 15 patients (50%) were with hard Koshta, 07 patients (23.3%) were with soft Koshta and 08 patients (26.7%) were with normal Koshta. 10 patients (33.3%) had normal sleep while 20 patients (66.7%) had disturbed sleep. 21 patients (70%) were having coated tongue while in 09 patients (30%), tongue was uncoated. 19 patients (63.3%) were having congestion in soft palate while 1 patient (3.3%) was having edematous soft palate and 10 patients (33.33%) were having normal soft palate. 21 patients (70%) were having normal movement of soft palate while 09 patients (30%) had impaired movement of palate. 08 patients (26.7%) had congested uvula, 06 patients (20%) had shift uvula, 03 patients (10%) had elongate uvula and 13 patients (43.3%) had normal uvula. 1 patient (3.3%) had congested and edematous tonsil, 06 patients (20%) had congested and hypertrophied tonsils, 09 patients (30%) congested, and pustule tonsils, 24 patients (80%) had congested, and Swollen. 02 patients (6.7%) had congested and edematous tonsil, 6 patients (20%) had congested and hypertrophied tonsils, 09 patients (33.3%) congested, and pustule tonsils, 24 patients (80%) had congested, and Swollen. 13 patients (43.3%) had bilaterally palpable lymph nodes while 6 patients (20%) had unilateral palpable lymph nodes and in 11 patients (36.7%) lymph nodes were not palpable.

B. Data related to response to treatment

In the study, it was attempted to measure the effectiveness of the treatment by assessing signs and symptoms by adopting scoring technique. The effect of Patoladi syrup on Katinashodha, Ragatwa, Galoparodha, Mukhadourgandhya and Lasikagranthi Vriddhi are detailed from table 2 to 6. The effect of Patoladi Syrup on laboratory investigations in Tundikeri (BT and AT) - Paired Samples t- Test (within the group) is shown in table 7.

Table 1: Ingredients with Sanskrit and Botanical name, form and proportion

Sl. No.	Sanskrit Name	Botanical Name	Parts used	Proportion
1.	Patola	<i>Tricosanthus dioica</i> Roxb.	Moola	1 part
2.	Shunti	<i>Zingiber officinalis</i> Roscoe	Khanda	1 part
3.	Haritaki	<i>Terminalia chebula</i> Retz.	Phala	1 part
4.	Vibhitaki	<i>Terminalia bellarica</i> (Gaertn.) Roxb.	Phala	1 part
5.	Amalaki	<i>Emblica officinalis</i> Gaertn.	Phala	1 part
6.	Vishala	<i>Citrullus colocynthis</i> (L.) Schrad.	Moola	1 part
7.	Brahmi	<i>Bacopa monnieri</i> (L.) Pennell	Moola	1 part
8.	Katuki	<i>Picrorhiza kurroa</i> royle ex benth.	Khanda	1 part
9.	Haridra	<i>Curcuma longa</i> L.	Khanda	1 part
10.	Daruharidra	<i>Berberis aristata</i> DC	Twak	1 part
11.	Guduchi	<i>Tinospora cordifolia</i> (Thunb.) Miers	Kanta	1 part

Table 2: The effect of Patoladi syrup on Katinashodha

Parameter	N	Mean Rank	X <sup>2</sup>	df	Sig	Remark
Katinashodha BT	27	3.47	81.00	3	.000	HS
Katinashodha 7 <sup>th</sup> day		3.47				
Katinashodha 15 <sup>th</sup> day		1.53				
Katinashodha 30 <sup>th</sup> day		1.53				

HS – highly significant, Friedman's Test, X<sup>2</sup> – Chi square, N- Number of patients, Bonferroni correction = <.0125

Parameter	Negative Rank	Positive Rank	Ties	Total	Z Value	P Value	Remark
Katinashodha (7 - BT)	0	0	28	28	.000	1	NS
Katinashodha (15-7)	27	0	0	27	-5.112	.000	HS
Katinashodha (30-15)	0	0	27	27	.000	1.000	NS
Katinashodha (30-BT)	27	0	0	27	-5.112	.000	HS

Parameter	N	Mean Rank	X <sup>2</sup>	df	Sig	Remark
Ragatwa BT	27	3.7	70.348	3	.000	HS
Ragatwa 7 <sup>th</sup> day		3.12				
Ragatwa 15 <sup>th</sup> day		1.83				
Ragatwa 30 <sup>th</sup> day		1.35				

HS – highly significant, Friedman’s Test, X<sup>2</sup>– Chi square, N- Number of patients, Bonferroni correction = <.0125

Table 3: The effect of Patoladi syrup on Ragatwa

Parameter	Negative Rank	Positive Rank	Ties	Total	Z Value	P Value	Remark
Ragatwa (7 - BT)	12	0	16	28	-3.217	.001	S
Ragatwa (15-7)	20	0	7	27	-4.093	.000	HS
Ragatwa (30-15)	10	0	17	27	-3.051	.002	S
Ragatwa (30-BT)	27	0	0	27	-4.602	.000	HS

Table 4: The effect of Patoladi syrup on Galoparodha

Parameter	N	Mean Rank	X <sup>2</sup>	df	Sig	Remark
Galoparodha BT	27	3.58	56.508	3	.000	HS
Galoparodha 7 <sup>th</sup> day		2.80				
Galoparodha 15 <sup>th</sup> day		1.88				
Galoparodha 30 <sup>th</sup> day		1.73				

HS – highly significant, Friedman’s Test, X<sup>2</sup>– Chi square, N- Number of patients, Bonferroni correction = <.0125

Parameter	Negative Rank	Positive Rank	Ties	Total	Z Value	P Value	Remark
Galoparodha (7 - BT)	12	1	15	28	-3.051	.002	S
Galoparodha (15-7)	13	0	14	27	-3.606	.000	HS
Galoparodha (30-15)	3	0	24	27	-1.732	.083	NS
Galoparodha (30-BT)	25	0	2	27	-4.838	.000	HS

Table 5: The effect of Patoladi syrup on Mukhadourgandhya

Parameter	N	Mean Rank	X <sup>2</sup>	df	Sig	Remark
Mukhadourgandhya BT	27	2.61	9.000	3	.029	NS
Mukhadourgandhya 7 <sup>th</sup> day		2.61				
Mukhadourgandhya 15 <sup>th</sup> day		2.39				
Mukhadourgandhya 30 <sup>th</sup> day		2.39				

NS – Non-significant, Friedman’s Test, X<sup>2</sup>– Chi square, N- Number of patients

Table 6: The effect of Patoladi syrup on Lasikagrundi vridhi

Parameter	N	Mean Rank	X <sup>2</sup>	df	Sig	Remark
Lasikagrundi vridhi BT	27	3.20	54.78	3	.000	HS
Lasikagrundi vridhi 7 <sup>th</sup> day		3.13				
Lasikagrundi vridhi 15 <sup>th</sup> day		2.02				
Lasikagrundi vridhi 30 <sup>th</sup> day		1.65				

HS – highly significant, Friedman’s Test, X<sup>2</sup>– Chi square, N- Number of patients, Bonferroni correction = <.0125

Parameter	Negative Rank	Positive Rank	Ties	Total	Z Value	P Value	Remark
Lasikagrundi Vridhi (7 - BT)	1	0	27	28	-1.000	.317	NS
Lasikagrundi Vridhi (15-7)	17	0	10	27	-3.758	.000	HS
Lasikagrundi Vridhi (30-15)	8	0	19	27	-2.714	.007	S
Lasikagrundi Vridhi (30-BT)	21	0	6	27	-4.158	.000	HS

HS – highly significant, NS- Non-significant, S- significant, Wilcoxon Signed Rank Test (Post hoc)

Table 7: The effect of Patoladi Syrup on laboratory investigations in Tundikeri (BT & AT) Paired Samples t- Test (within the group)

Difference BT and AT	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
Hb%	.060	.587	.113	-.172	.292	.531	26	.60
TLC	285.19	1506.32	289.89	-310.7	881.066	.984	26	.334
Neutrophils	2.074	6.707	1.290	-.579	4.728	1.607	26	.120
Lymphocytes	.296	6.626	1.275	-2.325	2.918	.232	26	.818
Eosinophils	.0741	.730	.140	-.215	.363	.527	26	.602
ESR	5.037	8.742	1.682	1.579	8.495	2.994	26	.006
AEC	20.741	82.470	15.871	-11.883	53.365	1.307	26	.203

BT: Before Treatment, AT: After Treatment

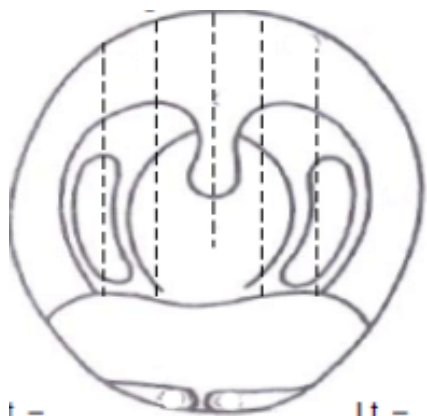


Figure 1: Grading of tonsillar size

## DISCUSSION

Kapha and Rakta are the doshas responsible for the formation of Tundikeri<sup>18</sup> which is preceded by deranged digestive capacity and obstruction of channels which later precipitates with mouth breathing, difficulty in swallowing etc.<sup>19-20</sup> Patoladi Kashaya Yoga is mentioned in Bhaishajya ratnavali under Mukharoga Prathishedha adhyaya. Here the drug is given in syrup form to mask the distaste. Patoladi Kashaya Yoga consists of Patola (*Trichosanthes dioica* Roxb.), Shunti (*Zingiber officinalis* Roscoe), Haritaki (*Terminalia chebula* Retz.), Vibhitaki (*Terminalia bellerica* (Gaertn.) Roxb.), Amalaki (*Emblica officinalis* Gaertn.), Vishala (*Citrullus colocynthis* (L.) Schrad.), Brahmi (*Bacopa monnieri* (L.) Pennell), Daruharidra (*Berberis aristata* DC), Haridra (*Curcuma longa* L.), Guduchi (*Tinospora cordifolia* (Thunb.) Miers) and Katuki (*Picrorhiza kurroa* toyle ex benth.).

Patola<sup>21</sup> is a tikta rasa pradhana dravya, which has laghu, ruksha and ushna guna. All these properties have kaphasamaka action which is the main dosha involved in Tundikeri. Krimighna action of Patola may help to counteract further infection of the tonsillar tissues. Shunti<sup>22</sup> does the actions like amapachana and jataragni deepana which is the first line of management of Tundikeri and also the sula prashamana properties of Shunti reduces the pain. Grahi guna of Shunti can control the anulomana karma of the Patola, Katuki and Haritaki. Triphala<sup>23, 24, 25</sup> has predominantly tikta kashaya rasa, laghu ruksha guna and ushna veerya which mainly pacifies kaphapitta and is tridosahara. It is agnideepaka and ruchikara<sup>26</sup>. Due to ushna veerya and kashaya rasa, Triphala has specific action of vrana shodhana, ropana, and vedana sthapaka<sup>27</sup>. Due to its lekhan property it helps to reduce kapha, kleda and pooya. Vibhitaki is krimighna, has dushta kaphaghna karma and is sophahara. Harithaki and Amalaki are known rasayanas and improves immunity<sup>28-29</sup>. Vishala/ Indravaruni<sup>30</sup> is kaphagna in nature by its tikta rasa, laghu ruksha teekshna guna, ushna veerya and katu vipaka. It has vranashothahara, swasakasahara karma and is also krimighna in nature. It is specifically indicated in Kanta rogas and Tundikeri is one among the kanta rogas. Brahmi<sup>31</sup>, due to its tikta, kashaya rasas and sheeta veerya, pacifies anubandhi doshas of Tundikeri ie, vitiated Pitta associated with rasa-raktha-mamsa. It has swarya action which helps to reduce the thick and muffled voice due to swelling of the tonsils. Brahmi is rasayana drug which enhance the immunity<sup>32</sup>. Katuki<sup>33</sup> digests rasagata ama and improves the jataragni by its deepana pachana effect which is the first line of management in Tundikeri. By its tikta rasa and ruksha guna,

Katuki absorbs kleda. By its bhedana action it helps to expels vitiated kapha and pitta accumulated in the body which is the main dosha and anubandhi dosha involved in Tundikeri. Haridra<sup>34</sup> is kaphasamaka by its tikta, katu rasa and ushna veerya, laghu ruksha guna and pitta samaka by its tikta rasa. Haridra belongs to vedanasthapaka gana with sothahara and vedanasthapana property<sup>35</sup>. Daruharidra<sup>36</sup>, due to its katu-tikta and ruksha qualities, eliminates kapha, puya and dushtasrava which helps to reduce the symptoms like halitosis present in the tundikeri. Daruharidra<sup>37</sup> is specifically indicated in diseases of mukha-kanta rogas. Guduchi<sup>38</sup> is kaphaghna due to tikta, katu, kashaya rasa and ushna veerya, pittaghna by its madhura vipaka and vataghna due to snigdha and ushna guna. It is vedanasthapaka, jwarahara and grahi in nature. By its tikta-katu-kashaya rasas and rukshata, it eliminates vitiated doshas and kleda associated with rasadhatu. Guduchi acts on all the seven dhatus and is a known rasayana drug.

Hot aqueous extract of root tubers of *Trichosanthes dioica* Roxb. exhibited significant anti-inflammatory activity<sup>39</sup>. Trichosanthen (TCS) present in trichosanthes exhibits immunomodulatory (immunosuppressive) and anti-viral activities<sup>40</sup>. Study reveals that Trichosanthes has components that can exert significant antibacterial activity against both gram (+) ve bacterial strains such as *S. aureus*, *S. pyogenes* and gram (-) ve bacterial strains such as *E. coli*<sup>41</sup>. In vitro studies have proved the antimicrobial potential of *Z. officinale* extracts towards both gram positive and gram-negative bacteria<sup>42</sup>. The rhizome extract of *Z. officinale* significantly reduced oedema showing anti-inflammatory activity<sup>43</sup>. *Z. officinale* essential oil showed the improvement in humoral immune response in immune suppressed state showing significant immunomodulatory activity<sup>44</sup>. The three fruits constituting Triphala extract when administered orally shows an increase in carbon clearance index which reflects enhancement of phagocytic function of mononuclear macrophage and nonspecific immunity, increase in DTH response or cell mediated immunity and also has a stimulatory effect on T cells<sup>45</sup>. The immunomodulatory property of Triphala can be attributed to flavonoids, alkaloids, tannins, saponin, glycosides and phenolic compounds<sup>46</sup>. Triphala controls dental plaque, gingival inflammation and microbial growth caused by *Streptococcus mutans* and *Lactobacillus*<sup>47</sup>. Flavonoids of *Citrullus colocynthis* (Linn.) display anti-inflammatory, antiallergic, antibacterial and antiviral activities<sup>48</sup>. *Bacopa monnieri* (L.) Pennell effectively suppressed experimentally induced inflammatory reaction effect by inhibiting the prostaglandins synthesis and partly by stabilizing lysosomal membranes<sup>49</sup>. Methanolic extract of

*Bacopa monnieri* (L.) Pennell shows good activity against *Staphylococcus aureus*<sup>50</sup>. *Picrorhiza kurroa* significantly increases the proliferation of lymphocytes and cytokine levels and improves the immune response<sup>51</sup>. It is observed that *Picrorhiza kurroa* shows significant anti-inflammatory effect<sup>52</sup>. *Picrorhiza* leaves are found to stimulate the cell mediated and humoral component of the immune system as well as phagocytosis<sup>53</sup>. *Picrorhiza* inhibited passive cutaneous anaphylaxis and protected mast cells from degranulation showing anti-allergic and anti-anaphylactic activity<sup>54</sup>. *Curcuma longa* L. exhibits anti-inflammatory, anti-human immunodeficiency virus, anti-bacteria, antioxidant effects and nematocidal activities<sup>55</sup>. Curcumin when tested against cultures of *Staphylococcus albus* and *S. aureus* showed the property to inhibit the growth of *S. albus* and *S. aureus*<sup>56</sup>. Studies on *Berberis aristata* have revealed its antimicrobial and immunomodulatory activities<sup>57</sup>. In immunomodulation studies humoral immunity was enhanced as evidenced by the hemagglutination titre<sup>58</sup>. Aqueous extract was effective in the early phase of acute inflammation and the alcoholic extract in the later phase of acute inflammation<sup>59</sup>. *Tinospora cordifolia* was found to significantly increase humoral immune response to produce an enhancement in macrophage activation<sup>60</sup>. The stem methanolic extract was also found to increase the total WBC count significantly<sup>61</sup>. *T. cordifolia* extract was found to enhance the production of circulating antibody titre<sup>62</sup>. The stem extracts of *Tinospora cordifolia* have been successfully used in many preparations with alleged immunostimulating activity<sup>63, 64</sup>.

## CONCLUSION

The study drug, Patoladi syrup is found effective in reducing most signs and symptoms of chronic tonsillitis. Among the objective parameters, statistically significant effect at  $p < 0.05$  was obtained in ESR while the same was not observed in the other parameters. Hence it can be concluded that Patoladi syrup is effective in reducing the number of attacks of chronic tonsillitis in children.

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