ORIGINAL ARTICLE

# Aetiological profile of paediatric stridor in a Malaysian tertiary hospital

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## Abstract

**Background:** Conditions causing stridor in paediatric patients can range from minor illnesses to life-threatening disorders. Proper evaluation and correct diagnosis are essential for timely intervention. The objective of this study was to determine the aetiological profiles and the management of paediatric patients with stridor referred to the Otorhinolaryngology Department of Hospital Serdang.

**Methods:** Medical records of all paediatric patients presenting with symptom of stridor from January 2010 to February 2015 were reviewed retrospectively. The patients' demographic data, clinical notes, laryngoscope findings, diagnosis and management were retrieved and analysed.

**Results:** Out of the total 137 patients referred for noisy breathing, 121 patients had stridor and were included in this study. There were 73 males and 48 females—most were of Malay ethnicity (77.7%). The age of presentation ranged from newborn to 10 years, with a mean of 4.9 months. Eighteen patients (14.9%) had associated congenital pathologies. The majority were congenital causes (90.9%), in which laryngomalacia was the commonest (78.5%), followed by subglottic stenosis (5.0%), vallecular cyst (2.5%) and congenital vocal fold paralysis (2.5%). Twelve patients (9.9%) had synchronous airway lesion. The majority of the patients were managed conservatively. Thirty-one patients (25.6%) required surgical intervention, of which only one needed tracheostomy.

**Conclusion:** Laryngomalacia was the commonest cause of stridor among paediatric patients. A synchronous airway lesion should be considered if the child has persistent or severe symptoms. The majority of the patients were managed conservatively.

## Introduction

Noisy breathing is a common presenting symptom among paediatric patients to primary care.[1] Clinicians must be able to differentiate types of noisy breathing such as stridor, stertor, snoring and wheezing; each suggest different airway pathologies. Stridor is a musical, often high-pitched sound resulting from turbulent airflow through a partially obstructed upper airway.[1] There are various aetiologies of stridor ranging from minor illnesses to life-threatening disorders.[2] Unfamiliarity with the evaluation and management of a stridorous child may result in avoidable adverse outcomes. Therefore, proper evaluation and correct diagnosis are essential for timely intervention and management. Flexible nasopharyngolaryngoscopy (FNPLS) assessment in a stable patient provides a dynamic, real-time visualisation of the upper airway.[3] A stridorous child may be managed conservatively or by surgery depending on the severity and the underlying pathology. This study aims to determine the aetiological profiles and the management of all paediatric patients with stridor referred to the Otorhinolaryngology Department of Hospital Serdang.

## Methods

From the electronic registry, the medical records of all paediatric patients aged 12 and younger who were referred for noisy breathing to the Otorhinolaryngology Department of Hospital Serdang from January 2010 to February 2015 were reviewed retrospectively. The sources of referral included primary care practitioners, district hospitals, emergency department and other departments in the studied hospital. The authors retrieved the clinical data from the electronic hospital information system (e-HIS). The patients' demographic data, clinical notes, laryngoscopy findings, diagnosis and management were reviewed. Patients without evidence of stridor or upper airway pathology after thorough assessment were excluded from

the study. All data were analysed with SPSS statistical software (SPSS Inc, version 22.0).

**Results**

A total of 137 paediatric patients were referred to the otorhinolaryngology department for noisy breathing during the study period. Out of the total number, 121 patients (81.8%) were diagnosed as stridor due to laryngeal pathology, and were then included in this study.

The patients consisted of 73 males and 48 females, with a male-to-female ratio of 3:2. Malay ethnic patients (77.7%) outnumbered those of Indian (14.9%), Chinese (4.1%) and other ethnicities (3.3%). The patients' age ranged from newborn to 10 years at presentation, with a mean age of 4.9 months (standard deviation ± 11.5 months). Most of the patients presented within the first 3 months of life (n = 72, 59.5%), of which 31 patients (25.6%) were neonate (Table 1). Fourteen patients (11.6%) were preterm at birth. Eighteen patients (14.9%) had underlying congenital pathologies such as Down syndrome, Pierre Robin sequence and Prader–Willi syndrome (Figure 1). All patients were assessed by FNPLS; 31 patients (25.6%) had direct laryngoscopy under general anaesthesia to confirm the diagnosis or exclude synchronous airway lesion.

In term of aetiology, congenital causes accounted for 90.9% (n = 110) of the cases and the remainder was of acquired origin (Table 2). Laryngomalacia was the commonest cause of congenital stridor (n = 95, 78.5%), followed by congenital subglottic stenosis (n = 6, 5.0%), vallecular cyst (n = 3, 2.5%) and congenital unilateral vocal fold paralysis (n = 3, 2.5%). The most common acquired aetiology was laryngopharyngeal reflux (n = 5, 4.1%), followed by laryngotracheobronchitis, acquired vocal fold paralysis and laryngeal foreign body (two cases, respectively). All the cases of vocal fold paralysis were unilateral, two of them acquired following open cardiac surgery. Besides the primary airway lesion, 12 patients (9.9%) were found to have synchronous airway lesions. Eleven of them had one synchronous airway lesion, one patient had multiple airway lesions namely laryngomalacia, vallecular cyst, laryngopharyngeal reflux and tracheomalacia (Table 3).

**Table 1.** Age distribution of patients at presentation

| Age group | No. of patients (%) |
|---|---|
| <1 month | 31 (25.6) |
| 1–3 months | 41 (33.9) |
| 3–6 months | 33 (27.3) |
| 6–12 months | 10 (8.3) |
| >12 months | 6 (5.0) |

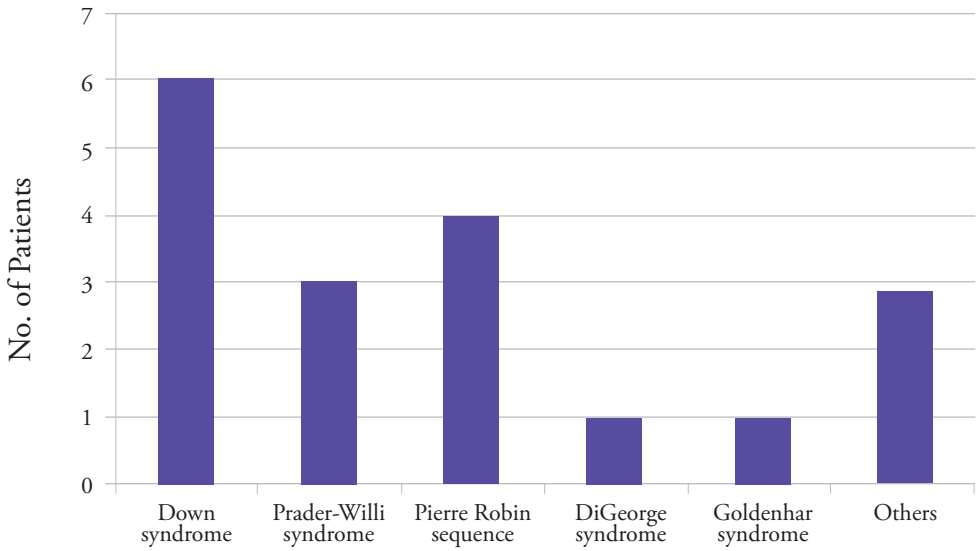


**Figure 1.** Number of patients with associated congenital pathologies

**Table 2.** Age distribution of patients at presentation

| Diagnosis | No. of patients (%) |
|---|---|
| *Congenital causes* | |
| Laryngomalacia | 95 (78.5) |
| Subglottic stenosis | 6 (5.0) |
| Vallecular cyst | 3 (2.5) |
| Unilateral vocal fold paralysis | 3 (2.5) |
| Laryngeal web | 1 (0.8) |
| Laryngeal dyskinesia | 1 (0.8) |
| Posterior laryngeal cleft | 1 (0.8) |
| *Acquired causes* | |
| Laryngopharyngeal reflux | 3 (4.1) |
| Laryngotracheobronchitis | 1 (1.7) |
| Unilateral vocal fold paralysis | 2 (1.7) |
| Laryngeal foreign body | 2 (1.7) |

**Table 3.** Number of patients with synchronous airway lesion

| Synchronous airway lesions | No. of patients |
|---|---|
| Laryngomalacia and laryngopharyngeal reflux | 5 |
| Laryngomalacia and tracheomalacia | 4 |
| Tracheomalacia and laryngeal dyskinesia | 1 |
| Laryngomalacia and type I laryngeal cleft | 1 |
| Laryngomalacia, vallecular cyst, laryngopharyngeal reflux and tracheomalacia | 1 |

The majority of the patients were managed conservatively ($n$ = 90; 74.4%), with the rest requiring surgical intervention. Out of all the patients with laryngomalacia, 18 (18.9%) required surgical intervention. The remainder had resolution of symptoms in 2–25 months (mean, 8.0 months), with a mean follow-up of 13.3 months (range, 3–30 months). From this study, only one patient with underlying spastic quadriplegic cerebral palsy and encephalomalacia needed tracheostomy to secure the airway. There was one death (0.8%) that occurred in a dysmorphic child with chronic lung disease, due to sepsis and multiorgan failure secondary to pneumonia.

## Discussion

There are various aetiologies of stridor in paediatric patients that may be acute or chronic, congenital or acquired, intrathoracic or extrathoracic.[4] The incidence of stridor in the general paediatric population is unknown.[4] With increasing premature neonates survival due to improved intensive care, more airway lesions that would have been lethal previously are seen nowadays.[5] However, stridor must be differentiated from other noisy breathing such as stertor, snoring or wheezing. Careful and detailed history taking and clinical examination would help to assess the severity of the illness and to decide whether immediate intervention is necessary.

In this retrospective review, congenital stridor accounted for 90.9% of the cases, which is higher as compared to that found in other studies that range from 32.3% to 57.6%.[1–3] It was noted that the incidence of infective causes of stridor was significantly lower compared to another series that quoted 33.3%–35.0%.[1,2] This is probably due to the advent of antibiotics and the effectiveness of the current childhood immunisation programme that leads to the reduction of infective causes of stridor among paediatric patients such as epiglottitis and retropharyngeal abscess. Another reason is that in the hospital in which this study was carried out, the paediatric team manages most of the children diagnosed with laryngotracheobronchitis first, instead of direct referral to the otorhinolaryngology department.

Laryngomalacia (78.5%) was the most common congenital cause of stridor consistent with the results in other studies that ranged from 60.2% to 77.5%.[1,2] The majority of these patients (81.1%) were managed conservatively. The rest

(18.9%) required surgical intervention, mainly due to recurrent severe respiratory distress and failure to thrive. This is consistent with a large series reported by Richter and Thompson in which about 20% of the infants with laryngomalacia required surgical intervention.[6] Supraglottoplasty has been shown to improve the airway in more than 80% of the patients with severe laryngomalacia.[7]

Although the majority of the young children presenting with stridor have laryngomalacia, synchronous lower airway lesion should also be considered. Studies revealed that 21%–47.3% of patients had at least one other airway lesion that contributed to airway compromise.[5,8] This is found in 9.9% of the patients in our review. However, not every child with stridor warrants an invasive or extensive workup. Performing direct laryngoscopy and bronchoscopy in children with severe or persistent symptoms is a widely accepted approach.

This study revealed that 15.9% of the patients had other congenital pathologies, in particular Down syndrome. Sanchez et al. reported that 23% of patients with tracheobronchial anomalies have associated genetic disorder particularly Down syndrome.[9] In a study by Bent, 68.1% of patients had comorbidities and it was associated with poorer outcomes.[10]

Unilateral vocal fold paralysis is more common than bilateral paralysis and more likely to involve the left. All five cases of vocal fold paralysis in this study, including three congenital cases and two acquired cases were unilateral (four left, one right) so tracheostomy was not indicated. The two acquired vocal fold paralyses were left sided and occurred in patients who underwent open cardiac surgery for congenital heart anomalies. Green reported that 16% of paediatric patients developed upper airway obstruction after cardiac surgery due to recurrent laryngeal nerve injury. A third of these patients had complete recovery of vocal fold function by early childhood. Bilateral paralysis had the worst prognosis with only 52% recovering spontaneously.[11]

The majority of the patients (74.4%) were managed conservatively without the need for surgery. Thirty-one patients (25.6%) required surgical intervention, of which 18 were laryngomalacia patients. Out of it, only one patient (0.8%) needed a tracheostomy to secure the airway. The percentage of patients who required tracheostomy was significantly lower compared to previous studies such as Waalkens et al. in 1989 (33.3%) and Rupa et al. in 1991 (25%).[2,3] Advancement in endoscopy technology nowadays allows more detailed assessment of the larynx and therapeutic intervention at the same setting, thus avoiding unnecessary tracheostomy in these patients.

## Conclusion

Stridor must be recognised as a symptom of upper airway obstruction, which can range from minimal to life threatening in severity. It is essential to establish the correct diagnosis for optimal management. Laryngomalacia was the commonest congenital cause of paediatric stridor referred to the Otorhinolaryngology Department in Hospital Serdang. Synchronous airway lesions should be considered if the child has persistent or severe symptoms. The majority of the patients were managed conservatively, and only one child required a tracheostomy to secure the airway.

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## Conflict of interest

The authors have no conflict of interest to disclose.

**How does this paper make a difference to general practice?**

- To expose family physicians and general practitioners to various aetiologies of stridor in paediatric populations, especially the common causes.
- To promote awareness among clinicians to recognise stridor as a symptom of upper-airway obstruction, which can be a life-threatening emergency.
- To highlight that early referral of a stridorous child to the otorhinolaryngology team is essential for optimal management of the patient.

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