

*MANAGEMENT OF CROUP AT ASSIUT
UNIVERSITY CHILDREN HOSPITAL*

By

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ABSTRACT

Background: *Croup or laryngotracheobronchitis is a respiratory condition that is usually triggered by an acute viral infection. We aim by this study to evaluate management of Croup in Assiut University Children Hospital, trying to find any defects and suggest methods of their correction.*

Patients and Methods: *This prospective study was done on 170 cases of children having croup in Assiut University Children Hospital, through a period of six months from start of October 2017 to the end of March 2018.*

Results: *Management of croup in Assiut University Children Hospital is compatible with the international guidelines but there are some defects including:*

- 1. Doing x-ray for some cases without a need.*
- 2. Abuse of antibiotics in many patients.*
- 3. Rushing to admission of the cases without acute management.*
- 4. No waiting for two hours after adrenaline use before deciding discharge to home.*
- 5. No repeating of adrenaline nebulization before deciding admission for the cases.*

Conclusion: *Management of croup in Assiut University Children Hospital is compatible with the international guidelines but there are some defects.*

INTRODUCTION

The term croup now generally refers to an acute respiratory illness characterized by a distinctive barking cough, hoarseness of voice, and inspiratory stridor in a young child, usually between six months and three years old. This syndrome results from inflammation of varying levels of the respiratory tract, which sometimes spreads to the lower respiratory tract, producing concomitant lower tract findings. Croup is primarily laryngotracheitis and encompasses a spectrum of infections from laryngitis to laryngotracheobronchitis and sometimes laryngotracheobronchopneumonia (Murtaza Mustafa et al., 2015).

Croup occurs most commonly in children between six months and three years of age, but can also occur in children as young as three months and as old as 15 years (Toward Optimized Practice [TOP], 2016). Males are affected more frequently than females, and there is an increased prevalence in autumn. Parainfluenza virus type 1 is the most frequent cause of croup. Parainfluenza viruses types 2 and 3 and influenza A are also major agents. Less common causes of croup are respiratory syncytial

virus (RSV), influenza B virus, rhinoviruses, adenoviruses, enteroviruses, rubeola virus and Mycoplasma pneumonia (Murtaza Mustafa et al., 2015). Allergic factors may play a role in recurrent croup, with the child becomes sensitized to viral antigen (Roger Zoorob et al., 2011).

The viral infection that causes croup leads to swelling of the larynx, trachea, and large bronchi. Swelling produces airway obstruction which, when significant, leads to stridor (Everard MI, 2009). Croup is diagnosed on clinical grounds once potentially more severe causes of symptoms have been excluded i.e epiglottitis or an airway foreign body (Vanderpool IP, 2014).

Children with croup are generally kept as calm as possible. Steroids are given routinely; with epinephrine used in severe cases (Everard MI, 2009). Children with oxygen saturations under 92% should receive oxygen. Dexamethasone and budesonide are effective in relieving the symptoms of croup as early 6 hours after treatment (Murtaza Mustafa et al., 2015).

AIM OF THE WORK

To evaluate management of Croup in children in Assiut University Children Hospital, trying to find any defects and suggest methods of correction of these defects.

PATIENTS AND METHODS

This prospective study was done on 170 cases of children having croup in Assiut university children hospital, through a period of six months from start of October 2017 to the end of March 2018.

Inclusion criteria:

All infants and children managed at Assiut University Children Hospital, suffering Croup.

Exclusion criteria:

- Patients with diseases other than Croup.

The following data were collected and recorded for each patient:

1. Socio-demographic characteristics such as name, age and sex.
2. History such as present history of barking cough, hoarseness of voice, stridor, cyanosis, feeding difficulty, dyspnea, rhinorrhea, fever, drooling, dysphagia, and choking.

3. General, systemic, and chest examination.
4. Assessment of cases.
5. Investigations such as chest x-ray and laboratory tests (arterial blood gases).

Regarding assessment the cases were classified as:

Mild:

- Barky cough
- hoarse voice
- No stridor at rest
- Mild coarse stridor only during agitation /activity
- No or mild work of breathing

Moderate:

- Stridor at rest
- Tachypnea
- Moderate work of breathing
- Anxiety / agitation /restlessness
- Difficulty talking or feeding

Severe:

- Stridor at rest.
- Severe work of breathing or respiratory fatigue.
- Self positioning: Tripoding and neck extension.
- Decreased level of consciousness.

- Inability to talk or feed.

Impending Respiratory Failure:

- Stridor may be present or decreased .
- Severe work of breathing.
- Bradypnea or poor respiratory effort.
- Cyanosis / hypoxemia despite supplemental oxygen.

Hypercarbia.

(Oliva Ortiz and Alvarez MD, 2017)

Ethical considerations:

- 1- A written informed consent was obtained from patients or their legal guardians.

- 2- An approval by the local ethical committee was obtained before the study.

- 3- The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of the article.

- 4- All data of the patients and results of the study are confidential and the patients have the right to keep them.

- 5- The patient has the right to withdraw from the study at any time.

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RESULTS

Table 1: Demographic data of patients

	No.	%
Sex		
Male	114	67.1
Female	56	32.9
Male to female ratio		2/1
Age		
<6 months	6	3.5
6 month - 3 years	112	65.9
3 - 6 years	48	28.2
>6 years	4	2.4

The study included 170 children having croup who were managed at Assiut University Children Hospital (AUCH) over six months period from the start of October 2017 to the end of March 2018.

Table 1 shows that males were 114 (67.1%), more than

females who were 56 (32.9 %). It also shows that most of the cases (65.9%) fall in the age group six months to three years, followed by 48 cases (28.2%) from 3 to 6 years. Six cases (3.5%) were < six months and four cases (2.4%) were > 6 years.

Table 2: Clinical symptoms of the studied cases

	No.	%
Barky cough		
Yes	170	100.0
Hoarseness of voice		
Yes	170	100.0
Dyspnea		
Yes	107	62.9
Stridor		
Yes	107	62.9
Fever		
Yes	137	80.6
Limitation to talk or feed		
some limitation	80	47.05
severe limitation	27	15.9
Rhinorrhea or coryza		
Yes	135	79.4
Drooling		
Yes	0	0
Dysphagia		
Yes	0	0
Odynophagia		
No	52	30.6
Yes	0	0
Cannot be assessed	118	69.4
Choking		
Yes	0	0
History of recurrence		
>3epsodes in / year	5	2.9
<3epsodes in / year	2	1.2

As shown in Table 2, the main symptoms were barking cough and hoarseness of voice in 100% of cases, fever in 137cases (80.6%), rhinorrhea in 135 cases(79.4%), dyspnea in 107 cases(62.9%), stridor in107 cases (62.9%), some limitation to talk

or feed in 80 cases (47.05%), severe limitation to talk or feed in 27 cases (15.9%). History of recurrence of same symptoms (>3episodes in / year) was present in five cases (2.9%) and (<3 episodes / year) in two cases (1.2%).

Table 3: General look of the studied cases

	No.	%
Mental state		
Normal	63	37.05
Agitated or anxious	80	47.05
↓ level of consciousness(LOC)	27	15.9
Cyanosis		
Yes	1	0.6
Toxic appearance		
Yes	0	0
Leaning forward		
Yes	0	0

Table 3 shows that 80 cases (47.05%) were anxious, 63cases (37.05%) had normal mental state, and 27cases (15.9%) had decreased level of consciousness.

One case only (0.6%) had cyanosis and no case was leaning forward. No case had toxic appearance.

Table 4: Vital signs of the studied cases

	Done	
	No.	%
Pulse		
Normal	63	37.1
Tachycardia	107	62.9
Rrespiratory rate		
Normal	63	37.1
Tackypnea	106	62.4
Bradypnea	1	0.6
Temperature		
Normal ($37.1 \pm 0.7^{\circ}\text{C}$)	31	18.2
Fever ($> 37.8^{\circ}\text{C}$)	139	81.8

Table 4 shows that 139 cases (81.1%) had fever. Tachycardia was present in 107 cases (62.9%). Tachypnea was present

in 106 cases (62.3%), while bradypnea was present in one case (0.6%).

Table 5: Chest examination of the studied cases

	No.	%
	0	0
Chest retraction		
Moderate	80	47.1
Severe	27	15.8
Sibilant rhonchi		
Yes	5	2.9
Sonorous rhonchi		
Yes	3	1.8

Table 5 shows that there was moderate chest retraction in 80 cases (47.1%) and severe retraction in 27 cases (15.8%). Auscultation of chest showed

that five (2.9%) cases had sibilant rhonchi. Three cases (1.8%) only had sonorous rhonchi. Cardiac examination was normal in all cases.

Chest x- ray was done in 13 (8%) of the studied cases and showed no abnormalities in all of them. It was recommended in seven cases (4.1%) due to doubt of alternative diagnosis (age < 6months or > 6 years or due to recurrence >3 episodes/ year) but, was done and not

recommended in 6 cases (3.5%). Arterial blood gas (ABG) was done in one case of croup (0.6%) that was assessed as having impending respiratory failure and showed decreased oxygen saturation(O2 sat.: 83%), table 6.

Table 6: Performed investigatory measures

	Performed in No	Indicated in No (%)	Not indicated in No (%)	P value
- Chest X-ray	13	7 (53.9)	6 (46.1)	0.996*
- ABG	1	1(100)	0(0)	NA**

* Statistically significant difference: p<0.05

**NA: not applicable

Assessment of the cases showed that 63 (37.05%) were mild, 80 (47.05%) were moderate, 26 (15.3%) were severe and one case (0.6%) had impending respiratory failure. Oxygen inhalation was done only in 27cases (15.9%). Antipyretics were used in 139 cases (81.8%). Antitussives were not used in any case. Antibiotics were used in 28 cases (16.5%) and not recommended in all these cases, table 6.

Regarding mild cases dexamethasone (0.16 – 0.6 mg/kg, I.M & I.V) once only was used in acute management of 8 cases (12.7%). Nebulized

adrenaline + dexamethasone (0.16 - 0.6 mg/kg) were used in 25 cases (39.7%). Hydrocortisone (I.M) only was used in three cases (4.8%). Nebulized adrenaline was used in 21 cases (33.3%), while hydrocortisone (I.M) + nebulized adrenaline were used in six cases (9.5%), table 7.

Regarding moderate cases dexamethasone (0.16 – 0.6 mg/kg, I.M & I.V)+ nebulized adrenaline were used in acute management of 24 cases (30%). Hydrocortisone (I.M & I.V) + nebulized adrenaline were used in 21 cases (26.3%), while nebulized adrenaline only was

used in 24 cases (30%). Repeating of adrenaline/ 20 minutes if required and waiting two hours after adrenaline intake were not done in any case. Direct hospitalization without any acute management was done in 11 cases (13.8%). Hospitalization was done in 20 cases, table 7.

Regarding severe cases dexamethasone (0.16 – 0.6 mg/kg, I.M & I.V) +nebulized adrenaline were used in acute management of seven cases (26.9%). Hydrocortisone (I.M & I.V) +nebulized adrenaline were used in 10 cases (38.5%), while nebulized adrenaline only was used in three cases (11.5%). Budesonide inhalation (two mg) instead of dexamethasone (I.M & I.V) was used in 0 cases (0%) and recommended in all these

cases. Repeating of adrenaline/ 20 minutes if required and waiting two hours after adrenaline intake were not done in any case. Direct hospitalization without any acute management was done in 6 cases. Hospitalization was done in only seven cases (26.9%), table 7.

Only one case had impending respiratory failure (RF) and had no acute management but direct PICU admission. Only oxygen inhalation was given in this case. Budesonide inhalation (two mg) was not done and is recommended in this case. Regarding hospitalization of all cases of the study it was done in 28 cases (16.4%), 18 cases (64.3%) without acute management, table 7.

Table 7: Lines of treatment

	Mild No(%)	Moderate No (%)	Severe No (%)	Impeding RF	P value
- Dexamethasone, IM or IV) once	8(12.7)	--	--	--	0.03
- Nebulized *adr. + dexamethasone	25(39.7)	24 (30)	7 (26.9)	--	0.32
- Hydrocortisone, IM	3(4.8)	--	--	--	0.012
- Nebulized adr.	21(33.3)	24(30)	3(11.5)	--	0.19
- Hydrocortisone + nebulized adr	6(9.5)	21(26.3)	10(38.5)	--	0.19
- Antibiotics	0(0)	1(1.25)	26(100)	1(100)	1
- Admission without acute management	--	11(13.7)	6(23.1)	1(100)	0.54

*adr.: adrenaline

DISCUSSION

In this study, we aimed to evaluate management of children with croup in AUCH, compared to Northern California Pediatric Hospital guidelines for management of croup in children.

In our study most of the cases (65.9%) fall in the age group of six months to three years. Our study is in agree with **Toward Optimized Practice (TOP) (2016)** in which, it was found that croup occurs most commonly in children between six months and three years of age. In our study males were (67.1%), more than females (32.9 %). Our study is in agree with **(Petrocheilou A, et al., 2014)** who found that Boys are affected more often than girls.

In our study the main symptoms were barking cough and hoarseness of voice where they occurred in 100% of case, fever in 137cases (80.6%), rhinorrhea in 135 cases (79.4%), dyspnea in 107 cases (62.9%), stridor in 107 cases (62.9%). Our study is in agree with **(Johnson DW and Williamson J, 2001)**.

In our study regarding the general look 80 cases (47.05%) were anxious, 63cases (37.05%) had normal mental state and 27 cases (15.8%) had decreased level of consciousness. Only one

case (0.6%) had cyanosis. Our study is in agree with **Consensus Guidelines for Management of Croup (2018)**.

As regard to vital signs, 139 cases (81.1%) had fever. Our result is in agree with **Consensus Guidelines for Management of Croup (2018)** which found that croup cases may complain or not from fever. Tachycardia was present in 107 cases (62.9%). Our result is in agree with **Toward Optimized Practice (TOP) (2016)** in which only mild cases have normal heart rate and the rest of cases have tachycardia. Respiratory rate was abnormal in 107 cases (62.9%) in the form of tachypnea in 106 cases (62.3%) and bradypnea in one case (0.6%). Our result is in agree with **Croup: Emergency Management in Children (2011)** in which only mild cases have normal respiratory rate, moderate and severe cases have tachypnea, and cases with impeding respiratory failure have bradypnea.

Inspection of chest showed moderate chest retraction in 80 cases (47.1%), no retraction in 63 cases (37.1%), and severe retraction in 27 cases (15.8%). Our result is in agree with **Consensus Guidelines for Management of Croup (2018)**

which found that moderate cases have moderate work of breathing and severe and cases with impending respiratory have severe work of breathing. Auscultation of chest showed that sibilant rhonchi were present in five cases (2.9%) cases and three cases (1.8%) had sonorous rhonchi. Our results are in agree with (**Bew S, 2006**) who found that in the more severe cases of croup, the small airways are affected, resulting in bronchial constriction and edema which cause sibilant or sonorous rhonchi.

In the vast majority of the studied cases (150, 88.2%) chest x-ray was not done and not recommended. In seven cases (4.1%) chest x-ray wasn't done and recommended due to doubt of alternative diagnosis (age <6months or >6 years or due to recurrence >3 episodes in one year), while it was done and recommended in seven cases (4.1%) due to doubt of alternative diagnosis and showed no abnormalities in all the seven cases but, was done and not recommended in 6 cases (3.5%) and also showed no abnormalities. Our result is in agree with **Consensus Guidelines for Management of Croup (2018)** in which routine

chest x-ray is not recommended but is considered if atypical presentation or suspected alternative diagnosis is present.

In our study arterial blood gas was done in one case (0.6%) that had impending respiratory failure and showed decreased oxygen saturation (O₂ sat. 83%). Our result is in agree with **Consensus Guidelines for Management of Croup (2018)** which consider arterial blood gas if impending respiratory failure is suspected.

Oxygen inhalation was applied only in 27cases (15.9%). The antipyretics were used in 139 cases (81.8%). Antitussives were not used any in case. Our results are in agree with **Toward Optimized Practice (TOP) (2016)** which found that:

- Oxygen should only be administered to children with hypoxia (oxygen saturation on room air less than 92%) and significant respiratory distress.
- There are no published controlled trials to support the use of analgesics or antipyretics specifically for treating children with croup; however, reducing fever and pain provides more comfort.

- There are no published studies to support use of antitussives or decongestants for children with croup. Furthermore, there is no clinical basis for their use and they should not be administered or recommended.

Antibiotics were used in 28 cases (16.5%) and not recommended in all these cases. Our result is not in agree with **Toward Optimized Practice (TOP) (2016)** in which there are no published controlled trials demonstrating benefit of antibiotics in children with croup. As croup is virtually always a viral infection, empiric antibiotic therapy is not recommended. Furthermore, prevalence of super-infection in croup (most commonly bacterial tracheitis and occasionally pneumonia) is so rare (less than one in 1,000) that the use of antibiotics for prophylaxis is also not indicated.

Regarding management of mild cases dexamethasone (0.16 – 0.6 mg/kg, I.M& I.V) once only was used in acute management in eight cases (12.7%) and recommended in all these cases. Nebulized adrenaline + dexamethasone were used in 25 cases (39.7%) and not

recommended in all these cases. Hydrocortisone (I.M) only was used in three cases (4.8%) and not recommended in all these cases. Nebulized adrenaline was used in 21 cases (33.3%) and not recommended in all these cases, while hydrocortisone (I.M) + nebulized L.adrenaline were used in 6 cases (9.5%) and not recommended in all these cases. Our results are in agree with **(Sparrow A and Geelhoed G, 2006)** who found that the long half life of dexamethasone (36-54 h) often allows for a single injection or dose to cover the usual symptom duration of croup.

Regarding management of moderate cases dexamethasone (0.16 – 0.6 mg/kg, I.M & I.V) + nebulized adrenaline were used in acute management of 24 cases (30%) and recommended in all these cases. Hydrocortisone (I.M & I.V) + Nebulized L. adrenaline were used in 21 cases (26.3%) not recommended in all these cases. Nebulized L. adrenaline only was used in 24 cases (30%) and not recommended in all these cases. Repeating of L. adrenaline/ 20 minutes if required and waiting two hrs after adrenaline intake were not done in any case and were recommended in all these cases. Our result is not in agree with

Toward Optimized Practice (TOP) (2016) which found that the effects of epinephrine dissipate within two hours after administration. Patients treated with epinephrine return to their baseline severity but do not routinely develop worse symptoms (rebound effect) prior to the treatment. A number of retrospective and prospective studies have been published that suggest patients treated with epinephrine may be safely discharged home as long as their symptoms do not recur for at least two to three hours after treatment.

Direct admission without any acute management was done and not recommended in 11 (13.8%) of the moderate cases. This is not in agree with **Consensus Guidelines for Management of Croup (2018)** which, found that the first two admission criteria are persistent moderate symptoms after dexamethasone & L. epinephrine and continued stridor at rest despite therapy. This verifies the importance of the acute management before deciding the need for admission or not.

Regarding management of severe cases dexamethasone (0.16 – 0.6 mg/kg, I.M & I.V)+ adrenaline (I.M & I.V) were

used in acute management of 7 cases (26.9%) and recommended in all these cases. Hydrocortisone (I.M & I.V) + nebulized adrenaline were used in 10 cases (38.5%) and not recommended in all these cases. While nebulized adrenaline only was used in 3 cases (11.5%) and not recommended in all these cases. Our results are in agree with **Consensus Guidelines for Management of Croup (2018)**. Repeating of adrenaline/ 20 minutes if required and waiting two hours after adrenaline intake were not done in any case. Our result is not in agree with **Toward Optimized Practice (TOP) (2016)** which found that the effects from epinephrine dissipate within two hours after administration. Patients treated with epinephrine return to their baseline severity but do not routinely develop worse symptoms (rebound effect) prior to the treatment. A number of retrospective and prospective studies have been published that suggest patients treated with epinephrine may be safely discharged home as long as their symptoms do not recur for at least two to three hours after treatment. Budesonide inhalation (two mg) instead of dexamethasone (I.M or I.V) was not used in any of severe cases.

This is not in agree with **Consensus Guidelines for Management of Croup (2018)** which Consider budesonide inhalation (two mg) as an alternative to dexamethasone in children with emesis, severe respiratory distress, or parental refusal of systemic steroid. Direct admission without any acute management was done and not recommended in six (23.1%) of the severe cases and pediatric intensive care unit (PICU) admission was done in 4 cases and not surely recommended in 100% of these cases. Our result is not in agree with **Consensus Guidelines for Management of Croup (2018)** which, found that PICU admission is recommended if:

- Persistent severe croup symptoms despite therapy
- Escalating stridor at rest despite therapy

There was only one case with impending respiratory failure and had no acute management but direct hospitalization was done and this is not recommended. Only oxygen inhalation was given and is recommended in this case. Budesonide inhalation (two mg) was not done and is recommended in this case. Our result is not in agree with **Consensus Guidelines for**

Management of Croup (2018) which found that one of indication of PICU admission is impending respiratory failure but after trial of acute management which reduces PICU admission rate which consist of :

1. Oxygenation.
2. Dexamethasone (0.16 – 0.6 mg/kg, I.V) single dose or inhaled budesonide.
3. Nebulized L. adrenaline (repeated every 20 minutes).

CONCLUSION

From the previous results we conclude that management of croup in Assiut University Children Hospital is compatible with the international guidelines but there are some defects including:

- 1- Doing x-ray for some cases without a need.
- 2- Abuse of antibiotics in many patients.
- 3- Rushing to admission of the cases without acute management.
- 4- No waiting for two hours after adrenaline use before deciding discharge to home.
- 5- No repeating of adrenaline nebulization before

deciding admission of the cases.

REFERENCES

1. **Bew S, (2006):** Acute and chronic airway obstruction. *Anaesth Intensive Care Med* 7: 164– 8.
2. **Consensus Guidelines for Management of Croup, (2018):** Northern California Pediatric Medicine Consortium. UCSF Benioff children Hospital Approved by UCSF P&T: 1.10.18. Available from: <https://www.ucsfbenioffchildrenshospital.org>.
3. **Croup: Emergency Management in Children, (2011):** Sydney West Area Recognizing croup and stridor in children. American NurseToday.2012;7(12).Retrieved 15 April 2014.Health Service. Nurse Practitioner Clinical Practice Guideline for the Management of Croup [internet]. NSW Health website .Available from: http://www.health.nsw.gov.au/resources/nursing/practitioner/pdf/ab_croup_np_guidelines.pdf
4. **Everard MI, (2009):** Acute bronchiolitis and croup. *PediatricClin North Am.* 56(1):119-33.
5. **Johnson DW and Williamson J, (2001):** Croup: duration of symptoms and impact on family functioning. *Pediatr Res* 49:83A.
6. **Murtaza Mustafa et al., (2015):** Acute Laryngitis and Croup: Diagnosis and Treatment. *IOSR Journal Of Pharmacy* (e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219. www.iosrphr.org 5(4) : 19-23.
7. **Oliva Ortiz and Alvarez MD, (2017):** Acute management of croup in the emergency department .Canadian Paediatric Society, Acute Care Committee. *Paediatr Child Health* 22(3):166-169.
8. **Petrocheilou A et al., (2014):** Viral croup: diagnosis and a treatment algorithm. *Pediatr Pulmonol.* 49(5):421-9.
9. **Roger Zoorob et al., (2011):** Croup: An Overview. *Am Fam Physician.* 1;83(9):1067-1073.
10. **Sparrow A and Geelhoed G, (2006):** Prednisolone vs. dexamethasone in croup: A randomized equivalence trial. *Archives of Disease in Childhood.* 91 (7): 580-583.
11. **Toward Optimized Practice (TOP), (2016):** Diagnosis and management of croup. Edmonton, AB: Toward Optimized Practice. www.topalbertadoctors.org/download/252/croup_guideline.pdf (Accessed September 27, 2016).
12. **Vanderpoo IP, (2014):** Recognizing croup and stridor in children. American NurseToday.2012;7(12).Retrieved 15 April 2014.

علاج الخناق بمستشفى الأطفال - جامعة أسيوط

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قسم الأطفال - كلية الطب- جامعة أسيوط - مصر

مرض الخناق أو التهاب الحنجري الشعبى هو أحد أمراض الجهاز التنفسى التى تنشأ نتيجة لعدوى فيروسية حادة. ونهدف من خلال تلك الدراسة إلى تقييم علاج الخناق بمستشفى الأطفال – جامعة أسيوط، محاولين كشف أوجه القصور مع اقتراح طرق تلافيها. وقد أجريت تلك الدراسة على 170 طفلاً مصابين بالخناق بمستشفى الأطفال – جامعة أسيوط خلال ستة أشهر فى الفترة من أول أكتوبر 2017 حتى نهاية مارس 2018. وقد استنتجنا أن علاج الخناق بمستشفى الأطفال – جامعة أسيوط متنسق مع المعايير العالمية ، لكن توجد بعض أوجه القصور التى تشمل:

- 1- إجراء أشعة الصدر لبض الحالات دون داعى
- 2- الإسراف فى استعمال المضادات الحيوية
- 3- الاندفاع نحو حجز الحالات دون إجراء العلاج الأولى فى الاستقبال
- 4- عدم الانتظار ساعتين بعد استعمال الأدرينالين قبل انصراف الحالات إلى المنزل
- 5- عدم تكرار استنشاق الأدرينالين قبل حجز الحالات