

## Wheezy Chest in Children: Findings and Outcome

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### Abstract:

**Background:** wheezy chest is a serious public health problem throughout the world, affecting people of all ages and were recognized as leading cause of morbidity and mortality in the under-five children in developing countries. The disease places a burden on the health services in term of admission to hospitals and health centers.

**Objectives:** to identify some epidemiological aspects and fate of hospitalized cases of wheezy chest.

**Material and Methods:** A descriptive study was used to the study 385 children with wheezy chest among those admitted to el-Husen university hospital, Cairo, from January to December 2012 using a pre-designed questionnaire to collect data from mothers of the admitted children. The children recruited were those < 12 years coming with respiratory distress for one year. The variables included are age, sex, education, income, crowding index, symptoms presented. Laboratory findings and x ray were done to some cases when needed in the clinical pathology and x ray departments at hospital in the routine investigation of such cases. Administrative and ethical issues as patient consent and confidentiality were followed in all steps of the study. The data were analyzed by SPSS program version 18. Descriptive and analytic statistics were done. The lowest accepted level of significance was 0.05 or less.

**Results:** The highest affected age was infants (54%), males (53.7%), and of low income families (69.6%). Cough, dyspnea and tachypnea are the most frequent clinical findings (82.3%). Most investigations were normal, and more than half of cases have positive CRP. High percent had bronchovascular marking plus pneumonic patches and hyper-inflated chest in about 34.1% and 36.5% respectively. Most of admitted cases stayed at hospital for 10 days on average. High percent of the studied cases have respiratory distress (41.2%), wheezes (30.6%) and also recurrent wheezy chest (20.0%). The studied cases diagnosed as acute bronchiolitis (27.1%), bronchial asthma (18.8%) and bronchopneumonia (34.1%). The fates of cases were: improved with no complications (72.9%), improved with nebulizer (23.5%) and no case fatality recorded. Bronchopneumonia recorded highest CRP readings than the other acute respiratory infections.

**Conclusions and recommendations:** wheezy chest is a major cause of hospitalization of male infant of poor families. Cough, dyspnoea and tachypnea were major findings. Wheezy chest were recognized as pneumonia, acute bronchiolitis, and bronchial asthma with better outcome. We recommend admission of severe cases of wheezy chest, and the wheezy chest with other health problems (liable for complications) to minimize over use of beds.

Key words: wheezy chest, cough, dyspnea, outcome

### Introduction

Wheezing is a high-pitched, whistling-type sound that occurs while breathing out<sup>1</sup>. About 300 million people around the globe suffer from asthma, and 255 000 people died of asthma in 2005. Surveillance of asthma as part of a global WHO programme is essential<sup>2</sup>. WHO<sup>3</sup>, estimates 300 million people suffer from asthma and 255 000 people died of asthma in 2005. Asthma is the most common chronic disease among children. Asthma is not just a public health problem for high income countries: it occurs in all countries

regardless of level of development. Over 80% of asthma deaths occur in low and lower-middle income countries. Asthma deaths will increase by almost 20% in the next 10 years if urgent action is not taken. Asthma is under-diagnosed and under-treated, creating a substantial burden to individuals and families and possibly restricting individuals' activities for a lifetime.

The respiratory diseases represent about 50% of all illnesses of children below five years and 30% thereafter. 95%

of these infections involve the upper respiratory tract while the remaining 5% involving the lower respiratory tract. Increase in percent of hospitalization noted in the past ten years<sup>4</sup> might be due to availability of beds, short period of stay, changing technology and training of general practitioner<sup>5</sup>. The patients is said to have chronic chest problem when she/he has persistent cough for one month or more<sup>6</sup>.

The commonest respiratory diseases in pediatrics include: common cold, croup, acute laryngitis, otitis media, acute bronchitis, acute bronchiolitis, bronchial asthma and pneumonias. Upper respiratory infections represented a significant higher proportion from 10% up to 30% annually<sup>7</sup>.

Common cold and influenza is the commonest acute respiratory illnesses. Most of them have benign course about three days and recover spontaneously with light medications as fluids, antipyretics and bed rest<sup>8</sup>. The common cold can lead to wheezing when the chest becomes congested. This is different from pneumonia. The cold and the wheezing will go away on their own as long as the patient gets lots of rest and drinks plenty of liquids. The wheezing is caused by congestion, but there is no major inflammation or irritation in the lungs. However, a cold can turn into pneumonia<sup>1</sup>.

Acute laryngotracheobronchitis (Croup) is a severe illness of viral etiology in a majority of cases. About 20% of croup cases were bacterial; it represented about 15% of admission to pediatric wards. Stridor, retractions, poor air entry, cyanosis and altered consciousness are its major manifestations<sup>9</sup>. Croup is a self limiting with excellent prognosis, but most cases require a short hospital stay for mist therapy (cool air), corticosteroid and racemic epinephrine<sup>10</sup>.

Acute pharyngitis is a sore throat, usually caused by viruses in children younger than 2 years; few of them are due to beta hemolytic streptococci after 2 years, it's observed as redness in posterior wall with exudates sparing the tonsillar pillar. It's treated by rest, warm saline gargles, and throat lozenges that contain a

mild anesthetic, plenty of fluids and analgesics. Antibiotics (penicillin) are used for suspected bacterial infection until culture results come. Hydration may be required<sup>11</sup>. In Egypt Integrated management of childhood illnesses program (2007) reported 424,000 cases of acute pharyngitis<sup>12</sup>.

Otitis media is an infection in middle ear. It occurs after Eustachian canal block with fluids. It affects mainly infants 3-11 months. Bottle feeding, allergy, familial predisposition, and vitamin A deficiency are dependant risk factor, while passive smoking in low socioeconomic families encompasses independents risk factors<sup>13</sup>. Streptococcal pneumonia, H. influenza and Moraxella catarrhalis are the major bacterial pathogens. The respiratory Syncytial virus, influenza, Para influenza, rhinoviruses and adenoviruses are the remaining pathogens. Crying, trouble sleeping, pulling of ear, fever, nasal congestion and discharge, neck pain, ear discharge and may be difficult hearing are the main clinical findings. Breast feeding, upright bottle fed, avoidance of both passive smoking and exposure to acute respiratory infection, and immunization are important for prevention<sup>14</sup>. Watch and wait for 48 hour with oral and topical analgesics. Start antibiotic such as Amoxicillin (40.0 mg /kg/day) if condition of the child becomes worse (if developed high fever and / or severe otalgia). Drainage tube might be used in certain complicated cases<sup>15</sup>.

Although lower respiratory infections are mild and managed without hospitalization, severe illnesses carrying risk of respiratory failure and apnea may occurs. Variations in hospitalization are influenced by physician estimates of risk for non hospitalized children<sup>15</sup>. The case fatality (about 2.7%) might be due to late decision of hospitalization and additional underlying problem. These case fatalities will be limited through health service improvement<sup>16</sup>.

Acute bronchiolitis remains the most common and serious respiratory infections in infancy. Case fatality is low. It's initiated by upper respiratory infections. Passive smoking, overcrowding, family history of asthma or atopy, non breast

feed, airway reactivity are a risk factors<sup>17</sup>. Dyspnea, tachypnea, wheezes, irritability, poor feeding are the main clinical findings. Early Respiratory Syncytial Virus vaccination, early hospitalization, appropriate care will lower risk of severity and fatal outcome of acute bronchiolitis<sup>18</sup>.

Pneumonias are still the main cause of death in a weak infant (premature, with poor feeding, poor socioeconomic circumstances or congenital malformations). It's the second commonest cause of death in developing countries<sup>19</sup>. Pneumonia occurs when the lungs become inflamed and irritated, typically by infection. This can lead to wheezing and coughing, and often occurs after a cold or illness. Normally the cough is hard enough to cough up phlegm and can occur with a fever as well. Because of the inflammation and infection in the lungs, it can be hard for the patient to breathe, which leads to constant or intermittent wheezing. Patients should consult a doctor immediately for proper treatment<sup>1</sup>.

Bronchial asthma is a serous health problem affecting all people of different age by this chronic airway disorder world wide. When uncontrolled, it's sometimes fatal<sup>20</sup>.

There are three patterns of inappropriate hospital utilization: over utilization, underutilization, and miss utilization<sup>47</sup>. The goal of utilization review is to control costs of medical care by assuring appropriate utilization of medical services<sup>21</sup>.

There are indices for measuring utilization of beds: average length of a patient stays; average time the bed remain empty between patients (turnover rate); the percentage of beds, on average, occupied; and separation per available bed (throughout)<sup>22</sup>.

Proper diagnosis, early efficient treatment and appropriate admission together with controlling of environmental and socioeconomic factors will definitely decrease admission and will limit case fatality of acute respiratory illnesses<sup>6</sup>.

Identification of children with severe wheezy chest is an important element at admission to minimize unwanted outcome, to reduce admission of mild and moderate cases, to reduce the period of

hospitalization and to minimize the cost of busy bed.

#### Aim Of the Work:

1- General objective: To improve the management of child respiratory diseases as a part of quality care and to improve their health outcome.

2- Specific objectives:

1. To identify some epidemiological aspects of wheezy chest

3. To identify fate of cases of wheezy chest

4. To identify length of hospital stay of wheezy chest.

#### Material and Methods:

A descriptive study was chosen as a method to study the 385 children cases having wheezy chest recruited among those admitted to el-Husen university hospital from January to December 2012. Pre-designed questionnaire was used to collect data from mothers of the admitted child. Data about age, sex, education, income per month, crowding index and the symptoms presented were obtained from the recruited 385 children less than 12 years during this period. The data collection were done by working only two days per week (Saturday and Monday in one week, Sunday and Tuesday in the second week and the remaining two day are in the third week). Due to limited resources either money or manpower; many variables are not studied. Because we depends on the mother speaking about income of her family per month and some of them refuse to speak about income, so it was decided to ask about it as its enough or not. Laboratory data in our study were those performed to the patient in the hospital. X ray readings were the reading of radiology staffs for the admitted cases in the hospital. Administrative and ethical issues were followed in all steps of the study included: hospital administrative approval, consent from the ethical issue unit and patient oral consent, autonomy, confidentiality, do not harm and also beneficiality. Data collected were analyzed on SPSS program version 18. Descriptive and analytic statistics were done using appropriate statistical methods. The lowest accepted level of significance was 0.05 or less.

#### **Results:**

The study of cases of wheezy chest reveals the following results

**Table 1** showed that: most of the affected age was infants (54.0%), more in males (53.7%). Wheezy chest was involving children of families having unsatisfactory income (69.6%). We observed that affected cases were more in children born to illiterate mother (62.3%) compared to 11.2% and 26.5% in children of mothers educated <9 and >9 years respectively. We observed also that wheezy chest were more in children of non working mothers (76.4%) compared to (23.6%) among children of those working ones. Wheezy chest were noted to be high in children of families with crowding index more than 3 persons per room (59.5%).

**Table 2** showed that: cough, dyspnea, and tachypnea were the most frequent clinical findings (82.3%) while other clinical findings like chest wheezes, grunting, cyanosis and pallor's represented minority (it represented 29.8%, 15.5%, 5.2% and 20.8% respectively).

**Table 3** illustrated that: in minority of cases of wheezy chest, there were increase in WBCs count and CO<sub>2</sub> concentration and also there is decrease in oxygen level (hypoxia). We also noted that: the investigations were normal in majority of case.

**Table 4** illustrated that more than half of cases with wheezy chest had positive CRP.

**Table 5** illustrated that high percent of the studied cases with wheezy chest had bronchovascular marking with pneumonic patches and hyper inflated chest in about 34.1% and 36.5% respectively.

**Tables 6 and 7** illustrated that most of admitted cases with wheezy chest stayed in hospital for about 1-2 weeks (71.7%) and the mean is  $10.0 \pm 3.7$ .

**Table 8** demonstrated that high percent of the studied cases with wheezy chest had respiratory distress for differential diagnosis (41.2%), respiratory distress with wheezes for differential diagnosis (30.6%) and also recurrent wheezy chest for differential diagnosis (20.0%).

**Table 9** demonstrated that high percent of the studied cases with acute wheezy chest had acute bronchiolitis (27.1%), bronchial asthma (18.8%) and broncho pneumonia (34.1%).

**Table 10** demonstrated the presence of underlying medical or surgical conditions associated with wheezy chest like: congenital heart disease, cerebral palsy, Gastro-Esophageal Reflux Disease and pneumonia on top of asthma. It represented 7.2%, 1.2%, 2.4%, and 4.6% respectively

**Table 11** showed that there was high significant positive correlation between the level of ESR and both WBCS and CRP.

**Table 12** observed that bronchopneumonia recorded higher percent of CRP readings than acute bronchiolitis and bronchial asthma.

**Table 13** declared that there was no statistical significant difference between acute bronchiolitis, bronchial asthma, and bronchopneumonia in the length of hospital stay and mostly around 8-10 days.

**Table 14** demonstrated that high percent of the studied cases with acute wheezy chest improved with no complications in about 72.9% and the remaining 23.5% were improved with continuation of nebulizer after discharge.

## Discussion

Wheezy chest is a serious public health problem throughout the world, affecting people of all ages and were recognized as leading cause of morbidity and mortality in the under-five children in developing countries. These conditions place a burden on the health services in term of admission to hospital and health centers <sup>(23&24)</sup>.

The study results covering one year and showed in its general characteristics distribution as regard age and sex and also social characters are nearly close to situation in Egypt.

It was observed that more than fifty percent of the affected children were male infants and more than two thirds of children of families having unsatisfactory income. Wheezy chest was noted to be more in children born to illiterate mothers when it compared to children of mothers educated <9 and >9 years respectively. In this study it was found that wheezy chest were more in children of non working mothers when it compared to children of working ones. Wheezy chest were also noted to be high in families with crowding

index more than 3 persons per room. Dyspnea and tachypnea is the most frequent clinical findings. This is in agreement with nearly similar results seen in many studies like **fakher**<sup>(25)</sup>, **Banajeh et al.**<sup>(26)</sup>, **Kamper et al.**<sup>(27)</sup>, **Savit et al.**<sup>(28)</sup>, and **Samuel et al.**<sup>(29)</sup>. The higher per cent of affection of male infants in our study might be due to exposure to acute respiratory infections, unsanitary condition, overcrowding and delayed seeking of medical care. Low percent observed in children of working mothers might be due to early seeking medical care in these mothers compared to children of non working ones. High percent observed in families with crowding index more than 3 persons per room were due to more exposure to acute respiratory infections and delayed seeking medical care.

In this study we found that: cough dyspnea and tachypnea is the major clinical findings, while other symptoms like chest wheezes, grunting, cyanosis and pallor's represented minority. This is in agreement with **Margolis and Gadamiski**<sup>(30)</sup> who considers nearly similar findings. These findings are the usual symptoms described by mothers in most of cases.

The study results showed that: In wheezy chest there are increase in WBCs count and increase in CO<sub>2</sub> concentration and decrease in oxygen level (hypoxia) in a minority of cases but most of the investigations were normal in these cases. **Banajeh et al.**<sup>(31)</sup> and **Ramakreshna and Harish**<sup>(32)</sup>, found that more than 60.0% of cases of wheezy chest have WBCs count more than 11.000. The observed increase in CO<sub>2</sub> and decrease O<sub>2</sub> might be due to severity in admitted cases in this study.

This study results showed that more than half of cases wheezy chest have positive CRP. This is in agreement with **Banaje et al.**<sup>(31)</sup> and **Ramakreshna and Harish**<sup>(32)</sup>, who found that more than 60.0% of cases of acute severe respiratory infections have positive CRP.

In this study results showed that high percent of the studied cases with wheezy chest had broncho-vascular marking with pneumonic patches and hyper inflated chest, which is in accordance with **Kabir et al.**<sup>(33)</sup> who found in radiology of hospitalized pneumonic infant, there were

increased translucency, hyper inflated chest, and steaky densities represented 96.0%, 75.0% and 61.0% respectively. **Kern et al.**<sup>(34)</sup> described nearly similar findings.

As regard the hospital stay: we found that more than two thirds of cases with wheezy chest stayed in hospital for about 1-2 weeks and nearly about 10 days on average, which is in agreement with **Samuel et al**<sup>(29)</sup> who found that 41.0% of cases of hospitalized acute severe respiratory infections stayed less than one week, 39.5% stayed between 1-2 weeks and 19.5% stayed more than 2 weeks. Also in study of **Chang Gung**<sup>(35)</sup> the mean duration of stay were  $5.5 \pm 2.8$  days; the difference observed may be due to severity in the admitted cases in this study.

The final diagnosis in this study of cases of wheezy chest was found that high percent of the studied cases of wheezy chest had respiratory distress for differential diagnosis, respiratory distress with wheezes for differential diagnosis, and also recurrent wheezy chest for differential diagnosis. These findings are in agreement with **Johnson et al.**<sup>(36)</sup> and **Hussey et al.**<sup>(37)</sup> Who found that 61.2% and 62.2% respectively of admitted cases were pneumonia, while acute bronchiolitis represented 20.5% and 21.0% respectively, Also **Samuel et al.**<sup>(29)</sup> found about 79.0% of cases studied has pneumonia. Also **Hijazi et al.**<sup>(38)</sup> found 50.0% of admitted cases were acute bronchiolitis. The difference may be due to seasonality of studies and also depending on the pediatrician opinion about admission.

In this study, we observed that about third of the studied cases with wheezy chest had acute bronchiolitis, less than fifth of cases had bronchial asthma and more than third of studied cases were broncho pneumonia. This might direct our attention to importance of managing these health problems at hospital due to its high case fatality rate due to its severity and poor condition of families. Some clinicians advocate hospitalizing only severe cases but others might prefer to admit moderate cases of poor families.

It was noted those minorities of cases of wheezy chest are associated with

presence of underlying medical or surgical conditions like: congenital heart diseases, cerebral palsy, gastro-esophageal reflux disease, and pneumonia on top of asthma. In a study of **Samuel et al.**<sup>39</sup>: 12.5% had heart disease, 3.8% had neurological diseases. In the work of **Johnson et al.**<sup>43</sup> heart failure was the most frequently recognized underlying medical condition. In that of **Banajeh et al.**<sup>26</sup> 21% had heart failure. In the study of **Ciftci et al.**,<sup>40</sup>: 9% of cases had congenital heart disease, 32% had bronchial asthma, 15% had gastro esophageal reflux disease, 10% had immune disorders, 6% had lung anomalies, 4% had broncho-pulmonary dysplasia, 3% had cystic fibrosis, 3% had tuberculosis and 3% had aspiration syndrome, no predisposing illness could be demonstrated in (15%). The presences of complications in any case of wheezy chest lengthen the period of stay at hospital and in some cases require admission to the intensive care unit.

In this study there was high significant positive correlation between the level of ESR and both WBCS and CRP. Our findings regarding final diagnosis in relation to ESR results: in cases of bronchopneumonia the ESR value varies from 8-40 with mean (17.97), in acute bronchiolitis the ESR value varies from 5-25 with mean (13.96), in bronchial asthma the ESR value varies from 3-37 with mean (12.06). This means increase in ESR is always accompanied with increase of CRP and WBCs and vice versa, that means if we doing one of these investigations do not necessary to do the others.

Also Regarding CRP readings: in cases of bronchopneumonia CRP showed its highest levels 48 in less that 5 percent, 24 in about fifth of cases, 12 in more than fifty percent, and 6 in less than fifth of cases. While in acute bronchiolitis CRP showed its highest levels 12 and 6 in less than thirty percent, and -ve results in more than two thirds of cases. Also we found that in bronchial asthma CRP showed high levels 24, 12, and 6 in less than twenty percent, and were negative in more than eighty percent. **Donnelly**<sup>40</sup> found that CRP, WBC count and ESR or their combinations have a limited role in

screening between bacterial and viral pediatric community-acquired pneumonia. If all or most of these markers are elevated, bacterial etiology is highly probable, but low values do not rule out bacterial etiology. Also we observed that bronchopneumonia recorded higher percent of CRP readings than other cases of asthma and acute bronchiolitis. This might refer to bacteria etiology of admitted cases.

In this study, there was no statistical significant difference between acute bronchiolitis, pneumonia and bronchial asthma in the length of hospital stay and mostly around 8-10 days. In the study of **Dawson and Mogridge**<sup>42</sup>, the mean length of acute bronchiolitis was 2 days. In the study of **Hussey et al.**<sup>37</sup>, the mean length of hospital stay of cases of pneumonia was 5 days. In the study of **Kabir et al.**<sup>33</sup> the mean duration of hospital stay in cases of acute bronchiolitis were 4 days. In **Samuel et al.**<sup>39</sup> the cases stayed were 7 days in cases of pneumonia, acute bronchiolitis, and bronchial asthma. The cases stayed from 8-14 days of them (80%) pneumonia, (4%) acute bronchiolitis, (2%) bronchial asthma. The cases stayed >14 days of them (83.7%) pneumonia, (2%) acute bronchiolitis, (0%) bronchial asthma.

Regarding the fate of the admitted cases: more than three fourth of them improved with no complication, and less than fourth of these cases improving and continue on nebulizer, and about 2% of wheezy chest were referred to cardiothoracic surgery for surgical lobectomy, less than 2% of cases were cerebral palsy and need frequent physiotherapy, and also less than 2% of the admitted cases developed pleural effusion, no case fatality rate. This is in agreement with the study of **Samuel et al.**<sup>39</sup> who found that the case fatality rate were (4.8%). In the study of **Johnson et al.**<sup>36</sup> the case fatality rate were (7.8%), all of them were pneumonia. In the study of **Banajeh et al.**<sup>26</sup> who found that the case fatality rates were (9.8%). In **Sehgal et al.**<sup>44</sup> study the case fatality rate was (10.45%). In **Banajeh et al.**<sup>26</sup> study, the case fatality rate was (8.7%), (85%) of fatalities were in children < 1 year. **Olsen**

*et al.*<sup>45</sup> found that the case fatality rate was (9.0%). Small percent referred to other department either for another form of management or special care not found at pediatric wards.

**Conclusions and recommendations:** wheezy chest is a major cause of hospitalization of male infants of poor families. Cough, dyspnoea and tachypnea were major findings. Wheezy chest were presented as pneumonia and acute bronchiolitis, and bronchial asthma with better outcomes. We recommend admission of severe cases of wheezy chest, and the wheezy chest with other health problems (liable for complications). We recommend also routine use of CRP to differentiate between asthma, acute bronchiolitis and pneumonia. There are urgent need to improve income of families and more studies about risk factors of wheezy chest and determine properly severity of admitted cases to minimize over use of health services (beds) and directing effort to applying appropriate preventive strategies.

**References:**

1. **Reed J and eHOW C (2013):** "what causes wheezing in the chest" at J of eHow Health, at [www.eHOW.com](http://www.eHOW.com)
2. **World Health Organization (2000):** Asthma. Geneva, (WHO Fact sheet No. 206) 2007.
3. **WHO (2006):** Fact sheet No. 307, August <http://www.who.int/mediacentre/factsheets/fs307/en/index.htm>
4. **Hill A M (1989):** Trends in Pediatrics. Medical admission B.B.J., 298:1383-1479.
5. **Habite D (1990):** The crises of childhood in developing countries. Acta. Pediatrics scand, 79:130-136.
6. **Hadad (2011):** hospitalization in acute bronchiolitis: M. Sc. Thesis in pediatric by Sayed Seif, review of literature chapter, faculty of medicine, Al-Azher University.
7. **Tappenden P, Jackson R, and Cooper K, (2009):** Amantadine, oseltimivir and zanamivir for the prophylaxis of influenza (including a review of existing guidance no 67: A systematic review and economic evaluation. Health technical assessment, 13: 1-246
8. **Fiore AE, Shy DK, Broder K, Iskander JK, Uyeki TM, Mootrey G, (2009):** prevention and control of seasonal influenza with vaccines: recommendation of the advisory

committee on immunization practice, MMWR Recommendations. Rep., 58: 1-52.

9. **Sarnaik, AP and Heideiman, SM (2007):** "Respiratory system" in Nelson, textbook of Pediatrics 18<sup>th</sup> edition, copyright by saunder, pp: 1764-67-
10. **Rosekrans JA (1998):** Viral croup: current diagnosis and treatment. Mayo Clin Proc., 73:1102-7.
11. **Bulloch B, Kabani A, and Tenenbien M (2009):** Oral dexamethazone for treatment of pain in children with acute pharyngities: a randomized, double blind, placebo controlled trial. Ann Emer Med J., 6:1-8
12. **IMCI program (2007):** Report of the IMCI program, Ministry of Health 2007. Report obtained by personal communication
13. **De Miguel MI and Macias AR (2008):** Serious otitis media in children: Implication of *Alloiococcus otis* disease Otol Neurotol. J., 29: 526-30
14. **Niemela M, Uhari M, and Mottonen M (1997):** A pacifier increases the risk of recurrent acute otitis media in children in day care centers. Pediatrics, 96:884-88.
15. **Church, NR, Anas AG, Hall CB, and Brooks JG (1994):** Respiratory Syncytial virus related apnoea in infants, demographics and outcome. American Journal of Diseases of Children, 138: 247-250
16. **Leape LL, Park RE, Solomon DH and Chassin MR (1990):** in replay for children illnesses. JAMA, 263:275.
17. **Feigin C (2009):** "Acute brochiolities" in Feigin and cherry, textbook of Pediatric infectious disease, W. B. saunder company P: 147-150
18. **Schroeder AR, Marmor AK, Pantell RH, Newman TB (2004):** impact of pulse oximetry and oxygen therapy on length of stay in bronchiolitis hospitalizations. Arch Pediatr Adolesc Med, 158 (6): 527-30.
19. **Klig JE and Chen L (2007):** Lower respiratory infections in children. Curr Opin Pediatrics, 15: 121.
20. **GINA REPORT (2007):** global strategy for asthma management and prevention. WWW.ginasthma.org
21. **Tu J( 2000):** Utilization review: can it be improved? C M AJ., 162 (13); 1824- 5.
22. **Qayed MH (1991):** "bed utilization statistics" highlights on hospital administration, book by Qayed MH, Faculty of medicine Assiut University p: 103
23. **Bashour HN, Roger HW, Thomas F (1994):** A community-based study of acute respiratory infection among preschool children in Syria. Journal of tropical pediatrics, 40:207-211.

- 24. Samer CA, Sinaniotis AC, (2005):** Community-acquired pneumonia in children. *Curr Opin Pulm Med*, 11: 218.
- 25. Faher, OA (1997):** An epidemiologic study of acute respiratory infections in rural area: M.D thesis in public health and community medicine, Al-Azher- Faculty of Medicine, pp: 120-125
- 26. Banajeh SM, (1998):** Outcome for children under 5 years hospitalized with severe acute lower respiratory tract infections in Yemen: a 5 years experience. *J Trop Pediatr.*, 44 (6): 343-6.
- 27. Kamper M, Wohlfahrt J, Simonsen J, Gronback M, Benn CS (2006):** Population based study of the impact of child care attendance on hospitalization for acute respiratory infections pediatrics, 118: 1439-1446.
- 28. Savit A, Tan KH-V, Hyman TP, (2005):** Once versus three time's daily regimens of topramycin treatment for pulmonary exacerbations of cystic fibrosis-the TOPIC study: a randomized controlled trial *Lancet*, 365: 573-8.
- 29. Samuel S, Mohsen M, Aly I, Hassan H (2008):** Screening of non-asthmatic chest troubles in the patients of pediatric hospitals Cairo University in a period of one month. Thesis by Hassan H: Faculty of Medicine, Cairo University.
- 30. Margolis P and Gadamiski A (1998):** "the rational clinical examination, does this child have pneumonia, *JAMA*, 279: 1423-27
- 31. Banajeh SM, Al-Sunbali NN, and Al-Sanahani, SH (1997):** Clinical characteristics and outcome of children aged less than 5 years hospitalized with severe pneumonia in Yemen. *Ann Trop Pediatr.*, 17(4): 321-6.
- 32. Ramakrishina K, Harish PS. (2006):** Hemoglobin level as a risk factor for lower respiratory tract infections. *Indian J Ped.* , 73(10):881-3.
- 33. Kabir ML, Haq N, Hoque M, Ahmed F, Amin R, Hossain A, Khatoon S, Akhter S, Shilipi T, Haq R, Anisuzzaman S, Khan MH, Ahmed S, Khashru A. (2003):** Evaluation of hospitalized infants and young children with bronchiolitis- a multi-center study, *Mymensingh Med J.* , 12(2): 128-33.
- 34. Kern S, Uhl M, Berner R, Schwoerer T, Langer M. (2001):** Respiratory syncytial virus infection of the lower respiratory tract: radiological findings in 108 children. *Eur Radiol.*, 11(12): 2581-4. Epub May 3.
- 35. Chang G, (2005):** Human metapneumovirus and community-acquired pneumonia in children. *Chang Gung Med J.* , 28(10):683-8.
- 36. Johnson WB, Aderele WI, Osinusi K, Gbadero D, (1994):** Acute lower respiratory infections in hospitalized urban pre-school Nigerian children: a clinical overview. *Afr J Med Sci.*, 23(2): 127-38.
- 37. Hussey GD, Apolles P, Arendse Z, Yeates J, Robertson A, Swingler G, Zar HJ, (2000):** Respiratory syncytial virus infection in children hospitalized with acute lower respiratory tract infection. *S Afr Med J.*, 90(5): 509-12.
- 38. Hijazi Z, Pacsa A, El-Gharbawy F, Chugh TD, Essa S, El-Shazli A, Abd El-Salam R, (1997):** acute lower respiratory tract infections in children in Kuwait. *Ann Trop Pediatr.* , 17(2): 127-34.
- 39. Samuel S, Mohsen M, Aly I, Naguib NN (2007):** Screening of non-asthmatic chronic chest troubles in the outpatient's chest clinic in a 6 months period from 1<sup>st</sup> of January 2007. Thesis by Naguib NN: Faculty of Medicine, Cairo University.
- 40. Ciftci E, Gunes M, Koksall Y, Ince E, Dogru U. (2003):** Underlying causes of recurrent pneumonia in Turkish children in a university hospital. *J Trop Pediatr.* , 49 (4): 212-5.
- 41. Donnelly LF, (2009):** Maximizing the usefulness of laboratory and radiologic investigation in children with community-acquired pneumonia. *AJR Am I Roentgenol.* , 172(2):505-12.
- 42. Dawson KP and Mogridge N (1999):** Acute bronchiolitis: a three year study. *NZ Med J.*, 102 (877):528-9.
- 44. Sehgal V, Sethi GR, Sachdev HP, Satyanarayana L (1997):** Predictors of mortality in subjects hospitalized with acute lower respiratory tract infections. *Indian Pediatr.*, 34(3): 213-9.
- 45. Olsen,SG, Laosiritaworn, Y, Siasiriwattana, S, Chunsuttiwat, S, Dowel, SF (2006):** the incidence of pneumonia in rural thailand, *Int J Infect Dis.* , 10(6): 439-445, Epub Sep
- 46. Bousquet J (2005):** The public health implications of asthma. *Bulletin of the World Health Organization*, 83:548-54.
- 47. Brown JA (2000):** the health care quality handbook a professional resource and study guide; 15 th edition. *Managed care consultants, Pasadena.*
- 48. Chan, V., Ghash, A., Chan, T.K. (1986):** Prenatal diagnosis by direct DNA analysis of uncultured amniotic fluid cell, *BMN.*, 288:1317-1329



**Tables of the study:****Table 1: Socio demographic data for the studied sample.**

| Variables         | No  | %     |
|-------------------|-----|-------|
| Age:              |     |       |
| < 1year           | 208 | 54.0  |
| 1-5 years         | 130 | 33.7  |
| >5 years          | 47  | 12.3  |
| Total             | 385 | 100.0 |
| Gender:           |     |       |
| Males             | 207 | 53.7  |
| Females           | 178 | 46.3  |
| family income     |     |       |
| Enough            | 268 | 69.6  |
| Not enough        | 117 | 30.4  |
| Refuse to answer  | 0   | 0.0   |
| Mother education  |     |       |
| Illiterate        | 240 | 62.3  |
| < 9 years         | 43  | 11.2  |
| 9+                | 102 | 26.5  |
| Mother occupation |     |       |
| Working           | 91  | 23.6  |
| Not working       | 294 | 76.4  |
| Crowding index    |     |       |
| ≤ 3 per room      | 156 | 40.5  |
| > 3 per room      | 229 | 59.5  |

**Table 2: clinical findings of the studied sample:**

| Clinical findings: |     |      |
|--------------------|-----|------|
| Cough              | 317 | 82.3 |
| Dyspnea            | 317 | 82.3 |
| Tachypnea          | 317 | 82.3 |
| Chest wheezes      | 115 | 29.8 |
| Grunting           | 60  | 15.5 |
| Cyanosis           | 20  | 5.2  |
| Pallor             | 80  | 20.8 |

**Table 3: laboratory investigations of the studied sample.**

| Laboratory investigation | Mean $\pm$ SD       |
|--------------------------|---------------------|
| Hemoglobin               | 11.64 $\pm$ 1.52    |
| WBCs                     | 11.19 $\pm$ 4.01    |
| Platelets                | 342.52 $\pm$ 127.48 |
| ESR                      | 16.18 $\pm$ 9.16    |
| Alkaline phosphatase     | 258.75 $\pm$ 142.62 |
| ALT                      | 30.63 $\pm$ 36.38   |
| AST                      | 59.75 $\pm$ 53.19   |
| Total protein            | 6.6 $\pm$ 0.65      |
| Albumin                  | 4.4 $\pm$ 0.5       |
| Total Bilirubin          | 0.42 $\pm$ 0.22     |
| Creatinine               | 0.26 $\pm$ 0.12     |
| PH                       | 7.4 $\pm$ 0.09      |
| PCO2                     | 35.35 $\pm$ 10.11   |
| PO2                      | 82.42 $\pm$ 11.43   |
| HCO3                     | 23.28 $\pm$ 4.06    |
| NA                       | 125.6 $\pm$ 4.86    |
| K                        | 4.41 $\pm$ 0.91     |

**Table (4): Reading of CRP results of the studied group:**

| CRP level | %    |
|-----------|------|
| 0         | 40.0 |
| 6         | 10.6 |
| 12        | 36.5 |
| 24        | 10.5 |
| 48        | 2.4  |

**Table 5: Percent of Radiological findings for the studied group:**

| Radiological finding  | %    |
|---|------|
| Bronchovascular marking   | 10.6 |
| Bronchovascular marking & cardiac lesion                        | 2.4  |
| Bronchovascular marking & emphysema                             | 1.2  |
| Bronchovascular marking, pneumonic patches                      | 34.1 |
| Bronchovascular marking, pneumonic patches, cardiomegaly        | 3.5  |
| Bronchovascular marking, pneumonic patches, consolidation       | 1.2  |
| Hyperinflated chest   | 1.2  |
| Hyperinflated chest, Bronchovascular marking                    | 36.5 |
| Hyperinflated chest, Bronchovascular marking, cardiac lesion    | 1.2  |
| Hyperinflated chest, Bronchovascular marking, pneumonic patches | 5.9  |
| Hyperinflated chest, pneumonic patches                          | 1.2  |
| pneumonic patches   | 1.2  |

**Table 6: Percent of Period of hospital stay of studied group with wheezy chest:**

| Period of stay | %     |
|----------------|-------|
| < 1 week       | 11.7% |
| 1-2 weeks      | 71.7% |
| > 2 weeks      | 16.4% |
| Total          | 100.0 |

**Table 7: Mean period of hospital stay for the studied group:**

|                     | Mean $\pm$ SD  | Min – max | Median |
|---------------------|----------------|-----------|--------|
| Length of stay/days | 10.1 $\pm$ 3.7 | 4 – 28    | 7      |

**Table 8: Percent of Provisional diagnosis for the studied group:**

| Provisional diagnosis  | %    |
|--|------|
| Respiratory distress for differential diagnosis              | 41.2 |
| Respiratory distress with wheezes for differential diagnosis | 30.6 |
| Recurrent wheezy chest for differential diagnosis            | 20.0 |
| Chest infection for differential diagnosis                   | 5.8  |
| Bronchopneumonia   | 1.2  |
| Late onset sepsis for differential diagnosis                 | 1.2  |

**Table 9: Percent of Final diagnosis for the studied cases:**

| Final diagnosis                                  | %     |
|--|-------|
| Acute bronchiolitis                              | 27.1  |
| Bronchial asthma                                 | 18.8  |
| Broncho pneumonia                                | 34.1  |
| Broncho pneumonia, cardiomegaly                  | 1.2   |
| Broncho pneumonia, congenital heart diseases     | 2.4   |
| Broncho pneumonia associated with Cerebral palsy | 1.2   |
| Broncho pneumonia, pneumonectomy                 | 1.2   |
| Congenital bronchiectasis                        | 1.2   |
| Pneumonia  | 4.6   |
| Pneumonia on top of asthma                       | 4.6   |
| Pneumonia with gastro-esophageal reflux          | 2.4   |
| Pertussis  | 1.2   |
| Total  | 100.0 |

**Table 10: Per cent of wheezy chest associated other health problems.**

| Other health problems       | %   |
|-----------------------------|-----|
| Congenital heart disease    | 7.2 |
| Cerebral palsy              | 1.2 |
| Gastro-esophageal reflux    | 2.4 |
| Pneumonia on top of asthma. | 4.6 |

**Table 11: Correlation between CRP, ESR and WBCs for cases:**

| Correlation  | r    | Significance |
|--------------|------|--------------|
| WBCS and CRP | 0.10 | 0.7845       |
| WBCS and ESR | 0.47 | 0.0010       |
| CRP and ESR  | 0.34 | 0.0100       |

CRP: C reactive protein      ESR: Erythrocyte Sedimentation Rate

**Table 12: per cent of positive CRP findings for cases with acute bronchiolitis, broncho-pneumonia and bronchial asthma:**

| CRP     | Acute bronchiolitis | Bronchopneumonia | Bronchial Asthma |
|---------|---------------------|------------------|------------------|
| +ve CRP | 69.6%               | 81.3%            | 6.9%             |

**Table 13: mean duration of Hospital stay for cases with acute bronchiolitis, asthma and broncho-pneumonia:**

| Hospital stay/days | Acute bronchiolitis | Bronchial asthma | Broncho-Pneumonia | Significance   |
|--------------------|---------------------|------------------|-------------------|----------------|
| Mean ± S.D         | 8.8 ± 2.6           | 8.2 ± 2.3        | 9.8 ± 3.1         | F=1.82, p=0.17 |

**Table 14: Outcome of cases of the studied sample:**

| Fate                            | %     |
|---------------------------------|-------|
| Improved , no complication      | 72.9  |
| Improved, continue on nebulizer | 23.5  |
| Preparing for operation         | 1.2   |
| Needs frequent physiotherapy    | 1.2   |
| Pleural effusion                | 1.2   |
| Total                           | 100.0 |