Al-Nahrain University

Collage Of Medicine

Department Of pediatrics

Negative chest X-ray findings in children treated as pneumonia

Research submitted to department of pediatric /college of medicine/

AL-Nahrain University as part of M.B.CH.B graduation requirement

Done by:

Haider Luay Mohammed

Supervised by:

Prof. Dr. Abd Alkarim Jasim

(M.B.Ch.B.-D.C.H- F.I.C.M.S. ped)

2018-2019

بِسۡمِ ٱللَّهِ ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ ﴿١﴾

ٱلۡحَمۡدُ لِلَّهِ رَبِّ ٱلۡعَٰلَمِينَ ﴿٢﴾

ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ ﴿٣﴾ مَٰلِكِ يَوۡمِ ٱلدِّينِ ﴿٤﴾

إِيَّاكَ نَعۡبُدُ وَإِيَّاكَ نَسۡتَعِينُ ﴿٥﴾

ٱهۡدِنَا ٱلصِّرَٰطَ ٱلۡمُسۡتَقِيمَ ﴿٦﴾

صِرَٰطَ ٱلَّذِينَ أَنۡعَمۡتَ عَلَيۡهِمۡ

غَيۡرِ ٱلۡمَغۡضُوبِ عَلَيۡهِمۡ

وَلَا ٱلضَّآلِّينَ ﴿٧﴾

Acknowledgement

I would like to acknowledge this humble work to my supervisor Dr. Abd Alkarim for his continuous support, advice and supervision.

My sincere regard to the pediatrics department in Al-Kadhmyiah teaching hospital for their hard work and continuous patience preparing us for the medical life.

I also give my gratitude to my family who stood beside me all the way through my life.

List of contents

Abstract

Background:

Pneumonia is a major cause of child mortality in every region of the world. Pneumonia can be diagnosed by the symptoms, a physical examination, or by ordering diagnostics. Chest X-rays can help confirm the diagnosis of pneumonia by presence of specific findings, such as consolidation or infiltration in the lung. This study intended To identify the relationship between the clinical and radiological finding in diagnosis of pneumonia .

Patients and Methodology:

This descriptive study was done in Al-Imamain Al-Kadhimiyn medical city and the data were collected between November 2018 & February 2019 from pediatric department. The study involved 50 patients with age range between 1 day - 7 years with a suspicion of pneumonia.

Each patient underwent thorough history taking, physical examination and CXR.

Results:

In this study , the cases collected were 50 cases of of children treated as pneumonia , where the age group (1 - 12) month was the most of cases 16 (32%) . In whole cases the male was mostly affected 34 (68%) . The cases of children with breastfeeding was less than other feeding 15(30%) . The majority of cases present without cynosis 21(42%) but they present with abnormal ascultatory findings was the majority 38(76%) . The most of cases was with negative family history 36(72%) . In relation with history of passive smoking , the most of cases was without history of passive smoker 33(66%) . Regarding CXR findings , the . (majority of cases was with positive findings 35(70%).

Conclusion:

chest x-ray is very important In diagnosis of pneumonia . positive clinical finding (symptoms and sings) of pneumonia is important indicator for sending CXR .

Introduction

Definition of pneumonia :

Pneumonia is a major cause of child mortality in every region of the world, with most deaths occurring in Africa and South Asia[1]. It is an infection of lower respiratory tract that involve the airways and parenchyma with consolidation of the alveolar spaces. The term lower repirotary tract infection is often used to encompass bronchitis, bronchiolitis , pneumonia or any combination of these . pneumonitis is a general term for lung inflammation that may or may not be associated with consolidation. Lobar pneumonia describes pneumonia localized to one or more lobes of the lung . Atypical pneumonia describes patterns other than lobar pneumonia . Bronchopneumonia refers to inflammation of the lung that is centered in the bronchioles and leads to the production of a mucopurulent exudate that obstruct some of these small airways and causes patchy consolidation of the adjacent lobules . Interstitial pneumonitis refers to inflammation of the interstitium , which is composed of the walls of the alveolar sacs and ducts ,and the bronchioles . Pneumonia can be caused by different types of grams, including bacteria, viruses ,fungi, and parasites . Viruses are usually the cause of pneumonia in children . children with viral pneumonia can also develop bacterial pneumonia .pneumonia can also occur if foreign material ,such as food or stomach acid , is inhaled into lungs [2].

The risk for pneumonia in children[(3)]

1. Premature birth

2. Heart defects ,such as venticular septal defects (VSD) ,atrial septal defects (ASD) Or patent ductusarteriosus (PDA)

3. Undernourished children, especially those who are not exclusively breastfed or with inadequate zinc intake.

4. Weak immunity due to other co-infections are important risk factors in pneumonia-related mortality; such as measles or malaria

5. Asthma

6. Additionally, environmental factors, such as crowd n may contribute to increasing children's susceptibility ed living conditions and exposure to indoor air pollutio to pneumonia.

Daignosis :

The diagnosis of pneumonia is based mainly on clinical parameters including respiratory symptoms and signs, which incur no cost and are sensitive, but are also nonspecific and could lead to unnecessary prescription of antibiotics and drug resistance. According to World Health Organization (WHO) guidelines, severe pneumonia is diagnosed when there is cough and fast breathing (defined based on respiratory rate for age) with one or two of the severity signs including chest in-drawing (in infants <2 months of age), grunting, cyanosis, inability to feed, lethargy, or convulsion [(4)] . Chest X-ray (CXR) has been the main stay modality in the investigation of chest infection since its invention in the late century, despite the advances in imaging modalities [(5)]. The WHO recommends CXR for all patients clinically diagnosed with severe pneumonia at tertiary centers [(6)]. Chest radiograph improves the diagnosis of pediatric community acquired pneumonia to a certain degree and may prevent overtreatment with antibiotics [(7)] . However, it is important to understand that interpretation is subject to perceptual and cognitive limitation and errors [(8)] .

The interpretation of radiographs is difficult in young children and is affected by the radiographer's experience and the amount of clinical information available. Additionally, chest radiography cannot reliably distinguish between viral and bacterial pneumonia and is often unable to detect early changes of pneumonia. Other drawbacks of chest radiography include exposure to ionizing radiation, cost, the time and space used, and the need to wait from the radiograph and to see the clinician again. Moreover, chest radiography has a low sensitivity compared to advanced imaging tools like lung ultrasound, computed tomography, and magnetic resonance imaging [9].

Timely diagnosis and management of severe pneumonia, and shorter hospital stay is crucial to decrease childhood morbidity and mortality in resource limited settings[10] .

so, Diagnosing pneumonia in children can be challenging; Missed bacterial pneumonia can lead to significant morbidity and mortality; thus, many clinicians in the acute-care setting rely on the chest radiograph (CXR) as an additional tool to establish the diagnosis of pneumonia and determine the need for antibiotic therapy [11]. Additionally, some clinicians are concerned that radiographic findings of pneumonia may be absent early in the course of the disease or in patients with dehydration leading them to prescribe antibiotics despite a negative CXR [12] .

The ability of CXR to exclude pneumonia in children has not been determined[13] .

Viral pneumonia[14]

Etiology :

1. Respiratory syncytial virus (RSV)

2. Rhino ; Para in Fluenza ; In Fluenza

3. Adeno ; H.metapneumovirus

Clinical manifestation :

• upper respiratory tract symptoms

• Tacypnea and respiratory distress

• Auscultatoin of the chest may show wide spread of Crackles and wheezing

Diagnosis

1-C.X.R : diffuse infiltrates or lobar infiltrate

2-W.B.C : normal or slightly elevated with Lymphocytosis

3-ESR , C- reactive protein : normal or elevated

4- Isolation of a virus

5- culture of virus 5 – 10 days

6- use labeled virus – specific anti bodies to detect viral antigens in respiratory secretions

Treatment :

A-supportive

O2 , I.V.F

B.Drugs :

Amantadine ....Influenza

Ribavirin ....RSV

Bacterial pneumonia[14]

Etiology according to age groups

- **Neonates** :   Group B streptococcus , E- coli .

 -**1 mo-5 yrs** :   S . pneumonia, H. influenza, group A streptococcus ,
                          Mycoplasma pneumoniae

- **5 – 18 yrs** :   Mycoplasma pneumonia, S . pneumonia ,

                    H. influenza

   Clinical features :

A: In infancy

1. frequently there is a preceding UTI

 2. Infant becomes acutely ill , fever irritable & restless

 3. poor feeding

  4. cough is sever and may precipitate vomiting

5. dyspnoea with respiratory distress

B- children and adolescents

1. usually sudden onset with high fever , shaking chill

 2. Cough

3. Chest and Abdominal pain

4. Tachypnea , Respiratory distress , Cyanosis is uncommon.

5. Nuchal rigidity may also prominent

6. Referred pain to the right lower quadrant of the abdomen

                         - Dullness to percussion

Physical finding   ::   - Increase tactile and vocal fremitus

                          -Bronchial breath sounds & crackles

Investigation :

- CX.R : consolidation especially in pneumococcal peneumonia, diffuse bronchopneumonia.

- W.B.C : elevated > 20.000/mm3 with predominance of neutrophils

- B-culture : positive in 10-20 %

Treatment [15]

- pneumococcal pneumonia Penicillin G 100.000 unit (kg/24h)

      Cefotaxime 150 mg/kg/24h

      Ceftriaxone   75 mg/kg/24h   7-10 days

      Vancomycin   40 mg/kg/24h

- Group A sreptococcal pneumonia :

    Penicillin G (100,000 units)/kg/24h   for 2-3 wk

- Haemophilas influenzae   :

      Cefotaxime 150 mg /kg/24h   10- 14 day

      Ceftriaxone 75 mg/kg/24h

- Staphylococcal pneumonia :

      Nafcillin 200 mg/kg/24h   3-4 weeks

      Vancomycin 40 mg/kg/24h

- Mycoplasma pneumonia   :
      Erythromycin

      Clarithromycin

      Azithromycin

Aim of study

To identify the relationship between the clinical and radiological finding in diagnosis of pneumonia .

patients and methods

This descriptive study was done in Al-Imamain Al-Kadhimiyn medical city and the data were collected between November 2018 & February 2019 from pediatric department. The study involved 50 patients with age range between 1 day - 7 years with a suspicion of pneumonia.

Each patient underwent thorough history taking, physical examination and CXR.

Most important points to be emphasized in this study are:

- Age
- Gender
- Feeding type
- Cyanosis
- Auscultation findings
- CXR findings
- Family Hx
- Passive smoker

Results

1. **Age distribution:**

 The cases were distributed according to age , as we divided them into age groups

A(1 -28) days   ,   B (1 – 12) months
C (1 – 6) year   ,   D (above 6 year)

The majority of cases was in group (B)

as show in the table (1) :

table (1) distribution of patient according to the age

	age	male	female
A	1-28 day	8(16%)	4(8%)
B	1-12 month	16(32%)	6(12%)
C	1-6 years	9(18%)	4(8%)
D	above 6 years	1(2%)	2(4%)
	total	34	16

2- Gender distribution :

Regarding gender distribution in our study , the male cases was 34 (68%) case , while female cases was 16 (32%) case
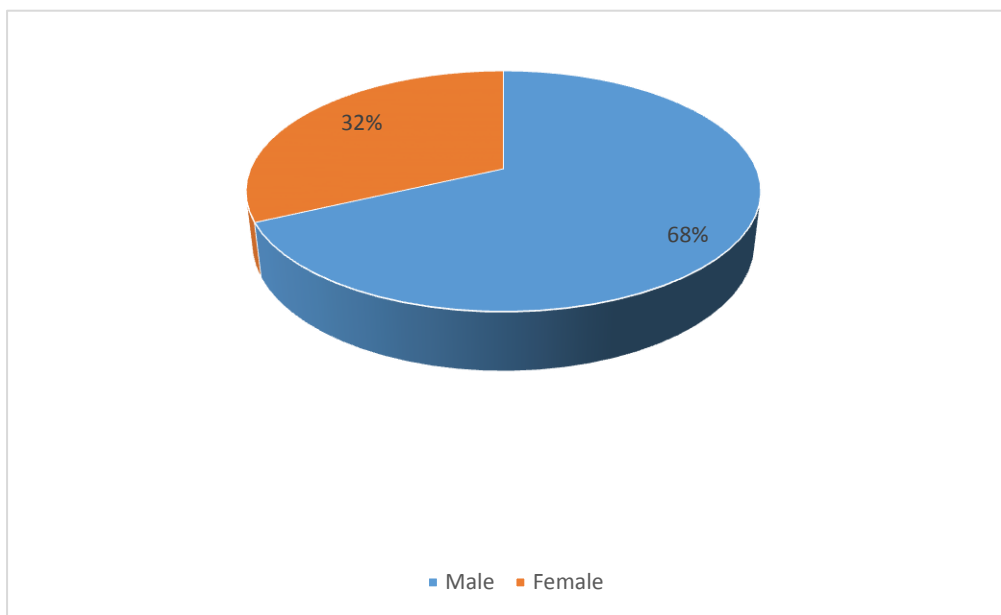
As show in figure (1) :

32%

68%

■ Male ■ Female

figure 1   Gender distribution

3- Residency :

In our study , the cases of patient who living in urban regain was 32 (64%) , while who living in rural area was 18 (36%)
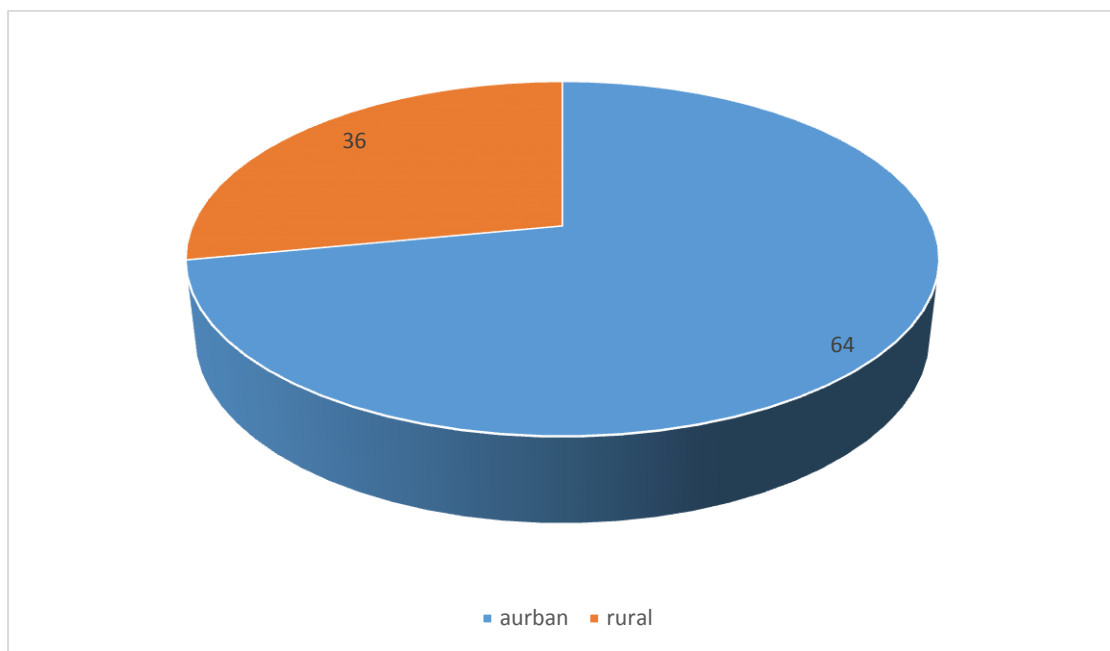
As show in figure 2 :

figure 2 Residency distribution

4- **Feeding type:**

In our study , Regarding the feeding type of children the , the cases who is breast feed was 15 (30%)

While cases on bottle feeding was 17(34%)

And cases on mixed feeding was 18(36)
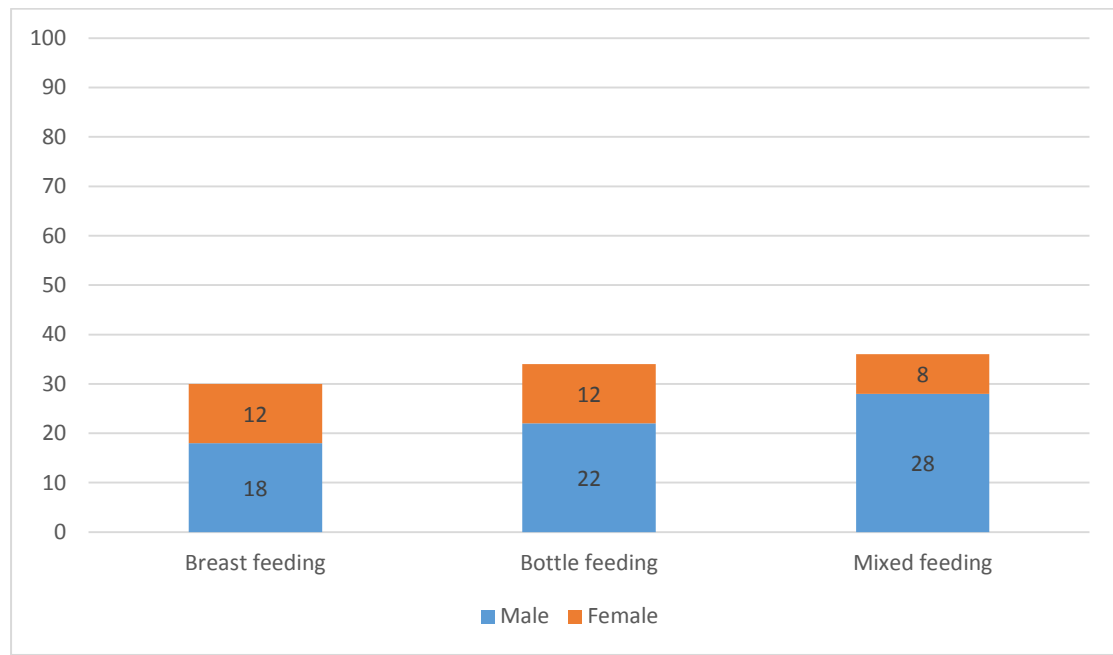
As show in figure 3 :

figure 3 Feeding distribution

5- Cyanosis :

In our study , Regarding presence or absence of cyanosis , cases present While cases prescent with without cyanosis which about 29 (58 %) cyanosis were 21 (42%)
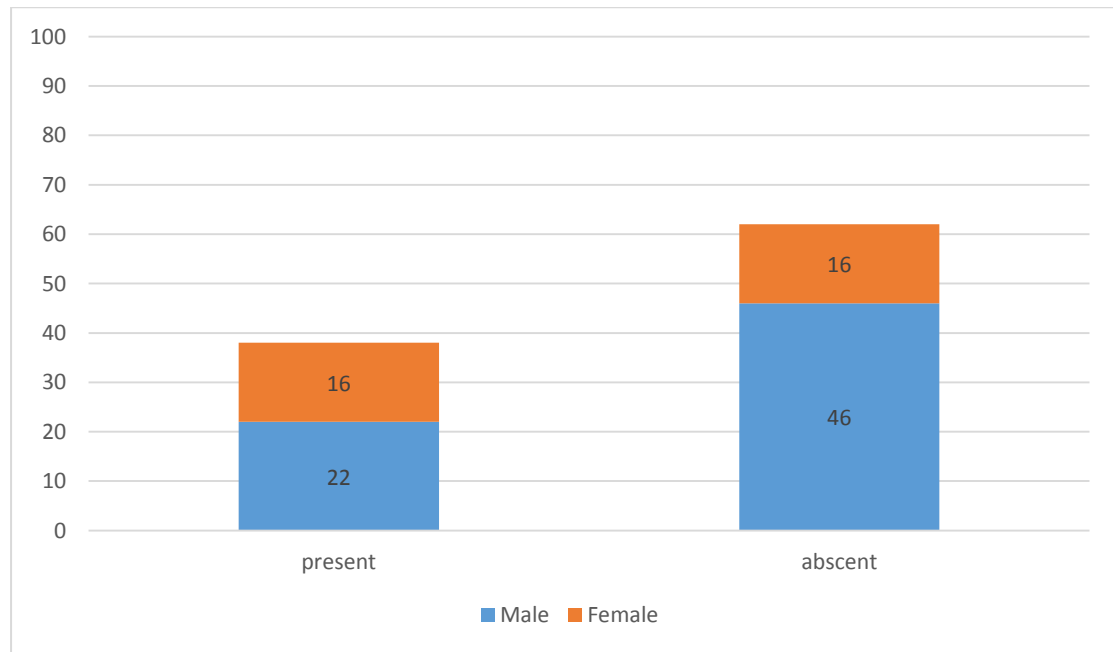
As show in figure 4 :

figure 4 Cyanosis distribution

6- <u>Auscultation findings :</u>

In the clinical diagnosis of pneumonia in the cases
Were 38(76) % prescence of abnormal auscultatory finding
But12(24)% their chest was clear

As show in figure 5 :

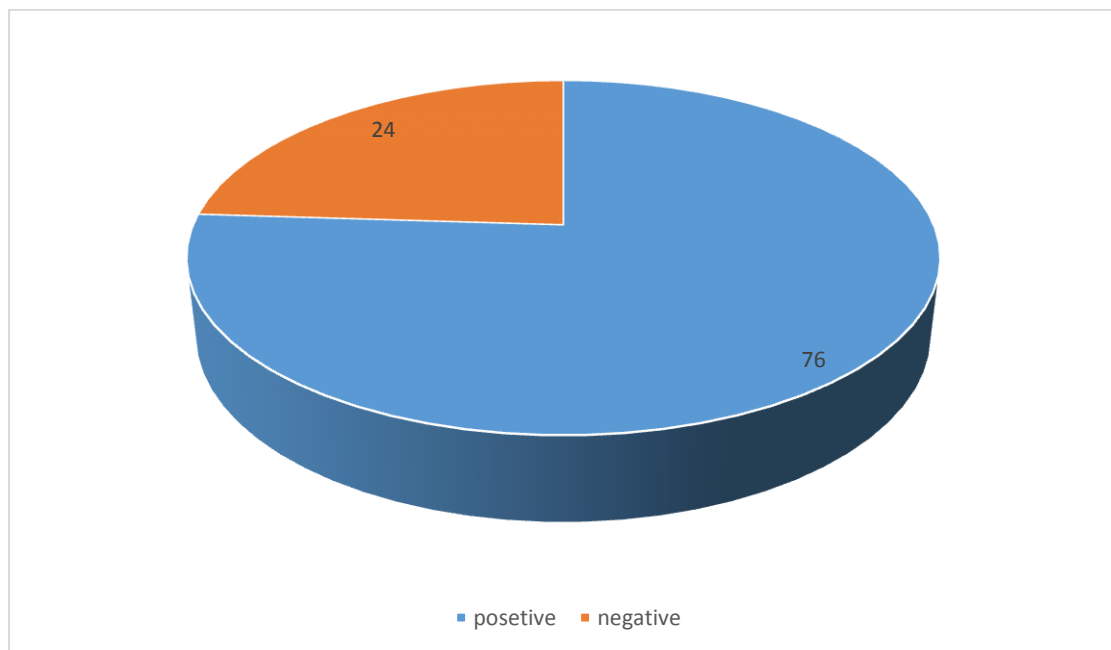figure 5 Auscultation distribution

\

7- **Family Hx:**

In our study , The cases were collected with negative family Hx was 36 (72 %)

While

cases were with positive family Hx 14 (28%)

as show in figure 6 :
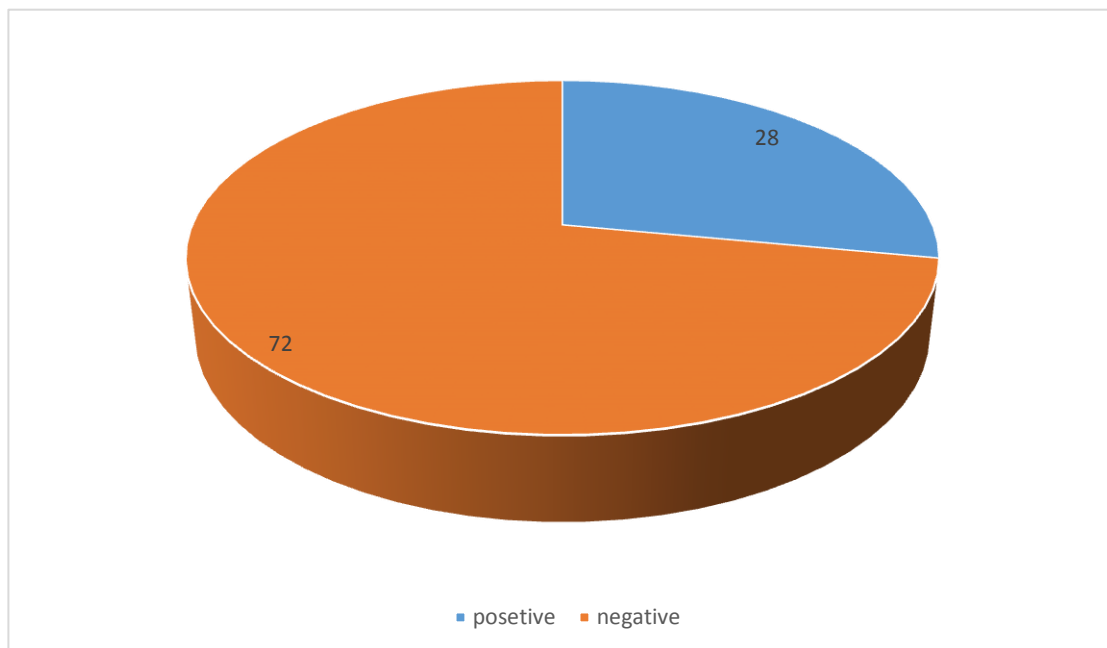
figure 6 family Hx distribution

8- **Passive smoker:**

In our study , cases were negative Hx of second hand smoking which about 33(66%)

17(While cases with positive Hx of second hand smoking about 34 %)

As show in figure 7 :

- posetive
- negative

figure 7 Passive smoker distribution

9- CXR finding:

In our study , Regarding chest x-ray :

The cases with positive CXR finding was 35 (70%)

While cases without CXR finding was 15 (30%)

As show in figure 8 :
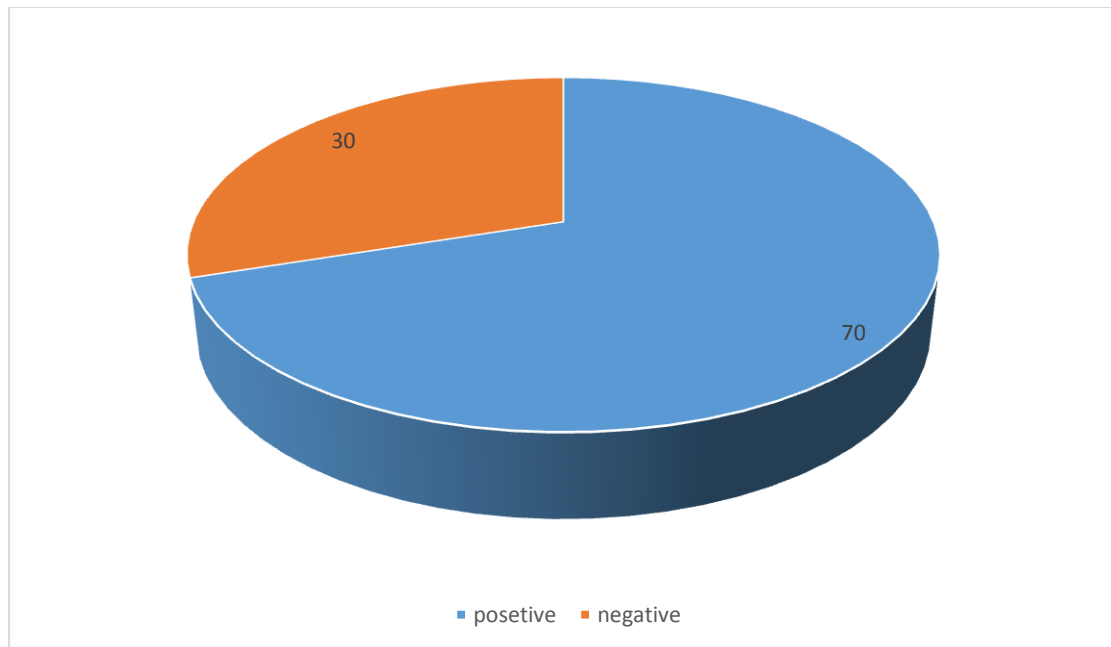
figure 8 Chest x- ray distribution

10 .in our study , the finding of CXR in relation with age groups was :

Group A : +ve finding 7

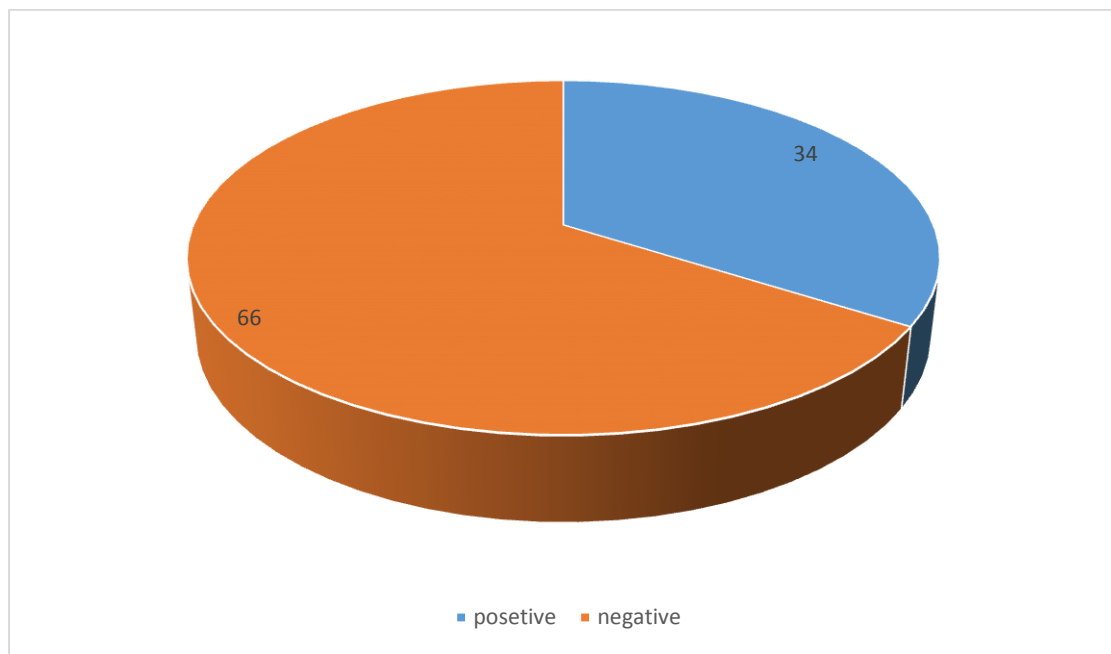-ve finding 4

Group B : +ve finding 19

-ve finding 7

Group C : +ve finding 6

-ve finding 4

Group D : +ve finding 3

-ve finding 0

As show in table 2 :

Table 2   CXR finding in relation to age group

Age	positive CXR	negative CXR	Total
A	7(14%)	4(8%)	11
B	19(38%)	7(14%)	26
C	6(12%)	4 (8%)	10
D	3 (6%)	0 (0%)	3
Total	35	15	50

11- the relation of CXR with gender :

male cases :+ve finding : 24

           -ve finding : 10

Female cases : +ve finding 11

            -ve finding 5

As show in table 3 :

Table (3) CXR finding in relation to gender

Gender	posetive CXR	negative CXR	Total
Male	24(48%)	10(20%)	34
Female	11(22%)	5(10%)	16
Total	35	15	50

12 . in our study , the relation between finding in CXR with patient residency :

In urban regain : +ve finding 23

               -ve finding   9

In rural regain : +ve finding 12

               -ve finding   6

As show in table 4 :

Table (4) -CXR finding in relation with residency

Residency	posetive CXR	negative CXR	Total
Urban	23(46%)	9(18%)	32
Rural	12(24%)	6(12%)	18
Total	35	15	50

**13. in our study , the relation
between finding in CXR with cyanosis :**

Cyanosis present :+ve CXR finding   14

               -ve CXR finding   7

Cyanosis abscent : +ve CXR finding   21

               -ve finding   8

As show in table 5 :

Table (5) -CXR finding in relation with cyanosis

	posetive CXR	negative CXR	Total
cyanosis present	14(28%)	7(14%)	21
cyanosis abscent	21(42%)	8(16%)	29
Total	35	15	50

14- in our study , the relation between finding in CXR with finding on asculatation :

+ve   clinical finding : +ve CXR   25

                              -ve CXR   4

-ve clinical finding : +ve CXR   10

                             -ve CXR   11

<u>Table (6) CXR finding in relation with clinical finding</u>

clinical finding	posetive CXR	negative CXR	Total
Positive	25(50%)	4(8%)	29
Negative	10 (20%)	11(22%)	21
Total	35	15	50

Discussion

1 – in our study , the cases with positive CXR finding , was the majoraty of cases which about 35 of 50 cases (70%), this result agree with study of Susan C[16] , which state that , a negative CXR excludes pneumonia in the majority of children.

2. We can see the majority of cases were between (1 – 12) months old and the frequency decreases as age advances , the cause might be the maturation of the respiratory tract or the larger airways and more accommodation as the child gets older and this result agree with a study of Mark louden[17] , which found that 81% among those younger than 1 year.

3. The males are more affected than females as we found on figure 1 and also in other study Mark Louden [18], which found that as many as 1.25 times more frequently in males than females.

4. breast feeding has very good effect on the result (30%) of cases were on breast feeding , while (70%) were having mixed and artificial feeding , and this result agree with study of Michael C.[19] . Which state that exclusive breast feeding during first months of life provides access to food and resistance to diseases , two elements that are absoultly critical for health and nutritional well- being ,a one third reduction in child deaths caused by acute respiratory infections can be achieved.

5 –clinical diagnosis in majority of cases correlate with CXR findings , and this result agree with study of Takeshi Saraya [20] , which showed the first evidence of a correlation between the extent of lung abnormalities on chest X –ray.

6– in our study , we found that the posative CXR finding in relation with cyanosis was not significance correlate with it , and this result disagree with study of Hereza Fadlinda [21] , which showed that the more sever pneumonia associated with cyanosis with positive CXR finding .

Conclusion

1.chest x-ray is very important In diagnosis of pneumonia

2.positive clinical finding (symptoms and sings) of pneumonia is important indicator for sending CXR

3. male is a risk factor for pneumonia , and is important indicator for sending CXR

Recomandation :

1 . In this reaearch the CXR finding was mostly positive and correlate with clinical diagnosis , so,clinical diagnosis is very Important in diagnosis of pneumonia

2. breast feeding is relitevly protective aganist pneumonia

Referance:

1. 1. . Karen J . Marcdante , Robert M .Kliegman , Hal B . Jenson , Richard E. Behrman , Nelson Essentials of pediatrics ,(6th Edition) , chapter 61 , Respiratory Diseases of the Neborn,pp 237-40

2. Karen J . Marcdante , Robert M .Kliegman , Hal B . Jenson , Richard E. Behrman , Nelson Essentials of pediatrics ,(6th Edition) , chapter 110 , Infectious disease , pp (398- 404).

3. Scott JA, Brooks WA, Peiris JS, Holtzman D, Mulhollan EK. Pneumonia research to reduce childhood mortality in the developing world. J Clin Invest. 2008;118:1291–300.

4. Kending C. Disorders of the respiratory track in children. 8th ed. China: Elsevier saunders; 2012. 1250-54.

5. Pneumonia in South-East Asia Region: public health perspective. Indian J Med Res. 2012;135(4):459–68.

6. Neuman MI, Graham D, Bachur R. Variation in the use of chest radiography for pneumonia in pediatric emergency departments. Pediatr Emerg Care. 2011;27(7):606–610.

7. Neuman MI, Scully KJ, Kim D, Shah S, Bachur RG. Physician assessment of the likelihood of pneumonia in a pediatric emergency department. Pediatr Emerg Care. 2010;26(11):817–822.

8. Davies HD, Wang EE, Manson D, Babyn P, Shuckett B. Reliability of the chest radiograph in the diagnosis of lower respiratory infections in young children. Pediatr Infect Dis J. 1996;15(7):600–604.

9. Nelson KA, Morrow C, Wingerter SL, Bachur RG, Neuman MI. Impact of chest radiography on antibiotic treatment for children with suspected pneumonia. Pediatr Emerg Care. 2016;32(8):514–519

10. Johnson J, Kline JA. Intraobserver and interobserver agreement of the interpretation of pediatric chest radiographs. Emerg Radiol. 2010;17(4):285–290.

11. Olsen SJ, Thamthitiwat S, Chantra S, et al. Incidence of respiratory pathogens in persons hospitalized with pneumonia in two provinces in Thailand. Epidemiol Infect. 2010;138:1811–22.

12. Caldwell A, Glauser FL, Smith WR, Hoshiko M, Morton ME. The effects of dehydration on the radiologic and pathologic appearance of

experimental canine segmental pneumonia. Am Rev Respir Dis. 1975;112(5):651–656

13. Hagaman JT, Rouan GW, Shipley RT, Panos RJ. Admission chest radiograph lacks sensitivity in the diagnosis of community-acquired pneumonia. Am J Med Sci. 2009;337(4):236–240.

14. Robert c; Stern , Robert M ; Kliegman ; Bonita F ; stanton , Rechard E ; Berhman , Nelson Textbook of pediatrics, french -Doin Editerus ,SA ., paris , (10th Edition) , chapter 12, Disease of the Respiratory system ,pa(1205 – 22).

15. Sazawal S, Black RE Pneumonia Case Management Trials Group. Effect of pneumonia case management on mortality in neonates, infants, and preschool children: a meta-analysis of community-based trials. Lancet Infect Dis. 2003;3:547–56.

16. Susan C , Cherian T, Mulholland EK, Carlin JB, et al. Standardized interpretation of paediatric chest radiographs for the diagnosis of pneumonia in epidemiological studies. Bull World Health Organ. 2005;83(5):353–359.

17. Mark Luden , Edmond K, Scott S, Korczak V, et al. Long term sequelae from childhood pneumonia; systematic review and meta-analysis. PLoS One. 2012;7:e31239. doi: 10.1371/journal.p

18. Mark louden، Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H (2008)Epidemiology and etiology of childhood pneumonia. Bull World Health Organ86: 408–416.

19.، Kramer MS, Kakuma R. The optimal duration of exclusive breastfeeding. Cochrane Database Syst Rev. 2012;8.

20. Saraya T, Ohkuma K, Tsukahara Y, et al. Relationships among clinical features, HRCT findings, and a visual scoring system in patients with Mycoplasma Pneumoniae pneumonia. Am J Respir Crit Care Med 191: A1781, 2015.

21. Hereza Fadlinda ، Muangchana C . Factors associated with diagnosis of bacterial pneumonia in children of Northern Thailand. Southeast Asian J Trop Med Public Health 2009; 40:563–9.

Negative CXR finding in children treated as pneumonia

General information:

Name: _____

Age: _____

Sex: _____

Residency: _____

_____

Feeding type: _____

Respiratory distress: +ve [   ]   -ve [   ]

Cyanosis: +ve [   ]   -ve [   ]

Finding in auscultation: _____

CXR finding: +ve [   ]   -ve [   ]

_____

Family history: +ve [   ]   -ve [   ]

Passive smoker: +ve [   ]   -ve [   ]