ISSN No:-2456-2165

Drug Selection Patterns in Asthma and Hyperre Active Airway Disease in Children

MOHAMMAD SONY, KEERTHANA KOTA, GUDURU VIJAY KUMAR,Dr. TEJASWI CHILLARA.
DEPARTMENT OF PHARMACY PRACTICE, VAAGDEVI PHARMACY COLLEGE,
BOLLIKUNTA, WARANGAL, TELENGANA.

Abstract:- A prospective observational study was conducted at Mahatma Gandhi Memorial (MGM) hospital, Warangal over a period of 6 months. This study is conducted to evaluate clinical presentation of various respiratory conditions and to optimize oxygen, inhalational therapy and antibiotic treatment for optimal outcome. We conclude that many children were under 5 commonest age group, suffering from wheeze, respiratory distress and asthma. Nebulization of salbutamol was useful in HRAD and asthma rather than bronchiolitis and LRTI. IV hydrocortisone was beneficial in HRAD and less beneficial in bronchiolitis. Supplemental oxygen was most effective treatment in bronchiolitis condition. None of the children were receiving holding chambers or spacers. At least some percentage of the children in the present study may require spacers in long term use to decrease morbidity.

Keywords:- *ASTHMA, HRAD, LRTI, SABA, LABA, PRAM.*

I. INTRODUCTION

A. ASTHMA:

Asthma is a severe inflammatory disease, which is identified by audible wheezing in children, chest tightness, coughing (most seen at night time), shortness of breath, fever, cold and several airways obstruction. Asthma diagnosis is done based on patient history, physical examination and pulmonary function tests.

- **Risk factors:** Allergies related to food, Inhalation of dust particles and adulterants, Parental exposure to allergies, Rhinitis, Inhalation of secondary smoke, Eczema and dermatitis, Cool wind. Under diagnosis and under treatment is due to comorbid conditions such as upper respiratory tract infection (URTI) and weak condition of the body, different phenotypes, intermittent occurrences of coughing and wheezing, non-medication adherence, poor economic status and disease understanding of the patient, improper usage of inhaler and continuous exposure to allergic annoyances. [(1)]

➢ *TREATMENT:*

- **SUPPORTIVE THERAPY**:

Oxygen therapy- It is the most suitable and beneficial therapy for mild intermittent, persistent and severe asthma. Both warm and cold humidifiers are used for various improvement reasons from life-threatening conditions. There is no evidence from research side of using oxygen therapy in acute conditions.

✓ Asthma in pre-school-

It is difficult to diagnose asthma in pre-school children as they experience symptoms which are, most of the time related to viruses and lead to coryza. Advanced utilization appertaining to corticosteroids for patients progressed from 1 year to 12 years resulted in no fast breathing for over 7 days.

✓ LABA-

These are not commonly used because of the adverse effects. Salmeterol used only in repeated interventions of exacerbations and for exercise-related asthma. And it should be discontinued immediately after the child feels less discomfort. It is used together with ICS, alone can increase the chances of future asthma-attacks and increase mortality rate.

✓ Monoclonal antibodies-

Omalizumab is used with inhaled corticosteroids for its synergistic effect. However, it is not commonly prescribed as it may provide lesser obstruction of the airways.

✓ SABA and bronchodilators-

These are the drugs mainly used to reduce bronchospasm or shortness of breath associated with nightly awakenings. Based on a comparative study, it concludes the use of an inhaled form of salbutamol- 2 puffs has greater chances and quick response of immediate relaxation of airways were found compared with oral format of same drug. It will provide its action with accompanying relaxation effect on airways.

✓ Corticosteroids-

Prednisone is converted to prednisolone, an active metabolite in which its oral dose should be less than 20mg in children. Increasing the dose of the drug may lead to serious adverse events. It is metabolized by the liver. It lowers the inflammation of the airways of bronchioles. After achieving improvement with combination of LABA/ICS, discontinuation of LABA should be implicated and use of ICS should be continued.

✓ Magnesium sulphate (mgso4)-

It was originally used in the year 1906 by horn in seizure condition during gestation, then is used in asthma for relaxation of airways or hyperinflation. Its primary mode of action is blocking of calcium affluence which is used for muscle contraction and also cessation of histamine production such as bradykinins and cytokinin release from mastocyte.

ISSN No:-2456-2165

➢ *Hyperreactive airway disease:*

Hyperreactive airway disease is notably a common condition in children which will furtherly lead to multi-trigger wheezer, viral wheezer and recurrent episodes of wheeze leads to mild, intermittent and mild persistent asthma [3]

➢ *Aetiology:*

Previously caused infections like RSV is mostly seen in infants and children. Second hand smoke, tobacco smoke and maternal smoke, pets, pollen, dust mite allergens, weather changes, drugs, stress and mediastinal mass (external compression of airway).

➢ *Diagnosis:*

There are some basic standard rules for diagnosing asthma;

- Children should consist of 5 years or greater.
- Reoccurrence of symptoms recurrently like episodic wheezer and airway inflammation and hyperresponsiveness.
- Keeping a track of forced expiratory volume (FEV1) at one second and reversible airways blockage following usage of a SAB2A.
- Treatment:
- Main treatment goals are-
- Providing o2 care while in travel and nebulization associated with severe respiratory distress.
- Emergency service rooms exist with - mild to moderate exacerbations (o2 >92%)
- Albuterol (SABA's are the most used to bring out best outcomes for management) should be given as primary treatment either by MDI or by o2 by mask.
- First line management - oral dexamethasone-0.6mg/kg/dose
- Second line management - oral prednisolone-2mg/kg/dose
- Nebulization with ipratropium bromide and SABA for 20min
- Severe exacerbations < 92% on RA should be given with high o2 flow (by mask, inhalational or HFNC, CPAP, whatever is being indulged). (7)
- 2.3 Pram Score {pediatric respiratory assessment measure}: This score consists of 5 types to assess the symptoms and signs Likewise they include suprasternal retractions, scalene muscle contractions, air entry, wheezing and oxygen saturation.
- Pram scores will be conducted and evaluated in children of age group 2 – 17 and also who exist with exacerbations. Pram score is used to measure seriousness of the asthma patients (6)

II. MATERIALS AND METHODS:

It is a prospective observational study done to assess the treatment patterns and clinical presentations of children. Study was conducted at Emergency service room and department of pediatrics, Kakatiya medical college, mahatma Gandhi memorial hospital, Warangal. Data was collected from 120 subjects for a period of 6 months.

Infants to 13 years age group population with a different diagnosis of acute severe asthma, hyperreactive airway disease, LRTI with wheeze, episodic viral wheeze, multi trigger viral wheeze and all children who received nebulization at admission are included in the study. Known cases of bronchial asthma children are also included in the study. Neonates, children with other comorbidities and diseases which are mimicking bronchitis, bronchiectasis are excluded based on exclusion criteria.

Data was collected from case reports which include patient details, past medical and family history, history of nebulization use, presenting clinical features, diagnosis, treatment given to the patient, and vitals of the patient and patient or care taker interview regarding medication adherence, physical activity, diet and socioeconomic status. Details of child weight, height, gender and treatment patterns. Informed Consent form from Parents was taken. All the above data was collected and included in the data collection forms.

Data is interpreted using Microsoft excel. Statistical analysis was performed using ANOVA (analysis of variance), mean, S.D, p-value was obtained.

III. RESULTS

TABLE 1: STATISTICAL ANALYSIS OF AGE:

Parameters	Number	Mean	SD	F-value	P-value
Age					
ASTHMA	15	95.14	28.03	28.76	<0.001
HRAD	13	51	39.596		
EPISODIC VIRAL WHEEZER	26	37.13	33.458		
LRTI AND BRONCHIOLITIS	68	15.84	27.788		
Total	122	32.87	39.477		

ISSN No:-2456-2165

TABLE 2: STATISTICAL ANALYSIS OF WEIGHT:

Parameters	Number	Mean	SD	F-value	P-value
Weight					
ASTHMA	15	19.9486	8.63671	17.05	<0.001
HRAD	13	12.6333	7.16359		
EPISODIC VIRAL WHEEZER	26	10.4875	6.45313		
LRTI AND BRONCHIOLITIS	68	7.5586	5.0991		
Total	122	10.0973	7.20451		

TABLE 3: STATISTICAL ANALYSIS OF HEIGHT:

Parameters	Number	Mean	SD	F-value	P-value
Height					
ASTHMA	15	114.29	18.841	24.809	<0.001
HRAD	13	88.25	32.238		
EPISODIC VIRAL WHEEZER	26	76.46	24.374		
LRTI AND BRONCHIOLITIS	68	59.71	21.346		
Total	122	72.28	29.044		

TABLE 4: AVERAGE DURATION OF HOSPITAL STAY

Diagnosis	**Average duration of hospital Stay**
severe bronchiolitis	**4 to 9 days**
HRAD	**4 to 7 days**
Acute exacerbation of asthma	**5 to 13 days**
Episodic viral wheezer	**5 to 8 days**
LRTI	**5 to 10 days**

TABLE 5: RESPIRATORY RATE OF CHILDREN

Parameters	**Number**	**Mean**	**SD**	**F-value**	**P-value**
Respiratory Rate					
ASTHMA	15	42.29	19.66	2.19	0.092
HRAD	13	44.73	18.391		
EPISODIC VIRAL WHEEZER	26	51.79	12.087		
LRTI AND BRONCHIOLITIS	68	51.34	12.939		
Total	122	49.76	14.454		

TABLE 6: SPO2 AT ADMISSION

Parameters	Number	Mean	SD	F-value	P-value
SPO2 at admission					
ASTHMA	15	97.14	1.875	1.188	0.318
HRAD	13	97.58	0.9		
EPISODIC VIRAL WHEEZER	26	96.13	2.724		
LRTI AND BRONCHIOLITIS	68	96.83	2.485		
Total	122	96.8	2.375		

TABLE 7: SPO2 AFTER THERAPY

Parameters	Number	Mean	SD	F-value	P-value
SPO2 after therapy					
ASTHMA	15	98.43	1.284	1.878	0.137
HRAD	13	98.58	0.793		
EPISODIC VIRAL WHEEZER	26	97.67	1.551		
LRTI AND BRONCHIOLITIS	68	98	1.228		
Total	122	98.04	1.286		

ISSN No:-2456-2165

TABLE 8: BIRTH WEIGHT

Parameters	Number	Mean	SD	F-value	P-value
	Birth Weight				
ASTHMA	15	2.8214	0.31666	0.239	0.869
HRAD	13	2.8167	0.73588		
EPISODIC VIRAL WHEEZER	26	2.8125	0.62836		
LRTI AND BRONCHIOLITIS	68	2.735	0.46199		
Total	122	2.7688	0.51253		

TABLE 9: PRAM SCORE

Parameters	Number	Mean	SD	F-value	P-value
PRAM SCORE					
ASTHMA	15	1.64	2.405	4.819	0.003
HRAD	13	2.08	3.088		
EPISODIC VIRAL WHEEZER	26	1.54	2.413		
LRTI AND BRONCHIOLITIS	68	0.4	1.209		
Total	122	0.94	1.98		

Table 10: Treatment details

Treatment	Frequency	Percentage
O2 THERAPY	84	68.6
NEB ASTHALIN	60	49.1
IV HYDROCORTISONE	32	26.2
ORAL PREDNISOLONE	5	4.0
ORAL BRONCHODILATOR	95	77.8
MGSO4	11	9.1
SYP CPM	25	20.4
SYP KUFRIL	29	23.7
SYP PCM	82	67.2
INJ AMPICILLIN	72	59
INJ AMIKACIN	31	21.4
IV FLUIDS	62	50.8
NEBULIZATION (BUDECORT, DUOLIN, ADRENALINE AND 3%NS)	45	36.6

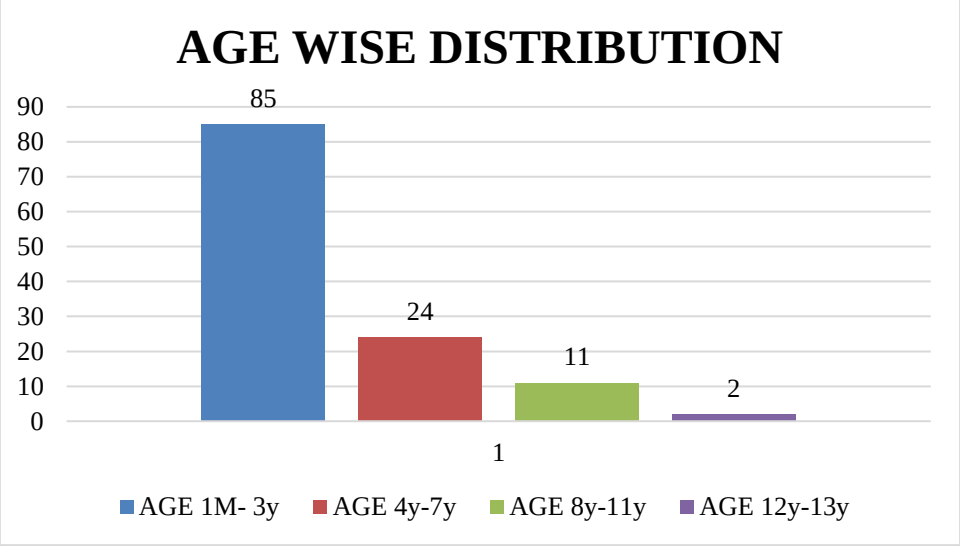

Fig. 1: Age wise distribution of affected children

ISSN No:-2456-2165

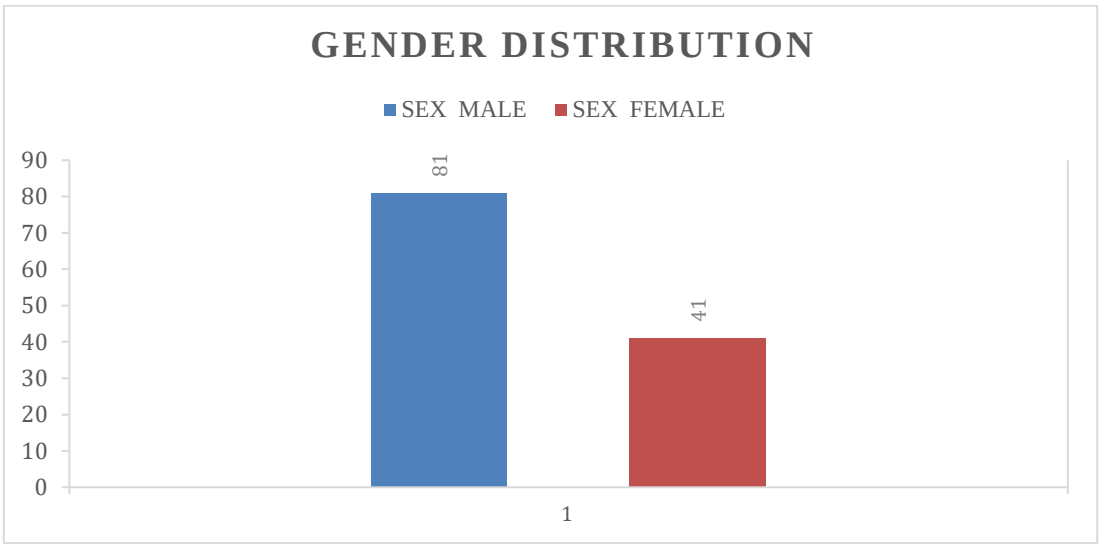

Fig. 2: Gender wise distribution

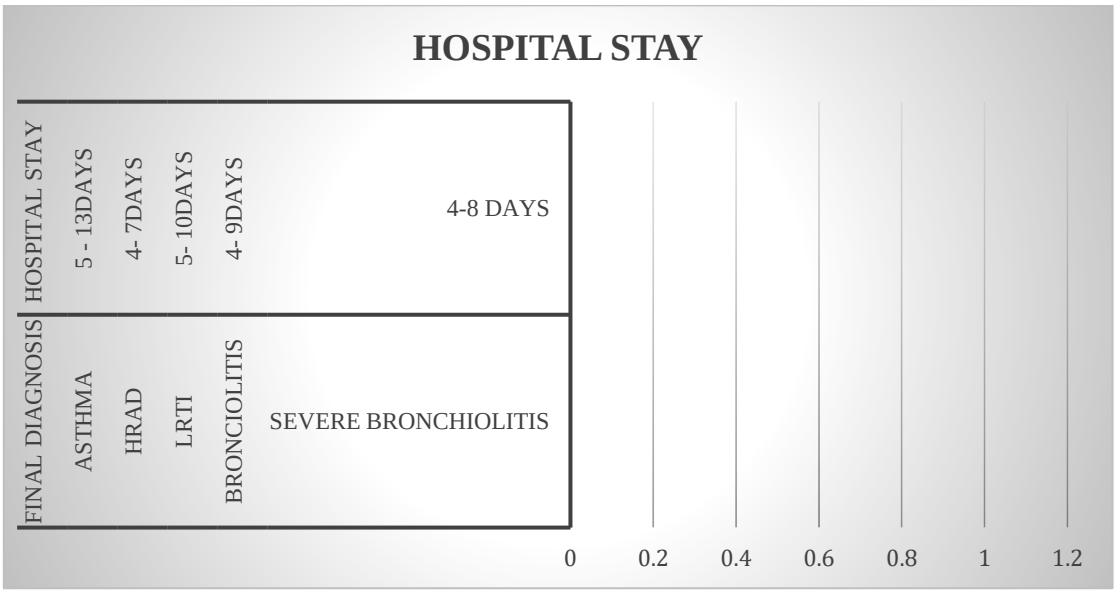

Fig. 3: Hospital stay of different diagnosis of patients

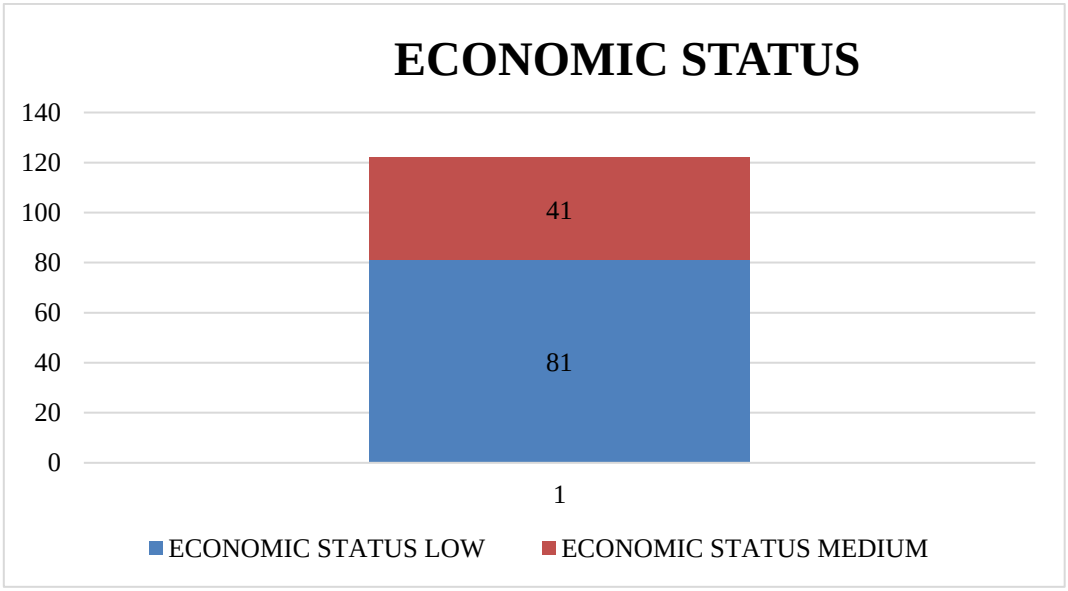

Fig. 4: Economic status

ISSN No:-2456-2165

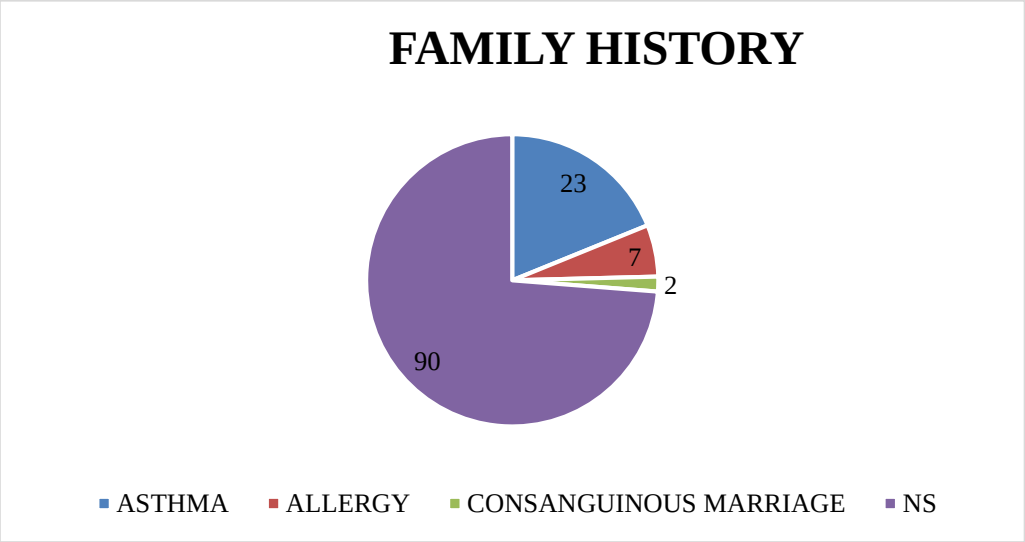

Fig. 5: Family history

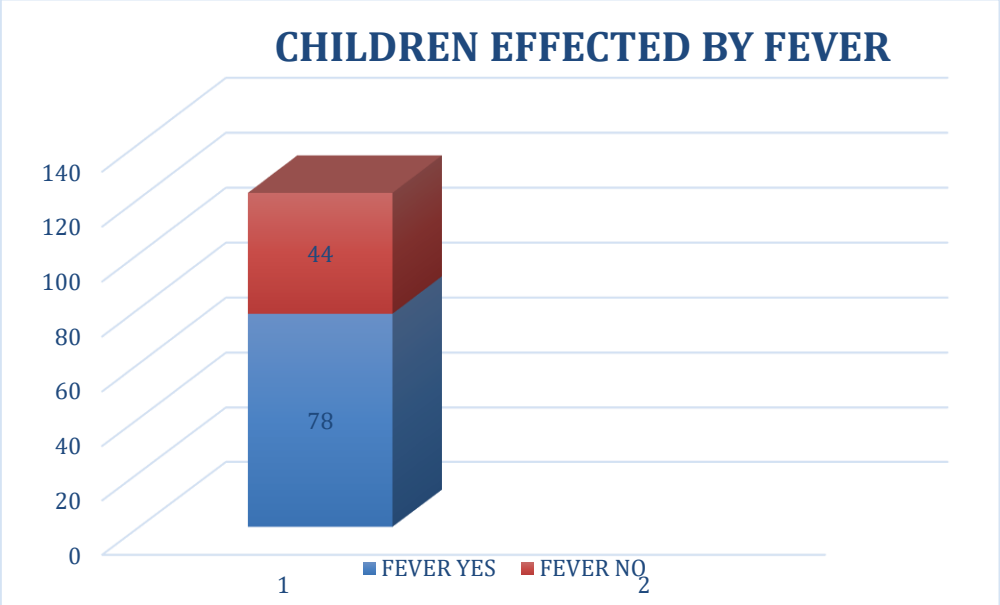

Fig. 6: Children affected by fever

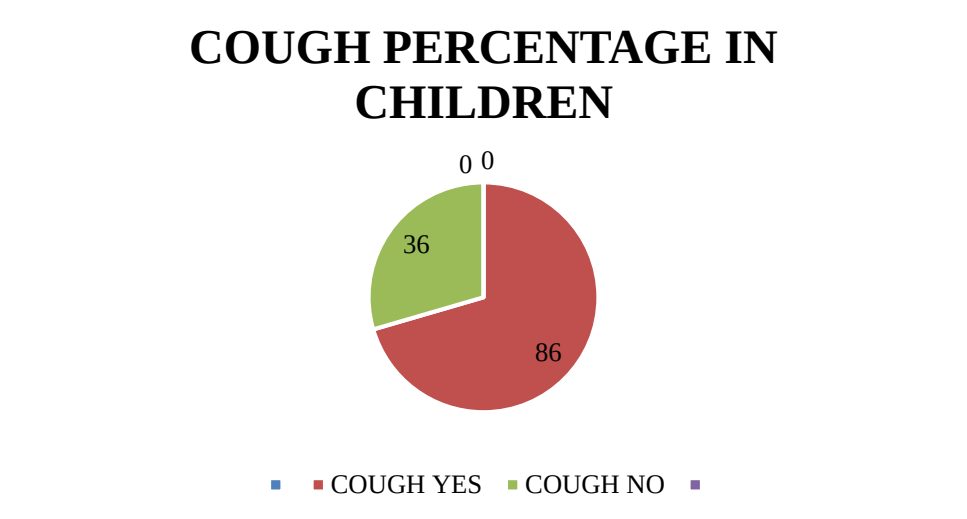

Fig. 7: Cough percentage in children

ISSN No:-2456-2165

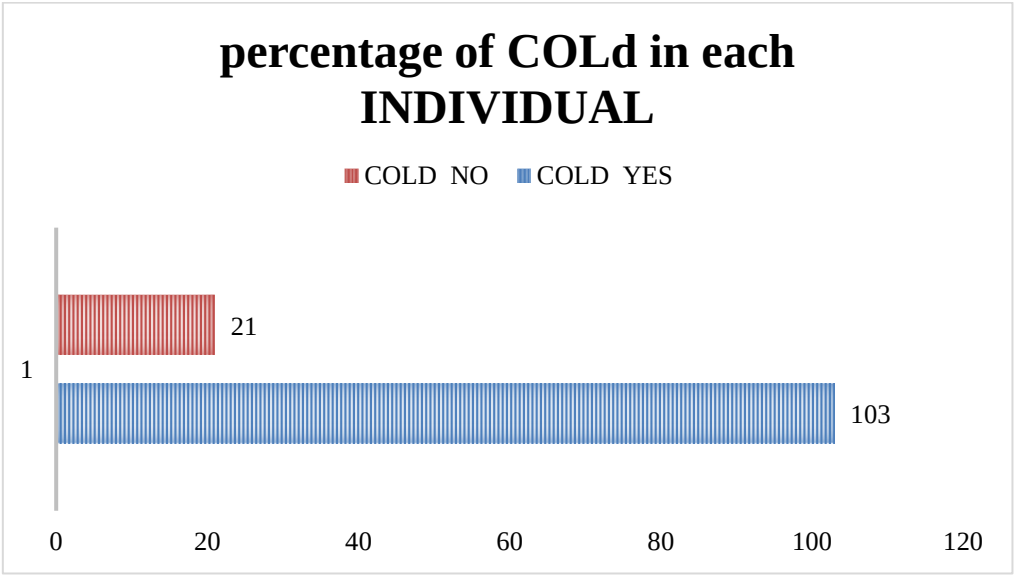

Fig. 8: percentage of cold in each individual

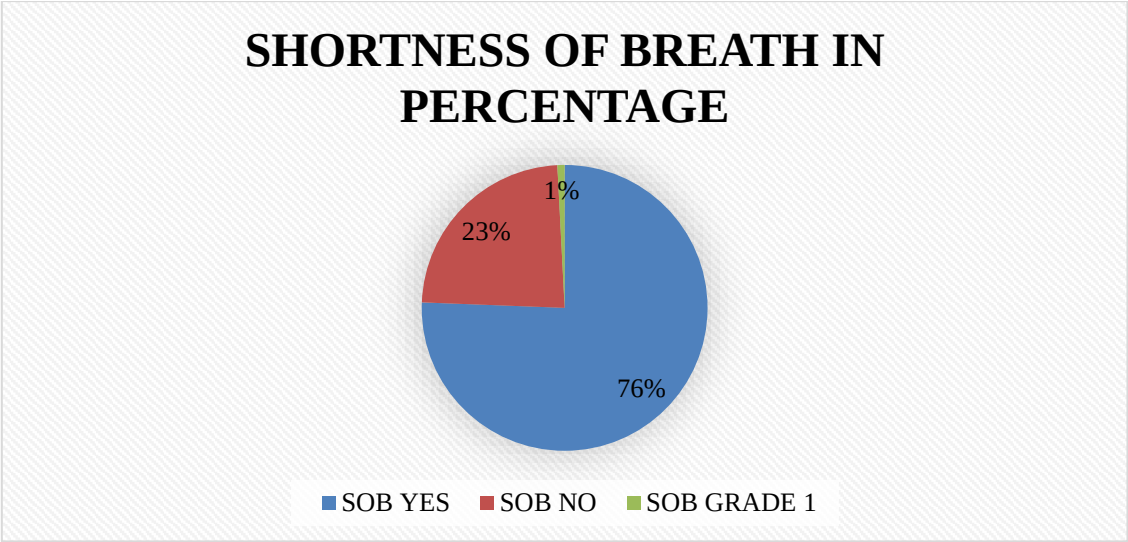

Fig. 9: Shortness of breath in children

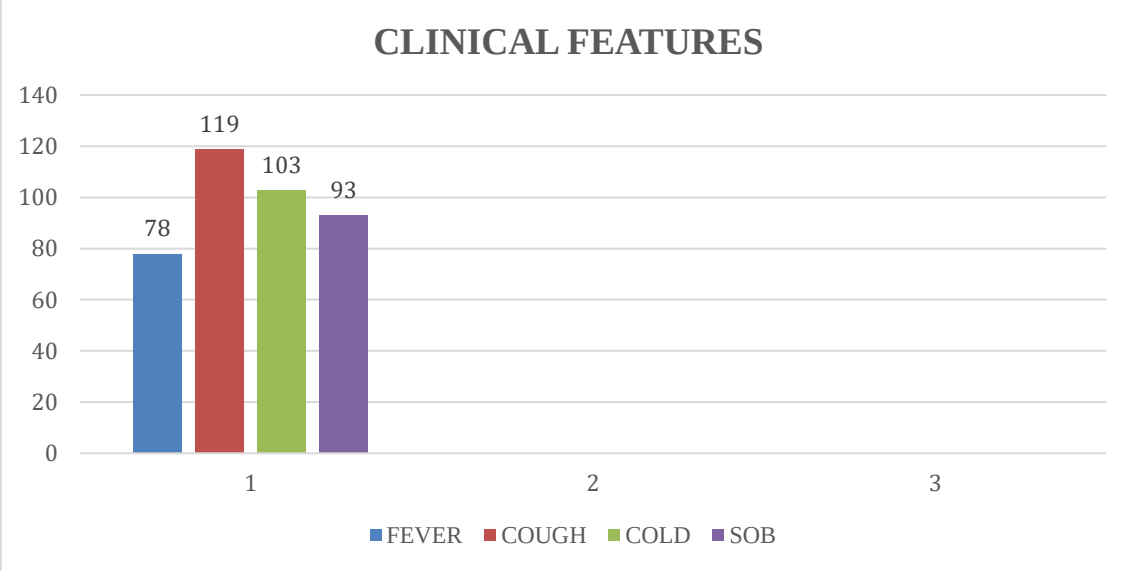

Fig. 10: Clinical features

ISSN No:-2456-2165

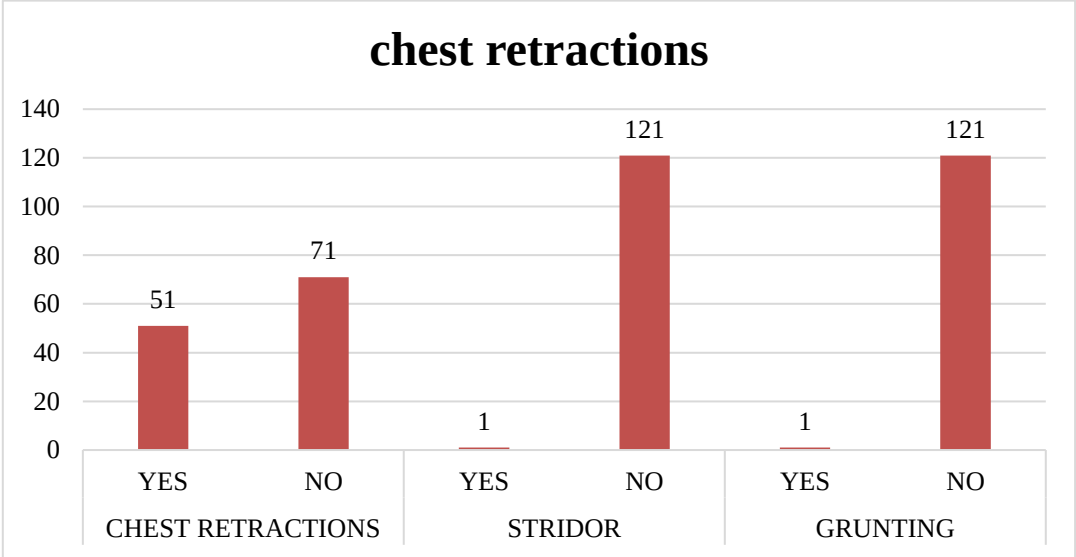

Fig. 11: Chest retractions in patients

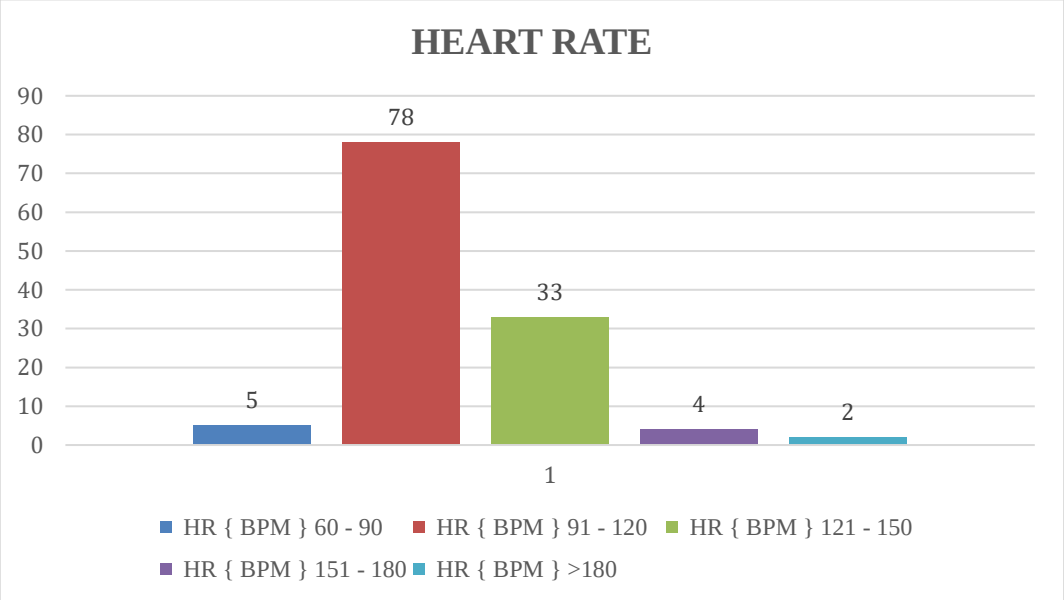

Fig. 12: Heart rate in children

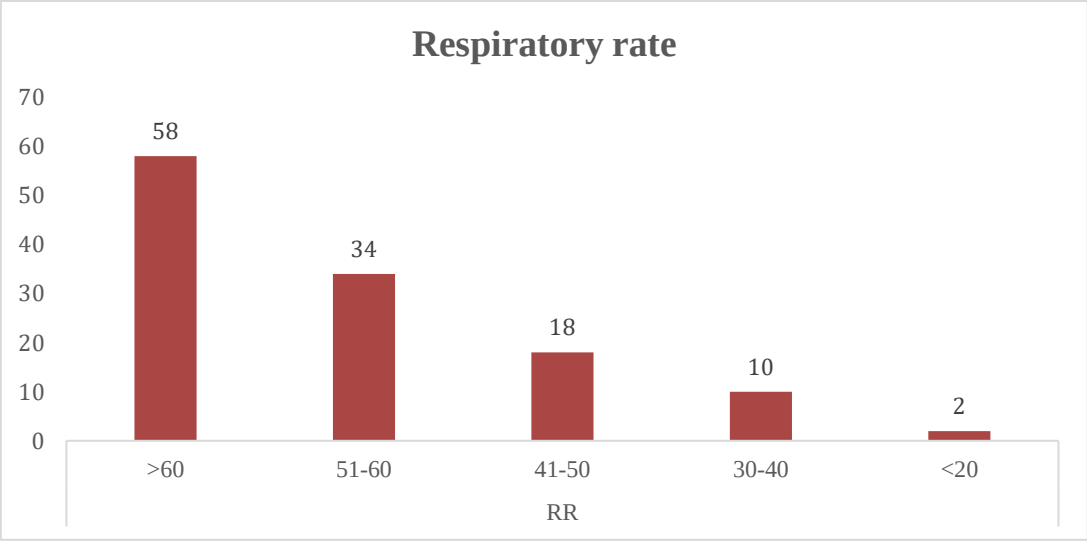

Fig. 13: Respiratory rate

ISSN No:-2456-2165

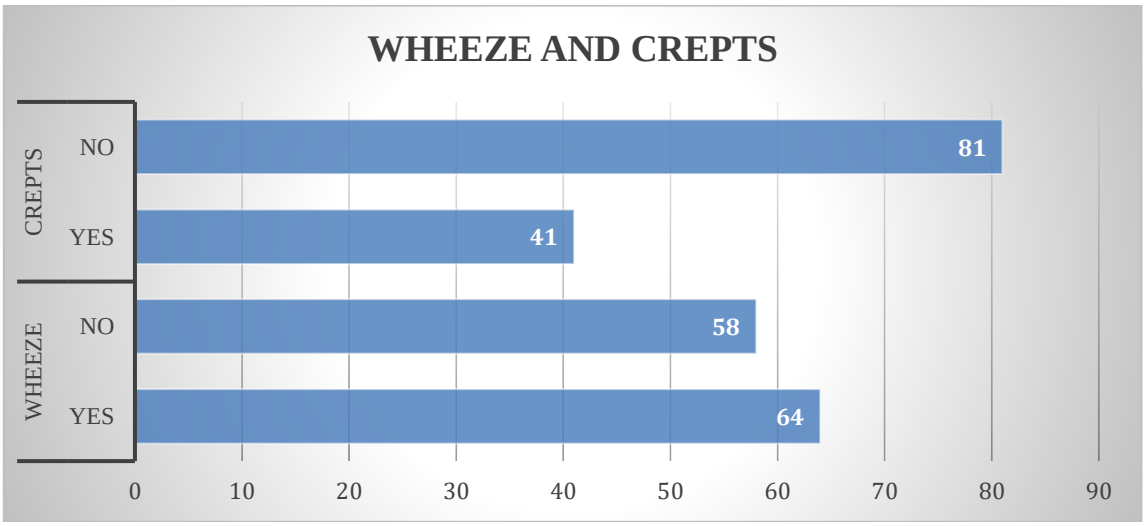

Fig. 14: Respiratory findings

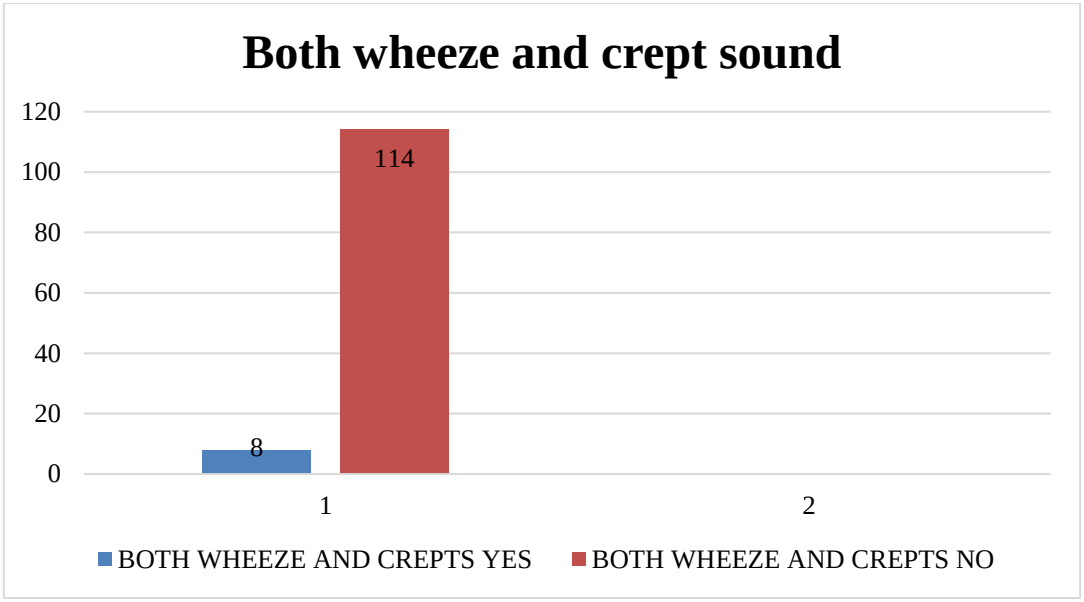

Fig. 15: Both wheeze and crept sounds in children

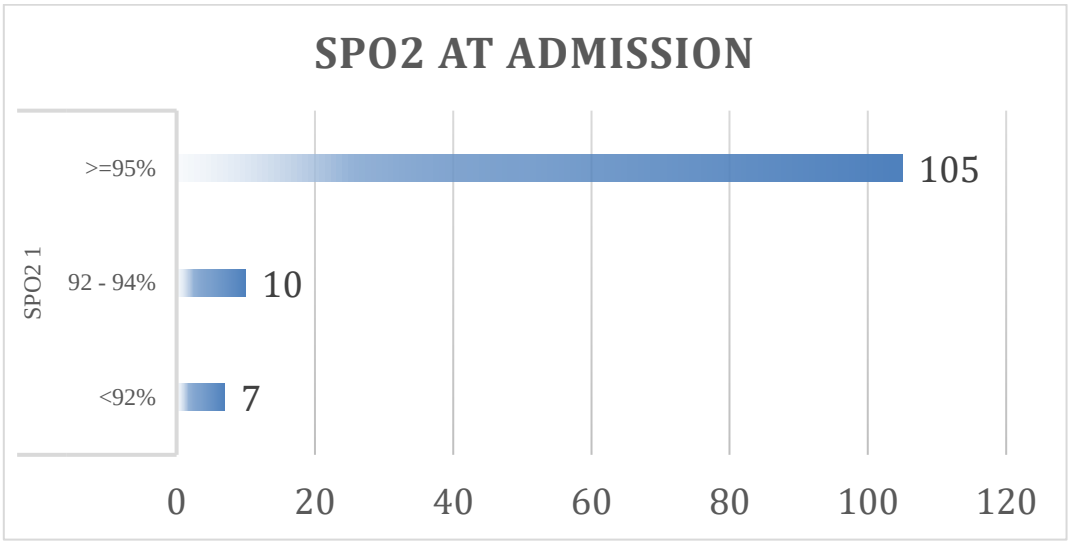

Fig. 16: Severity at admission

ISSN No:-2456-2165

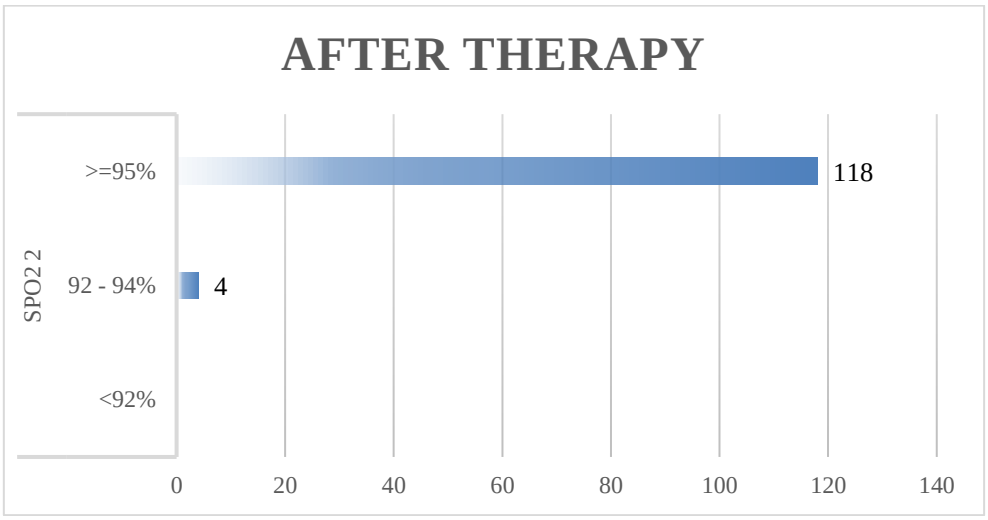

Fig. 17: Spo2 after treatment

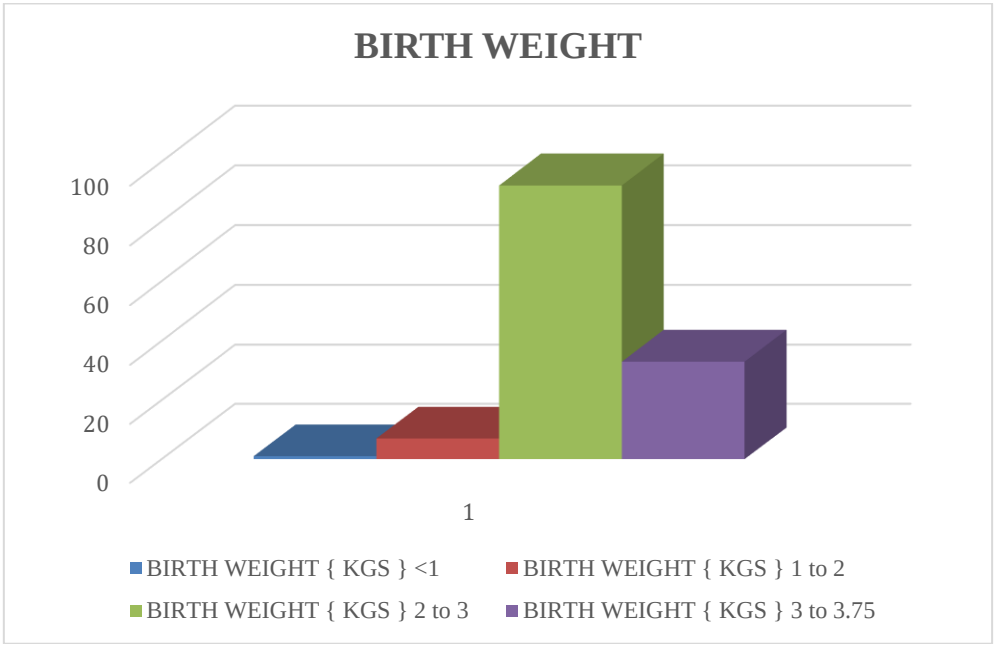

Fig. 18: Birth weight of patients

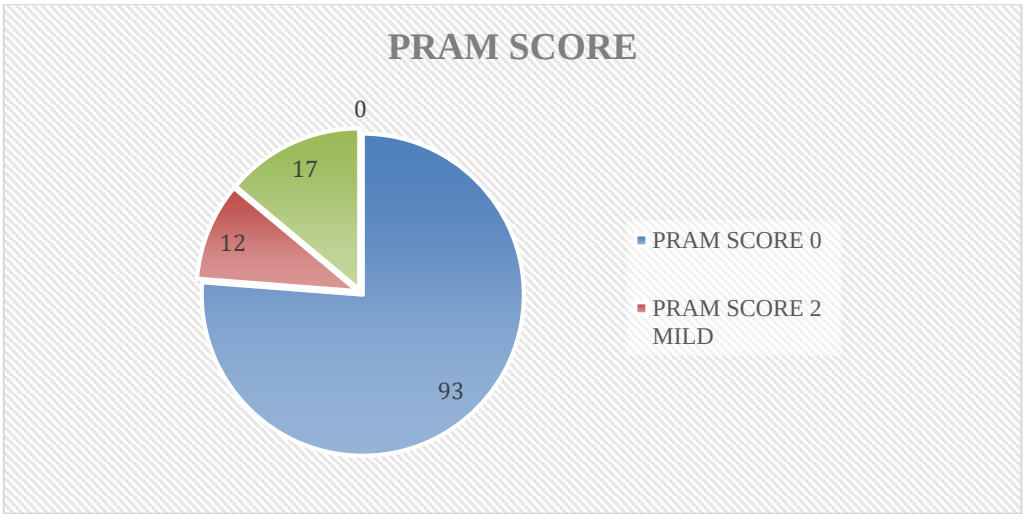

Fig. 19: PRAM score

ISSN No:-2456-2165

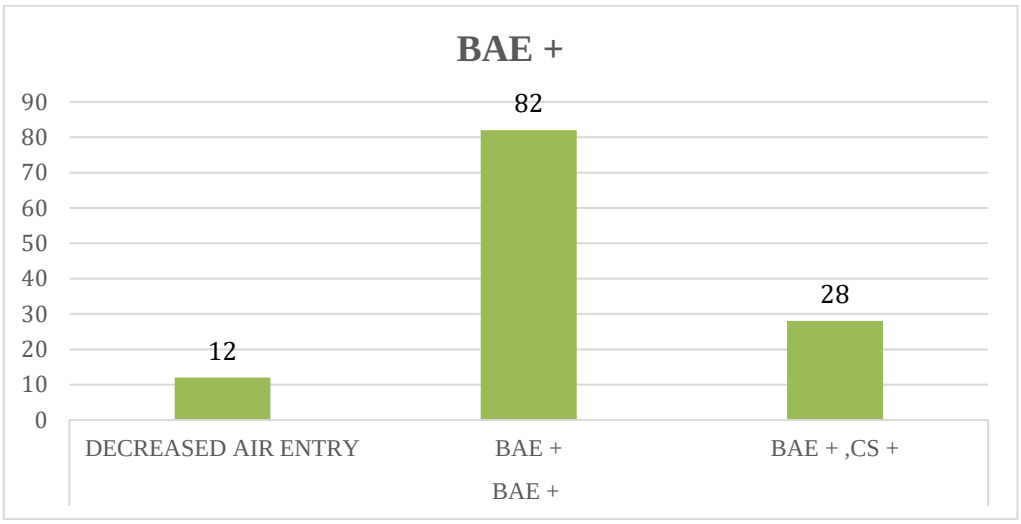

Fig. 20: BAE+ in children

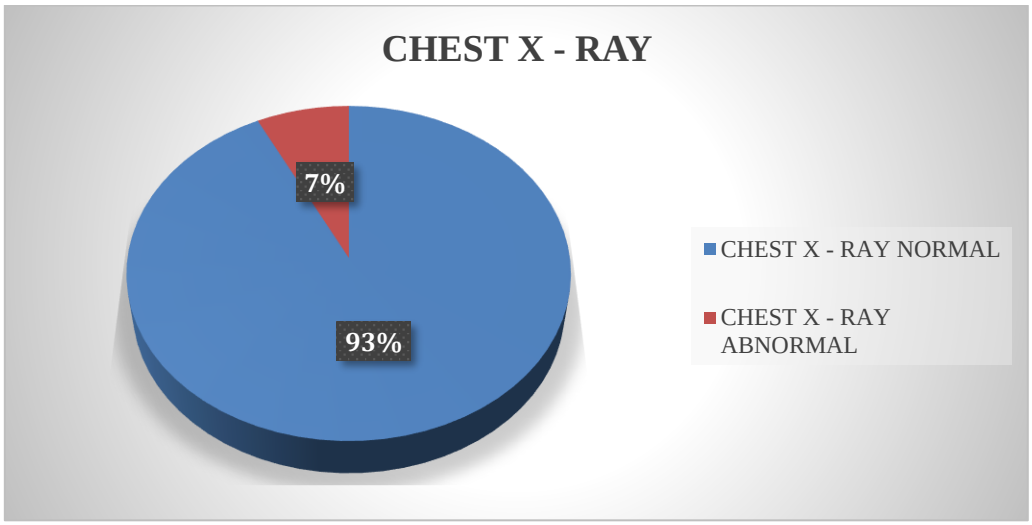

Fig. 21: Chest x-ray

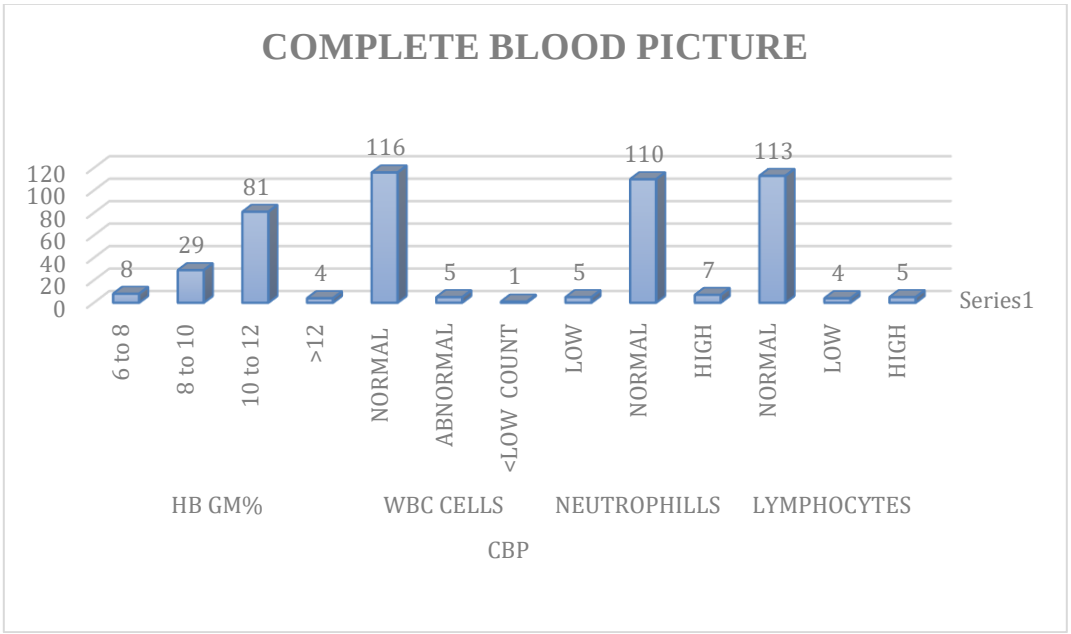

Fig. 22: Complete blood picture

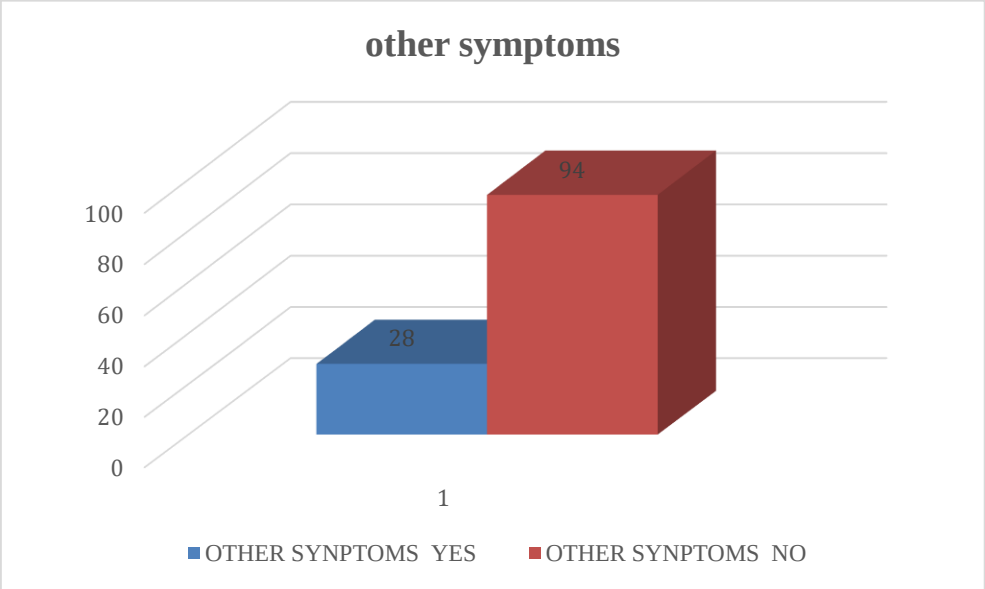

Fig. 23: Some other symptoms affected in children

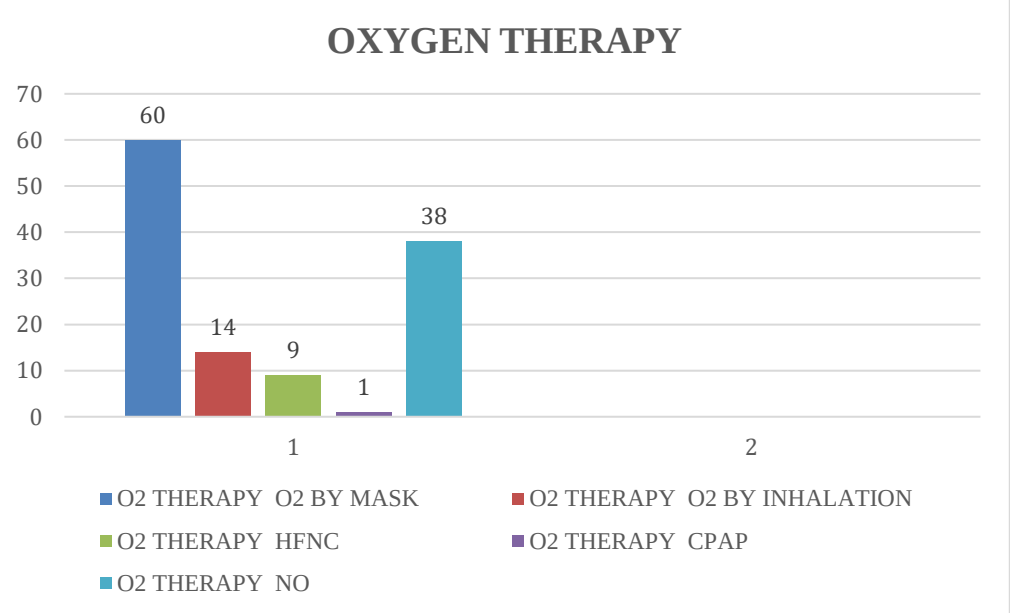

Fig. 24: Oxygen supplementation

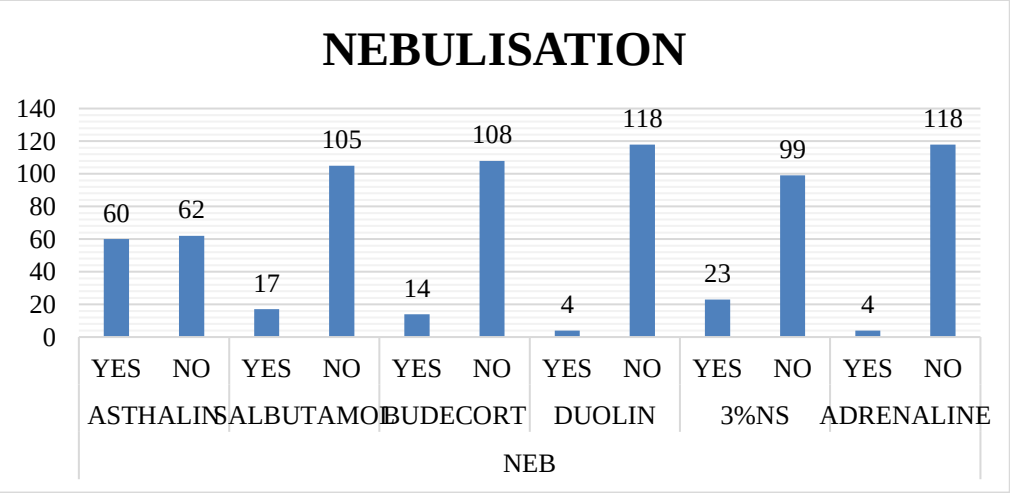

Fig. 25: Nebulization therapy

ISSN No:-2456-2165

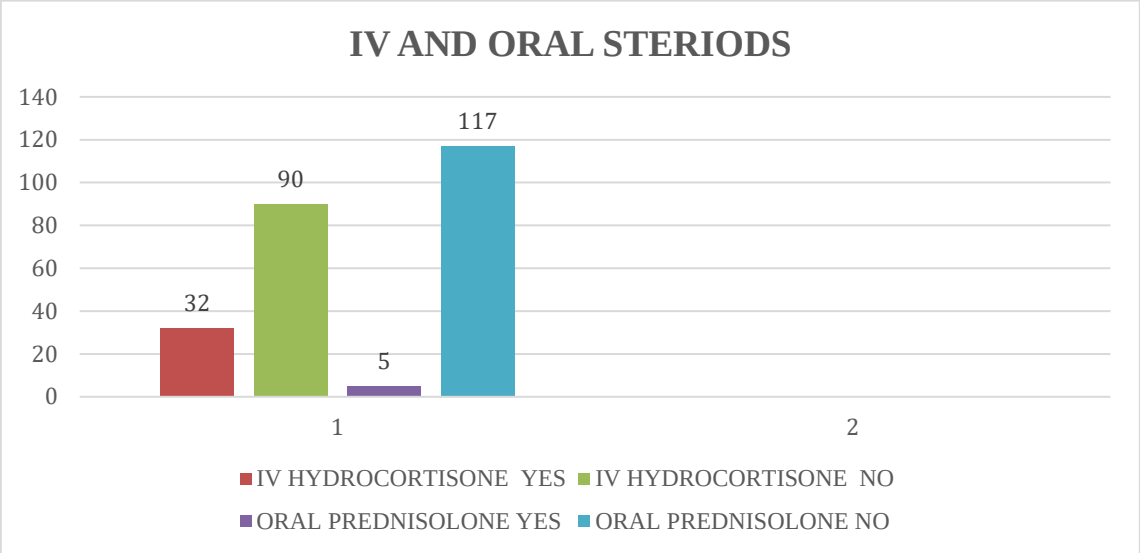

Fig. 26: Steroids

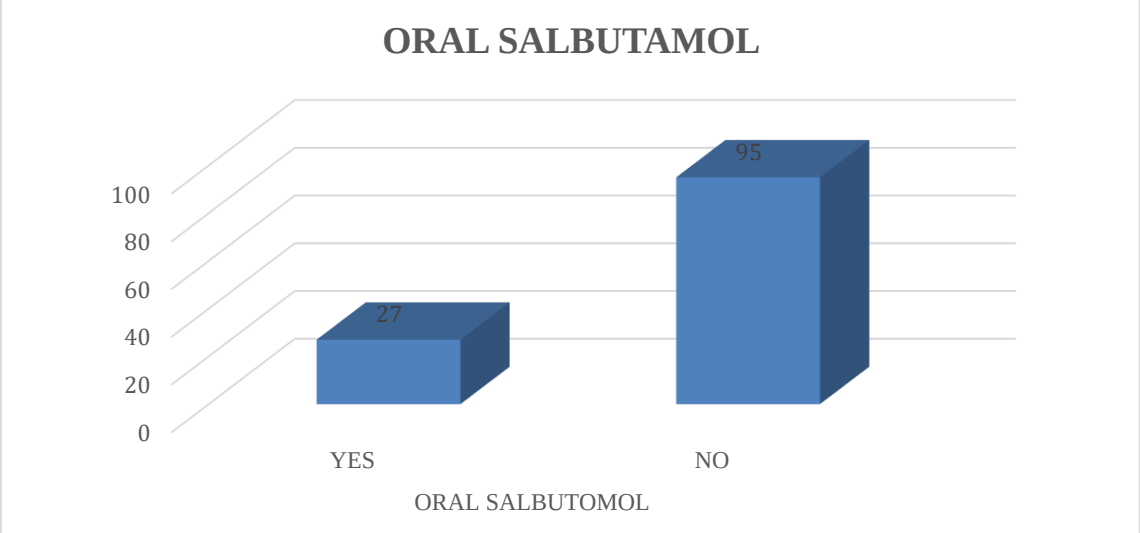

Fig. 27: SABA

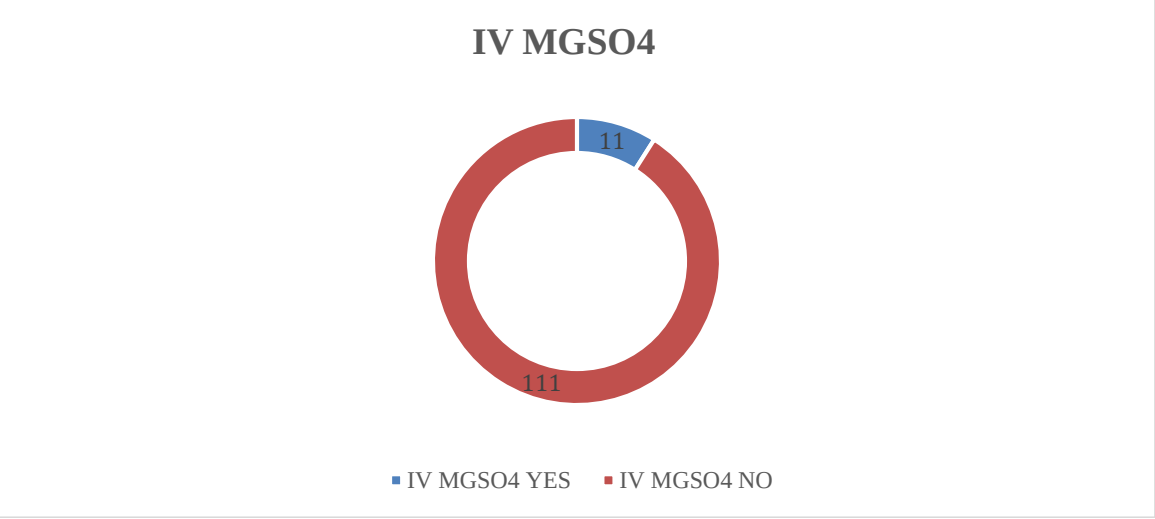

Fig. 28: IV Mgso4

ISSN No:-2456-2165

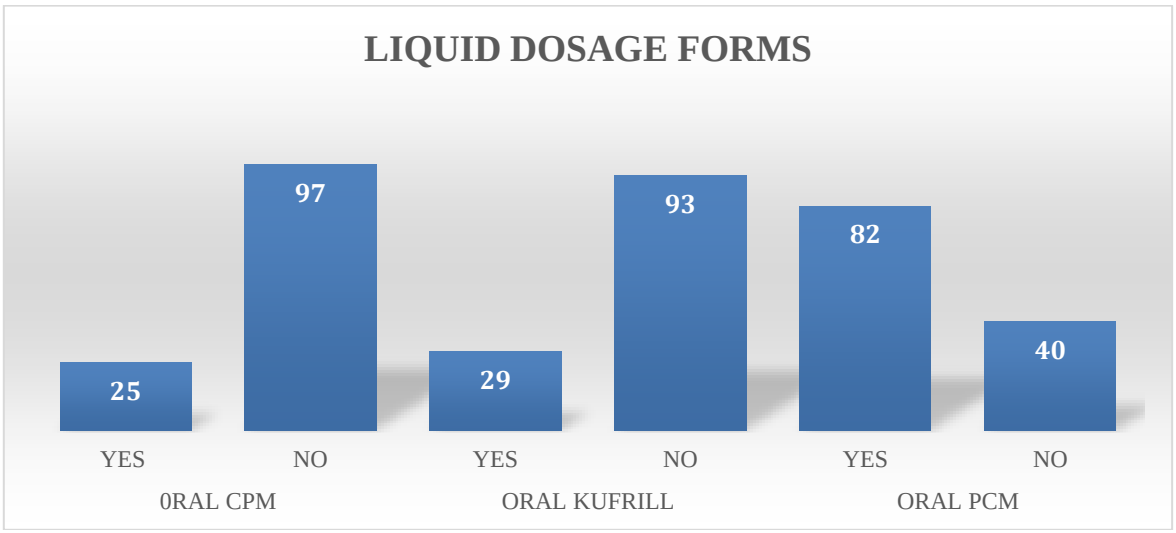

Fig. 29: DIFFERENT LIQUID DOSAGE FORMS

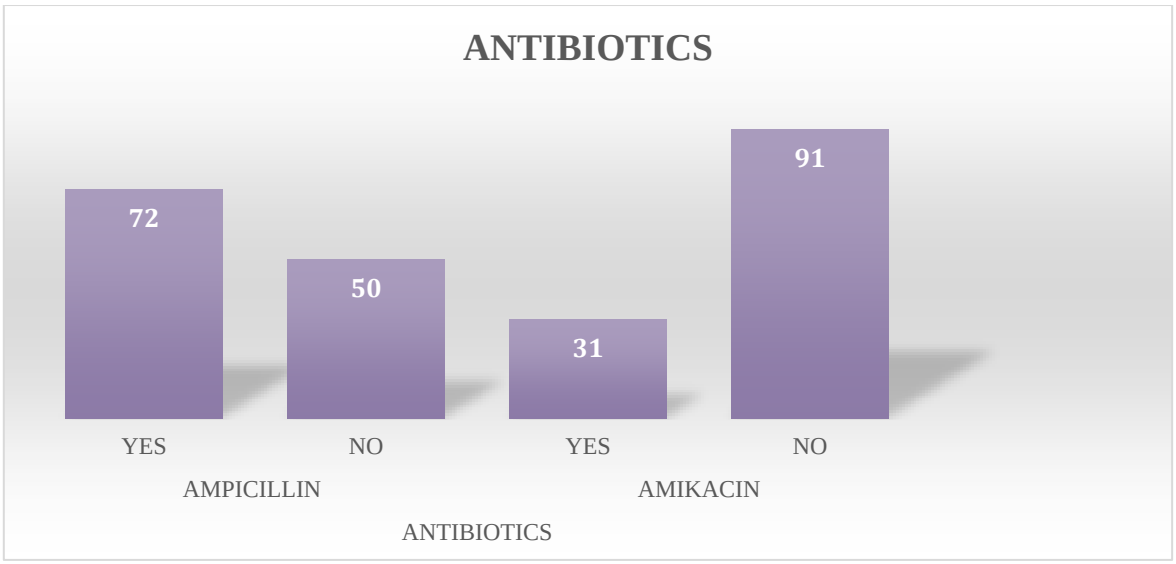

Fig. 30: Antibiotics

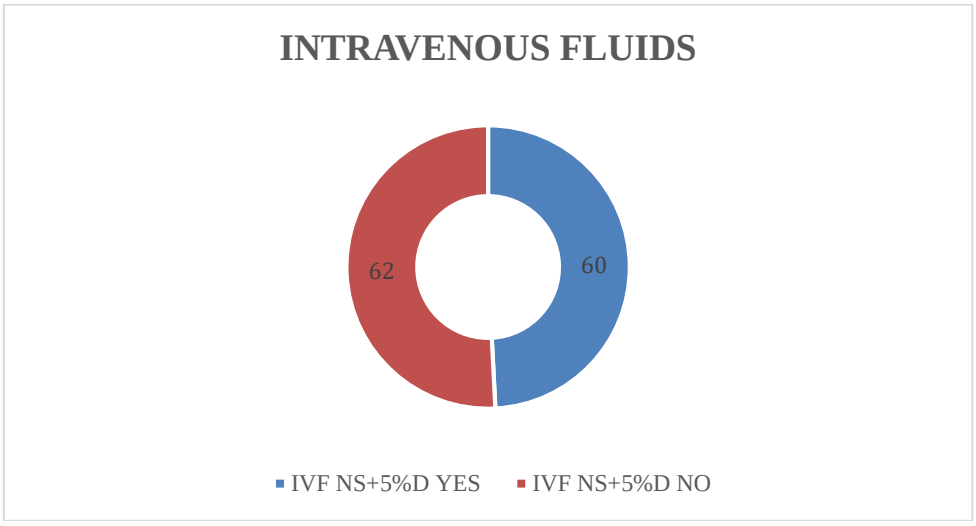

Fig. 31: Intravenous fluids

ISSN No:-2456-2165

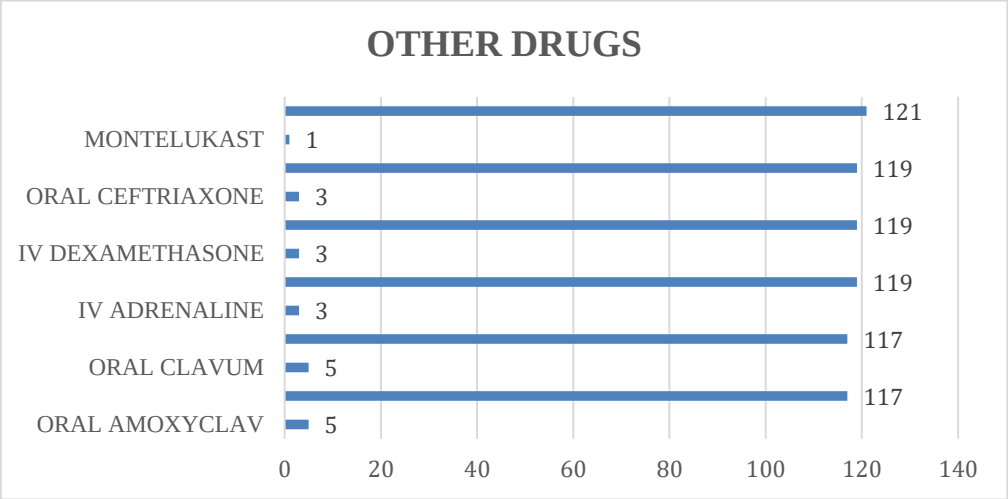

Fig. 32: Other drugs

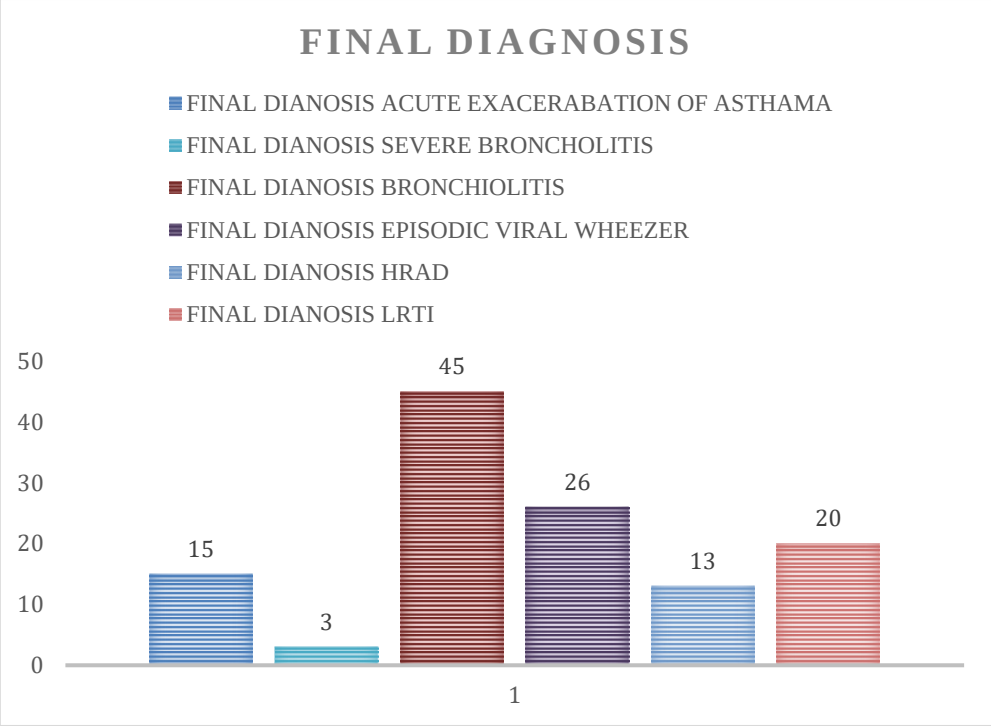

Fig. 33: Final diagnosis

IV. DISCUSSION

According to our study, out of 122 cases 85(69.7%) children are from 1m to 3 years of age, 24(19.7%) children 4 to 7 years of age, 11(9%) are from 8 to 11 years of age, 2(1,6%) children are from 12 to 13years of age group. Gender wise distribution include 81(66.3%) are male and 41(44.6%) are female, where males are mostly affected in our study. Among the subjects 15(12.2%) children were diagnosed with acute exacerbation of asthma, 13(0.6%) children with HRAD, 68(55.7%) with bronchiolitis and LRTI, 26(0.6%) with multi trigger wheezer. Based on the age factor, children who are less than 5 years of age who suffer with the wheeze and snore are expected with high chances of getting asthma and HRAD, not all who wheeze will have asthma some may have bronchiolitis, multi trigger wheezer and LRTI. The reoccurrence of this episodes may lead to asthma and HRAD.

Among 120 cases majority of children are from low economic status with percentage of 65.5% and medium economic status were found to be 44.5%. Based on their family history, 90(73%) children have no history of asthma, 23(19,6%) children have history of asthma in father, mother and paternal uncles. 7(5.7%) children gave history of sin and food allergy, 2(1.6%) children were from 3rd consanguineous marriage.

Out of the 120 samples 78(84.4%) children are suffering from fever, 86(70%) with cough, 103(84.4%) are affected with cold, 93(76.2%) with SOB and the rest of the children are not suffered from these symptoms. Out of 120 samples children with wheeze 64(52.4%) children are affected, 41(33.6%) children are experiencing with crept sounds. Children facing both wheeze and crept sounds are 114(93.5%).

ISSN No:-2456-2165

Among 120 cases spo2 at admission 7(5.7%) having < 92% suggests severe LRTI or pneumonia, 10(8.1%) children are having 92-94%, 105(86.2%) children are with tachypnoea. spo2 after supplemental o2 therapy 118(96%) children were improved after therapy, 4(4%) children were not improved and were upgraded to HFNC and CPAP.

Out of 120 children, birth weight was found to be 1(0.8%) child is <1kg, 7(5.7%) children are between 1-2kg, 22(18%) children are between 3-4kgs.

PRAM score in 93(76.2%) children are having 0 score, 12(9.8%) children are having mild score, 17(13%) children are having moderate score. The p value was found to be 0.003 and f value was found to be 4.819 which is statistically significant.

Chest x-rays was normal in 93% of children and abnormal in 7% children are having opacities, peri bronchial thickening and pleural cavity effusion. 12(9.8%) children are with decreased air entry, 82(67.2%) children are with clear BAE and 28(23%) children are having normal air with but present with conductivity sounds.

Supplemental oxygen in 84(68.6%), salbutamol nebulization in 60(49.1%). In addition to SABA nebulization budecort, ipratropium bromide, adrenaline and 3% NS were nebulized in another 45(36.6%) children.

IV hydrocortisone is given in 32(26.2%), oral prednisolone in 5(4%), oral bronchodilator in 95(77.8%), mgso4 in 11(9.1), CPM in 25(20.4%), kufril in 29(23.7%), PCM in 82(67.2%), antibiotic ampicillin is given in 72(59%), amikacin in 31(21.4%) and IV fluids in 62(50.8%) children.

Children who are affected with rhinoviruses, respiratory syncytial virus are having more prone to bronchiolitis and LRTI infections. Supplemental o2 and SABA and adding bronchodilators with nebulization will improve the patient condition. In my present study, more than 10% children received rescue steroids to prevent the acute asthma.

V. CONCLUSION

Many children were under 5 commonest age group, suffering from wheeze, respiratory distress and asthma. To many children, viral infection was one of the causes for wheeze, LRTI and other respiratory symptoms. Nebulization of salbutamol was useful in HRAD and asthma than bronchiolitis and LRTI. IV hydrocortisone was beneficial in HRAD and less beneficial in bronchiolitis. Supplemental oxygen was most effective treatment in bronchiolitis condition. Average hospital stay of asthma children is 7 to 12 days compared with HRAD was 6 to 7 days and with wheeze children for 5 to 8 days. Low socioeconomic status children are having more percentage in this study. Using PRAM score in our study, we concluded that less children are facing severity of exacerbations and some children are experiencing moderate types of severity. None of the children were receiving spacers or holding chambers. At least some percentage of the children in the present study may require spacers in long term use to decrease morbidity.

REFERENCES

[1.] Simon F. Thomsen. Genetics of asthma: an introduction for the clinician. Published online: 16 Jan 2015 https://doi.org/10.3402/ecrj.v2.24643.

[2.] Rogers et al. Mycoplasma pneumoniae induces chronic respiratory infection, airway hyperreactivity, and pulmonary inflammation: a murine model of infection-associated chronic reactive airway disease. 2002 Feb;70(2):649-54. doi: 10.1128/IAI.70.2.649-654.2002.

[3.] John A, Rankin, MD West Haven, Conn. The contribution of alveolar macrophages to hyperreactive airway disease. Accepted for publication Oct. 15, 1988.

[4.] Donald A. Goldmann. Epidemiology and Prevention of Pediatric Viral Respiratory Infections in Health-Care Institutions. Vol. 7, No. 2, March–April 2001.

[5.] Ranabir Pal, Sanjay Dahal,1 and Shrayan Pal2. Prevalence of Bronchial Asthma in Indian Children. 2009 Oct; 34(4): 310–316. doi: 10.4103/0970-0218.58389.

[6.] FuadAlnaji, MD, FRCPC, Roger Zemek, MD, FRCPC, Nick Barrowman, PhD, and Amy Plint, MD, FRCPC. PRAM Score as Predictor of Pediatric Asthma Hospitalization. 15532712.

[7.] Hatice S. Zahran, MD, corresponding author 1 Cathy M. Bailey, PhD, 1 Scott A. Damon, MAIA, 1 Paul L. Garbe, DVM, 1 and Patrick N. Breysse, PhD 2. Vital Signs: Asthma in Children — United States, 2001–2016. 2018 Feb 9; 67(5): 149–155. Published online 2018 Feb 9. doi: 10.15585/mmwr.mm6705e1.

[8.] Lin-Shien Fu a b c, Ming-Chin Tsai a. Asthma Exacerbation in Children: A Practical Review.Published:November11, 2013DOI:https://doi.org/10.1016/j.pedneo.2013.07.004.

[9.] Jennifer E. Fergeson DO, Shiven S. Patel MD, Richard F. Lockey MD. Acute asthma, prognosis, and treatment. https://doi.org/10.1016/j.jaci.2016.06.054.

[10.] Paul S. Mc. Namara ,DanniiClayton,CarolineBurchett,VanessaCompton, MatthewPeak,JanetClark,Ashley P. Jones. Humidified and standard oxygen therapy in acute severe asthma in children (HUMOX): A pilot randomised controlled trial. Published: February 3, 2022. https://doi.org/10.1371/journal.pone.0263044.

[11.] Approaches to Asthma Diagnosis in Children and Adults. Sejal Saglani1,2* and Andrew N. Menzie-Gow1,3. 17 April 2019. Sec. Pediatric Pulmonology, Volume 7 - 2019 | https://doi.org/10.3389/fped.2019.00148