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Role of Vitamin D in treatment of children with Pneumonia under 5 years old in Salahaldeen Hospital

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ABSTRACT

Pneumonia is acute respiratory infection that affects the lungs. In which alveoli are filled with pus and fluid that make breathing painful and limits oxygen intake. The thesis concerned about study the Role of Vitamin D in the treatment of children with Pneumonia under 5 years old , in order to reduce the morbidity and mortality in children having pneumonia. The management of acute childhood pneumonia includes antibiotics ,oxygen ,supportive therapy, and assisted ventilation (in severe cases), beside these treatment administration vitamin D during period of hospitalization and after discharge for 90 day in dose 400 iu in less than 1 years old and 600 iu in patient more than 1 year daily which is requirement dose . Convenient sample hospital based selective study done on patient attend emergency department at Salah Aldeen Hospital complaining from shortness breathing during the period from 1 st of January to 1 st of April 2019. .The study included 200 cases age from birth- 5 years ,each patient included in the study were assessed by prepare questionnaire from parents include (name ,age ,sex, residence) ,and screening done for general and chest examination ,each patinet where assessed by Acute Respiratory infection program (ARI) program , and by Community acquired pneumonia (CAP) score. The diagnosis of pneumonia confirmed by CXR. Total number of cases took vitamin D 100 cases and placebo(olive oil) 100 cases. While approved that duration of hospitalization and recurrence were less frequent in group who took vitamin D although it was statically not significant, and significant decrease in the duration of hospitalization among vitamin D group in regard to severity and there is no significant result in the recurrence of pneumonia in regard to severity in group took vitamin D every newborn baby must be supplement vitamin D in first day of life this will help to decrease the morbidity and mortality for acute respritory infection.

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Introduction

Pneumonia is a type of acute respiratory infection that affects the lungs. [1]. Pneumonia is the largest infectious cause of death in children with in the world accounting for 16% of all causes of death in children under 5 years old age. Pneumonia is caused by many numbers of infectious agents example; *streptococcus pneumonia, heamophillius influenza, respiratory syncytial virus,* in infant with HIV *pneumocystis carina* which is the most common cause of death in HIV infants with pneumonia[2] .Pneumonia can spread in a number of way, the virus and bacteria that are commonly found in child nose or throat can infect the lungs if they inhaled ,they may also spread via air born droplets through cough or sneeze[3] . The symptom of pneumonia may be mild or sever can include fever, cough, SOB, difficulty of feeding rapid breathing, irritability, poor aptitude, decrease level of activity[4]. The CAP score is one of the side bed score that used to assess the severity of Pneumonia which include respiratory rate, wheezing Accessory muscle use, difficulty of feeding and SPO2[5] . Administration of vitamin D_3(Cholecalciferol) in requirement daily dose (400_600) iu with antibiotic in management of pneumonia ,in order to decrease duration of hospitalization and recurrence in 90 days[5].

Aim of the study:

The aim of study is to reduce the morbidity and mortality in children having pneumonia by adding vitamin D orally to the other line of treatment of pneumonia .

Patients and method:

Convenient sample based selective study done on patient attending emergency department at Salah Aldeen Hospital aged from birth to 5 years having pneumonia during the period from 1 st of January to 1 st of April 2019. The cases of pneumonia were taken from the emergency word and patients admitted in the ward of Salah Aldeen Hospital.

A written acceptance from the hospital and oral agreement from parent of each patient included in the study were obtained .Each patient included in the study where assessed by prepared questioner that include name , age, sex ,etc. Each patient where having general examination including respiratory rate and sings of dyspnea that include tachypnea, use of accessory muscles, wheezes and chest indrawing Examination of the chest, looking for crepitation and rhonchi .Each patient were assessed by ARI program (the WHO program for acute respiratory infection).

And assessment of severity of pneumonia by using community acquired pneumonia (CAP).

The diagnosis of pneumonia confirmed by CXR .the radiological classification of pneumonia include:

1-Sever multifocal pneumonia in which more than 2 sites involvement unilateral or bilateral (Multi lobar or lobular)

2-Unifocal pneumonia or one sits involvement (lobar).

3-Mild increased lung marking (Broncho pneumonia) .

Inclustion criteria

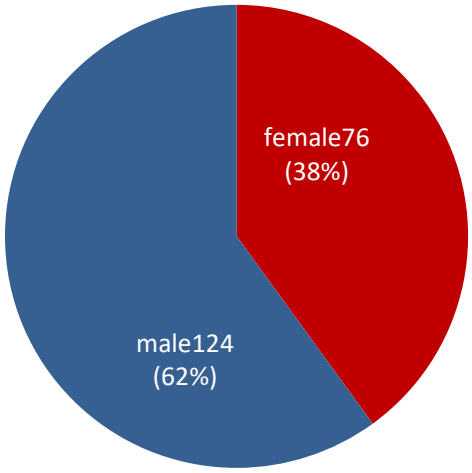
1-Patient age under 5 years admit to hospital .

2- Patient diagnosed as pneumonia.

Exclusion criteria : Children who had clinical signs of vitamin D deficiency or rickets , Patient received high-dose vitamin D in the past 3months , Had severe vomiting , Children with other severe systemic illnesses (like mengities ,encephalitis ,renal failure) , Migrating family , Patient on Anticonvulsant medication therapy, Chronic diseases associated with fat malabsorption.

Results:

Total number of study was 200 cases 124 (62%) of sample was male and 76 (38 %) female as shown in Figure (4-1).



Figure(4- 1): Distribution of study cases according to sex.

regarding the residence most of cases from urban area120 (60%) .

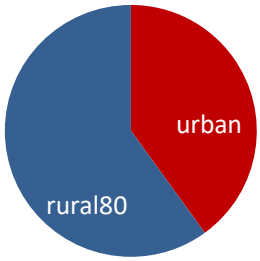


Figure (4- 2): Distribution of study cases according to residence

.Regarding age, most frequent cases was among age group 0-2 month 92 (46%) followed by 3-12 month 60 (30%),then among age group 37 -60 month 32 (16%), and lastly16 (8%) among age group 13 - 36 month .

Table (4- 1): Distribution of study cases according to age group

Age month	Male	Female	Total
0 -2	64 (32%)	28 (14%)	92 (46%)
3- 12	32 (16%)	28 (14%)	60 (30%)
13-36	12 (6%)	4 (2%)	16 (8%)
37-60	16 (8%)	16 (8%)	32 (16 %)
Total	124 (62%)	76 (38 %)	100%

.In the current study the most frequent cases those with bottle feeding112 (56%) ,followed by mixed 52(26 %), and the last was among those with breast feeding 36,and male was most frquent 124 (62%).

Table (4-2): Distribution of study cases according of type of feeding.

Type of feeding	Male	Female	Total
Bottle feeding	68 (34%)	44 (22%)	112 (56%)
Mixed feeding	36 (18%)	16 (8%)	52 (26%)
Breast feeding	20 (10%)	16 (8%)	36 (18%)
Total	124 (62%)	76 (38%)	100%

.In regarding to the risk factor for occurrence of Pneumonia history of upper respiratory tract infection160 (8%) most frequent ,and 64 (32%)with history of aspiration. 108 (54%)with history of recurrences and 80 (4%) with family history of allergy .lastly 112(56%) not taken vaccination as shown in (table4-3).

Table :(4-3) Distribution of study cases according to some risk factor that participate illness.

Factor		Male	Female	Total	P -value
Upper respiratory tract infection	Yes	96(48%)	64(32%)	160(80%)	0,001 Significant
	No	24(12%)	16(8%)	40(22%)	
Aspiration	Yes	24(12%)	40(20%)	64(32%)	0,001 Significant
	No	96(48%)	40(20%)	136(68%)	
Family history of allergy	Yes	44(22%)	36(18%)	80(40%)	0.6 not significant
	no	76(38%)	44(22%)	120(60%)	
First episode or multiple episode	yes	64(32%)	44(22%)	108(54%)	0.6 not significant
	no	56(28%)	36(18%)	92(46%)	
Vaccination	yes	52(26%)	36(18%)	88(44%)	0.6 not significant
	no	68(34%)	44(22%)	112(56%)	

. According to CAP score 116 (58 %) with mild to moderate pneumonia Followed by 84 (42 %) with sever pneumonia, as shown in Table (4-5).

Table(4-4)Distribution of study cases according to CAP severity score

Severity	Male	Female	Total
Mild to moderate CAP	68 (34%)	48 (24%)	116 (58%)
Sever CAP	52 (26%)	32 (16%)	84 (42%)
Total	120 (%)	80 (%)	100 %

.According to ARI program 112(56 %) with very severe illness followed by 52 (26 %) with sever pneumonia .And 36 (18%) with pneumonia and no case with cough and cold ,male gender was most frequent, as shown in Table (4-5)

Table (4-5): Distribution of study cases according to ARI program

ARI program	Male	Female	Total
Very severe illness	68 (34%)	44 (22%)	112 (56%)
Sever pneumonia	32 (16%)	20 (10%)	52 (26%)
Pneumonia	20 (10%)	16 (8%)	36 (18%)
Cold and cough	0	0	0
Total	120 (60%)	80 (40%)	100%

.In regard to radiological finding ,the study show that most of cases multifocal 88 (44%) ,44 (22%) focal followed by 40 (20%) increase lung marking ,and about 28 (14%) with normal X-ray , male gender was most frequent among all radiological finding as shown in Table (4-7).

Table (4-6): Distribution of study cases according to radiological finding.

Radiological finding	Male	Female	Total
Multifocal	52 (26%)	36 (18%)	88 (44%)
Focal	28 (14%)	16 (8%)	44 (22%)
Increase lung marking	24 (12%)	16 (8%)	40 (20%)
Normal	16 (8%)	12 (6%)	28 (14%)
Total	120 (60%)	80 (40%)	100%

. Table (4-7) show the distribution of cases in regarding to vitamin D vies Placebo treatment according to age.

Age month	With vit D	Placebo	Total
0- 2	50(25%)	42 (21%)	92(46%)
3–12	30(15%)	30 (15%)	60(30%)
13 –36	10(5%)	6(3%)	16(8%)
37 –60	10(5%)	22 (11%)	32(16%)
Total	100(50%)	100(50%)	100%

. Distribution of study cases vitamin D versus Placebo treatment according to days of hospitalization in regarding age as shown in table (4-8) .

Age (month)	Duration of hospitalization (Mean duration ± SD)	
	With Vit D	With placebo
0-2	3±0.7 Days	4-0.7 Days
3-12	2±0. 4 Days	4-0.5 Days
13-36	2±0.3 Days	2-0.3 Days
37-60	2±0.3 Days	2-0.4 Days

P- value >0,05 (not significant)

Distribution of study cases vitamin D versus placebo according to recurrent pneumonia in 90 days in regarding age as shown in Table(4-9). From 100 cases took vitamin D only 40 cases(40%) was having recurrent pneumonia and from 100 cases took placebo 60 cases (60%) develop recurrent pneumonia .Most of recurrent cases between (0-2 month) ,followed by (3-12month),then (13-36 month),lastly age group (37-60 month).

Age	Recurrent Pneumonia in 90 days		Total
	With Vit D	With Placebo	
0-2 month	20 (20%) Cases	30(30%) Cases	50(50%)
3-12 month	13(13%) Cases	27(27 %) Cases	40(40%)
13-36 month	4(4%) Cases	3(3%) Cases	7(7%)
37-60 month	3(3%) Cases	0 Cases	3(3 %)
Total	40(40%)	60(60%)	100%

P-Value >0,05 (not significant).

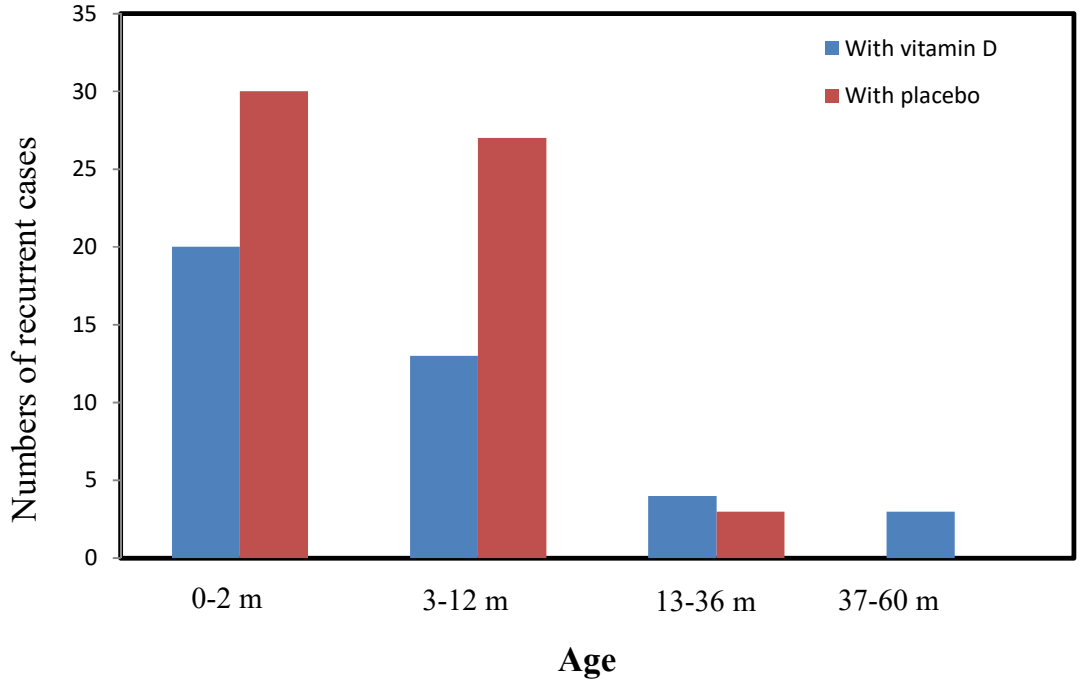


Figure (4-3): . distribution of recurrent pneumonia within 90 days according to age group

.Distribution of study cases according to duration of hospitalization in regarding sex as showing in Table (4-10) .

Sex	Duration of hospitalization (Mean +_SD)	
	With Vit D	With Placebo
Male	3-0,7 Days	4-0,5 Days
Female	3-0,5 Days	5-0,7 Days

P -value >0,05 (not significant)

.Distribution of study cases according to recurrent pneumonia in 90 days in regarding to sex , most of recurrent cases male as shown in Table (4-11).

Sex	Recurrent in 90 days		Total
	No of Vit D cases	No placebo cases	
Male	28(28%)	42(42%)	70(70%)
Female	12(12%)	18 (18%)	30(30%)
Total	40(40%)	60(60%)	100%

P-value >0,05 (not significant)

.Distribution of study cases according to duration of hospitalization in regarding type of feeding as showing in Table (4-12)

Type of feeding	Duration of hospitalization (Mean ± SD)	
	With Vit D	With Placebo
Bottle feeding	3 -0,7 days	4- 0,4 days
Mix feeding	2 -0,6days	3-0,5days
Breast feeding	2 -0,3 days	2-0,5 days

P- Value < 0.05(not significant)

.Distribution of study cases vitamin D versus placebo treatment according to recurrent pneumonia in 90 days in regarding type of feeding , those with bottle feeding 60(60%) cases ,followed by those with mix feeding 30(30%) cases ,lastly those with breast feeding 10(10%) cases as showing in Table (4-13) .

Type of feeding	Recurrent pneumonia		Total
	With Vit D	With Placebo	
Bottle feeding	25 (25%) cases	35 (35%) cases	60 (60%)
Mix feeding	10 (10%) cases	20 (20%) cases	30 (30%)
Breast feeding	5 (5%) cases	5 (5%)cases	10 (10%)
Total	40(40%)	60(60%)	100 %

P-value >0,05 (not significant)

.Distribution of study cases vit D versus placebo according to duration of hospitalization in regarding resident ,the study show that those live in rural area less in duration of hospitalization as showing in table (4-14)

Resident	Duration of hospitalization (Mean ± SD)	
	With Vit D	With Placebo
Urban area	4 -0,7 Days	5 -0,7 Days
Rural area	3-0, 5 Days	3 – 0,4 Days

P-Value > 0,05 (not significant)

Distribution of study cases according to recurrent pneumonia in 90 days in regarding resident ,most of recurrent cases from Urban area 70 cases ,followed by Rural area as showing in table (4-15).

Resident	Recurrent pneumonia		Total
	With Vit D	With Placebo	
Urban area	30(30%) cases	40 (40%) cases	70(70%)
Rural area	10(10%) cases	20(20%) cases	30(30%)
Total	40(40%)	60(60%)	100%

P- value >0,05(not significant).

.Distribution of study cases of vitamin D versus placebo according to days of hospitalization in regarding severity as shown in table (4-16). There is significant effect of vitamin D on duration of hospitalization in regard to severity.

Severity	Duration of hospitalization (Mean + SD)	
	With Vit D	With Placebo
Sever	5- 0,7 days	7-0,7 days
Mild to Moderate	3- 0,5 days	4- 0,7 days

P-Value < 0,05 (significant)

Distribution of study cases of vitamin D vies placebo according to recurrent pneumonia in 90 days in regarding severity(according to CAP score) shown in the Table (4 -17) .

Severity		Recurrent pneumonia		
	No cases took vit D	Recurrent after 90 day	No of cases took Placebo	Recurrent after 90 days
Sever	46(46%)	7 (7%)	38 (38%)	10(10%)
Mild to Moderate	54(54%)	33(33%)	62 (62%)	50(50%)
Total	100 %	40(40%)	100%	60(60%)

P- value >0,05 (not significant)

Discussion:

Pneumonia is potentially serious infection in children and often result in hospitalization[(1)].

In regard to duration of hospitalization those group who took vitamin D were have less days of hospitalization in comprism to placebo group although it was statically not significant ,and in regard to recurrence of pneumonia[(6)] ,also vitamin D group were less frequent in regard to pneumonia recurrence in compare to placebo group .this is goes with Gupta study [(7)].This due to fact that vitamin D were found to have a major role in immune response ,as well as low vitamin D might be associated with hypotonia that may precipitate pneumonia .

Vitamin D bost immune defenses and reduces excessive inflammation, by mediated innate immunity, particularly through enhanced expression of the human cathelicidin antimicrobial peptide (hCAP_18) is important in host defenses against respiratory tract pathogens . Macrophages, lymphocytes and dendritic cells express the vitamin

D receptor (VDR) and respond to stimulation by1,25(OH)2D and expression the cathelicidin, (hCAP_18) and then cleaved to active form known as LL-37; is an endogenous antimicrobial peptide active against a broad spectrum of infectious agents including gram negative and positive bacteria , fungi , mycobacteria and viruses by acting as chemo attractant for neutrophils and monocytes, and has a defined. vitamin D-dependent mechanism LL-37 is highly expressed at barrier sites , including respiratory and colonic epithelium, saliva and skin and thus provides an important first line defense mechanism for the innate immune system to respond to infectious[6]. Also it is important in the metabolism and absorption of the minerals in the body ,.. both calcium and phosphorus absorption take place in the intestinal tract . the entry of calcium and phosphorus into the digestive tract is enhanced by the presence of vitamin D. once it enter the gut ,calcium and phosphorus are move through the body to build bone and teeth[8].

There is significant decrease in the duration of hospitalization among vitamin D group in compare to placebo group in in regard to severity this is goes with Gupta study [7].The reason why is the same what is mention above as vitamin D has a major role in the immune response to disease.

While there is no significant result in the recurrence of pneumonia in regard to severity .This is dose not goes with Adams study [9].

This may due to the difference in the sample size or duration of study or vitamin D dose which need to be increase in dose and duration to have significant result .

Conclusion: The study concluded that:

There was significant decrease the duration of hospitalization among vitamin D group in compared to placebo group in regarding to severity and there was no significant result in the recurrence of pneumonia in regard to severity in group took vitamin D .

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