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Overview of viral pneumonia associated with influenza virus and its therapeutic treatment

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ABSTRACT

The study was conducted at aware Gleneagles global hospitals in L.B. nagar, Hyderabad, overa 6 months period among 70 subjects in the study. Patients with the history of flu[viral pneumonia], patients of either sex, and patients from the age of 5-70 were included in the study.Patients with or without co morbidities are both allowed. Any patients with flu like symptomswho are at risk of developing viral pneumonia had their information collected using a well- designed data collection form that included patient demographics, prescriptions charts, laboratory investigations, medical history, and other pertinent information. A total of 70 of the patients were collected out of which male patients who are 38 in number and 32 females in number. Among 70 patients, 47 members are affected by type A influenza 21 members are affected by type B virus, 2 members are affected by type C virus of influenza and none were affected by type D virus. Among 70 patients in observational studies 75% were vaccinated andremaining 25% were unvaccinated. And patients are 33 in number of having fever ranging from99-101 degree Fahrenheit and 37 in number of having fever ranging from 101-103 degree Fahrenheit . Season wise number of patients include summer-4, winter-45, rainy season-21.

Keywords: Influenza, Pneumonia, Demographics, co morbidities, prescriptionscharts, laboratory investigations.

INTRODUCTION

Viral Pneumonia is the lower respiratory-tract infection that causes inflammation in the air sacs of the lungs that is caused by a virus. One pathway for IFV to trigger pneumonia called primary influenza pneumonia. Although the body usually clear up the +buildup away, but influenza virus changes it. Addition to it, the weakened immune system, and the human bodymay not be able to get rid of the virus. Every person of all ages is at risk and every region across the world is suspectable to this respiratory illness. It affects suddenly can range from mild to severe illness. According to everyday health, 1/3rd of the pneumonia cases develop from a respiratory virus, the flu is the most common of those. First symptoms include coughing, difficulty breathing and high fever.[1-5]

Types include:

- Influenza A
- Influenza B
- Influenza C and
- Influenza D.

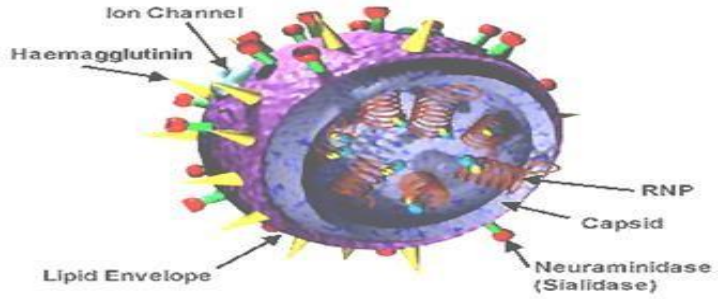


Fig 1: Influenza Virus Diagram

Influenza a virus

It is divided into many subtypes based on its antigenicstructure which contains 2 proteins on the surface of the virus. They are hemagglutinin(H) and neuraminidase(N). They can undergo genetic changes i.e; anti genetic properties that affect human immune system easily.

Table 1: Influenza type A Infectiousness, severity, transmission

Type	Infectiousness	Case Severity	Transmission
A	High	Potentially high	Humans and animals

Influenza b virus

It is not divided into subtypes but rather they are furtherdivided or classified two lineages. This two lineages are:

- B/Yamagata
- B/Victoria

Table 2: Influenza type B infectiousness, severity, transmission

Type	Infectiousness	Case Severity	Transmission
B	High	less severe than A	Humans

Table 3: Differences between Influenza type A and type B

Influenza A	Influenza B
Subtypes: A(H1N1) A(H3N2)	Lineages: B(Victoria) B(Yamagata)
Clades(Groups): 6B.1 3C.2a 3C.3a	Clades(Groups): V1A Y1, Y2,Y3
Sub- Clades: 6B.1A 3C.2a1; 3C.2a2; 3C.2a3; 3C.2a4;	V1A.1; V1A.2;V1A.3 None

Influenza c virus

Influenza C virus is the one and only species in the genius gamma influenza virus ,which belongs to the family of viruses called Orthomyxoviridae. Similar to the other influenza viruses this influenza C virus also cause flu(influenza).The characteristic feature of this influenza C virus is that it can affect both human and pigs. It is the less known common type among all influenza viruses. Influenza C virus is most likely to cause dry cough, rhinorrhea, headache etc.

Table 4: Influenza type C infectiousness, severity, transmission

Type	Infectiousness	Case Severity	Transmission
C	Less than A&B	Typically mild	Humans

Influenza d virus

Among all the types of influenza virus, influenza D is the only virus that primarily affect cattles and is not well known to affect or infect the humans. Recently, the circulating of this virus to other species had been found. Influenza D virus belongs to the genus delta influenza virus, and belong to the family Orthomyxoviridae.

Table 5: Influenza Type D infectiousness, severity, transmission

Type	Infectiousness	Case Severity	Transmission
D	Low	Typically mild	Cattle, swine

Influenza like symptoms in viral pneumonia mainly include fever ,dry cough , headache, and weakness etc., In viral pneumonia usually symptoms develop slowly over a period of several days . After the occurrence of early symptoms, within a day or two , the symptoms gradually get worse .[6-10] Generally, pneumonia have 4 stages .

They include :

1. Congestion
2. Red hepatization
3. Gray hepatization
4. Resolution

Typically considering, patients will experience worst symptoms during the 1-3 stages.

Transmission

1. Influenza virus causing pneumonia travel through the air in the form of droplets of fluid followed by sneezingand coughing by the infected patient.
2. But can also get infected by touching the infected items such as virus infected door knobs, keyboards, handlesf the stairs etc., and then frequently touching your mouth and nose
3. The influenza virus gets into your respiratory tractby means of inhalation
4. Coughing or touching or sneezing are the most common pathways for the spreading of this influenzavirus leading to the similar affects.

Risk factors

- Every person are at risk of catching viral pneumonia as it is airborne and highly contagious . Humans who are at higher risk of being infected by viral pneumonia are as follows:
  - ✓ Young children (2-7 years)
  - ✓ Pregnant women
  - ✓ Workers or People who live in a hospital or Nursing care units
  - ✓ Older persons(>65 Years)
- Person who is suffering from chronic illness that include - autoimmune diseases, respiratory infections, COPD and asthma, any other heart related diseases.
- Patients who are undergoing chemotherapy- Cancer or any other conditions related.
- Viral pneumonia may infect in patients with recent viral infections.
- People who has the habit of smoking tobacco may get infected and worsen the situation because it damages patients defense mechanism against viralpneumonia.

Immediate consultation if

Viral pneumonia can cause a serious condition. So if any of the following signs or symptoms of pneumonia occurs go to thehospital and to the emergency room.

- Continuous fever of 102 degrees Fahrenheit or more.
- Heavy and rapid breathing.
- Severe chest pain.
- Dizziness (low blood pressure).
- Severe headache with severe cough.

Signs and symptoms

Sings and symptoms of viral pneumonia include:

- Fever (temperature elevation), rigors.
- Skin – rash, nasal discharge.
- Bilateral positive (+) lung findings.
- The paucity of physical findings on pulmonary exam disproportionate to thelevel of debility.
- Contaminant upper respiratory tract infection.
- Tachycardia and tachypnea out of proportion to the temperature.
- Fatigue, arthralgias.
- Sweating, dizziness, confusion.
- Blueness of the lips.
- Weakness, malaise.
- Chest pain, muscle pain.
- Sinusitis, rhinitis, sepsis.
- Older patients may experience body temperature that is lower than normal.[11-13]

Diagnosis and it's tests

Viral pneumonia will be diagnosed by the doctor bylistening to the following:

Crackling lung sounds.
Wheezing sounds when breathing.
Increasing heartrate(rapid).
Decreased passage of air flow.

Tests include the following:

Viral culture (nasopharyngeal, throat secretions, sputum culture, nasal swab).
Serology.
Complete blood count (CBC).
Arterial blood gas (ABG).
CT Scan.
Bronchoscopy.
Chest X-Ray.

Pathophysiology

The pathogenesis of viral-pneumonia associated with influenza virus can be explained based on the observational studies it can be divided into 2 pathways:

1. Viral host interaction pathway.
2. Host physiology and immunity pathway.

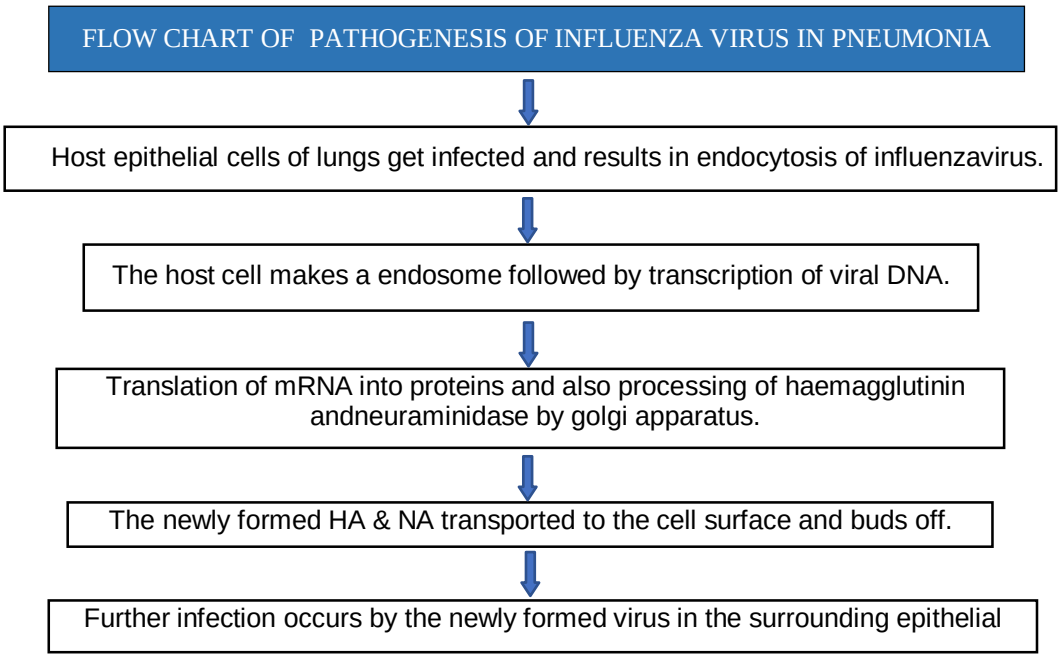
Viral host interaction pathway

Influenza virus can express several virulence factors and they directly interact with the infected host lungs and a host immune system. Firstly, haemagglutinin initiates endocytosis by attaching its bodyto the host cell surface terminal sialic acids, on the cell surface proteins of the host cell.Contrast to it a wide variety of several extra cellular molecules or proteins bind to the haemagglutinin glycans which are present on the haemagglutinin. Generally the bindedviruses can easily be eliminated from the lower respiratory tract because the binding makes easy for the host cell to eliminate it . But virus which is poorly glycosylated haemagglutinin results in the penetration into the deep areas of the lungs. Neuraminidase helps in the equilibrium of haemagglutinin binding and it's adaptation.

Host physiology and immunity pathway

After the penetration into the cell this influenza virus changes the physical properties of the lungsof the host and compromise the patients innate immunity at various levels. Epithelial damage of the lungs results in various release of primary and secondary mediators such as cytokines, TNF etc., which regulates various down regulation processes i.e., TLR down regulation which results in dying of several macrophages. Chronic infection by the virus may result in alveolar damage and macrophages depletion .[14-18]

The following flowchart shows the pathogenesis of influenza virus causing pneumonia.



The pathophysiological mechanisms of the host body defenses by producing:

- Irritation of the respiratory tract resulting in cough.
- Increase in mucus production.
- Pain due to inflammation etc.

Pharmacological treatment

Generally considering, flu like symptomsare suppressed on their own. Mild and chronic symptoms can be treated. The following table classifies the general anti-influenza drugs:

General Classification of Anti-Influenza Drugs
Amantadine, Rimantadine
Oseltamivir, Zanamivir

These above anti-nfluenza mentioned virus drugs are adamantane derivatives i.e., (M2 Channel blockers) and Neuraminidase inhibitors.

a) Adamantine derivatives: They are M2 channel blockers which are not in use exampleamantadine, rimantadine.
b) Neuraminidase inhibitors: This are the first line drugs in the therapeutic treatment which are used mainly. They include oseltamivir, zanamivir etc of their own class.

Vaccines

1. Influenza which are also known as flu shots. These vaccines protect the humans from infection caused by influenza virus. The flu vaccine has the ability to lower the risk of getting influenza (flu).
2. Getting this flu vaccine early in flu season, is the best

way has this flu virus rapidlyspread in the colder months of the year (flu season).

3. Vaccines are available in 2 forms
   Flu shot-they are injected with the help of a needle .
   The **nasal spray** – this is a mist that is sprayed into the nostrils.
4. Previously in the past, this nasal spray vaccine is not recommended for kids has itdoesn't seems to be working properly and showing its therapeutic effects. But the newer versions are seemed to be working.
5. **FLU SHOT:** This flu shots contains killed flu virus and it doesn't have the ability tocause the flu in the patients who had taken the flu shot. But it has the ability to cause redness, soreness and swelling at the administration site of the injection. It rarely causes low fever or body pains.
6. **NASAL SPRAY:** This nasal spray contains weakened form of live flu virus. It hasthe ability to cause symptoms that include wheezing, vomiting, tiredness, running nose and sore throat. Unlike the flu shot, it has the ability to cause low fever and body pains.

Table 6: Vaccination

S.NO	Age	Status of Vaccination	Schedule for Dosage
1	Children around 2-8Years of age	Not Vaccinatedwith Influenza vaccine	2 doses
2	Children around 2-8Years of age	Vaccinated with 2Doses of influenzavaccine	1 dose
3	Children, adolescents and adults around 9-49 years of age	Not applicable	1 dose

7. This flu vaccine is contraindicated in ranging outside of age 2-49 years. And in persons who have anaphylaxis to any components or ingredients in the vaccine andshowing anaphylaxis to the previous dose of inactivated influenza vaccine.[19-20]

METHODOLOGY

STUDY DESIGN: Retrospective observational study.
SOURCE OF DATA: Case sheets of the inpatients with hospital medical records.
SAMPLE SIZE: 70
STUDY LOCATION: The study was carried out in a tertiary hospital, on inpatientsmedical records from medical ward.
STUDY DURATION: Six months.

Inclusion criteria

- All the patients having the history of viral pneumonia with flu like symptoms.
- Patients of either sex have an age from 5-70 years.
- Patients with or without co-morbidities.
- Any patient with flu-like symptoms suffering with pneumonia.
- Patient who are at risk of getting pneumonia affected by influenza.
- More frequently occurred viral pnemonia with various influenza types.

Exclusive criteria

- People who are not willing to participate in this project study and patients withinsufficient data in their records.
- Mentally retarded patients.
- All out patients.
- Patients who are in critical condition.

RESULTS

Age Distribution

Table 7: Number Distribution Among AgeGroups(N=70)

Age Group	No of patients	Percentage
5-10	10	14.29%
10-15	8	11.43%
15-20	3	4.29%
20-25	1	1.43%
25-30	5	7.14%
30-35	3	4.29%
35-40	4	5.71%
40-45	2	2.86%
45-50	3	4.29%
50-55	6	8.57%
55-60	3	4.29%
60-65	10	14.29%
65-70	12	17.14%
Total:	70	100%

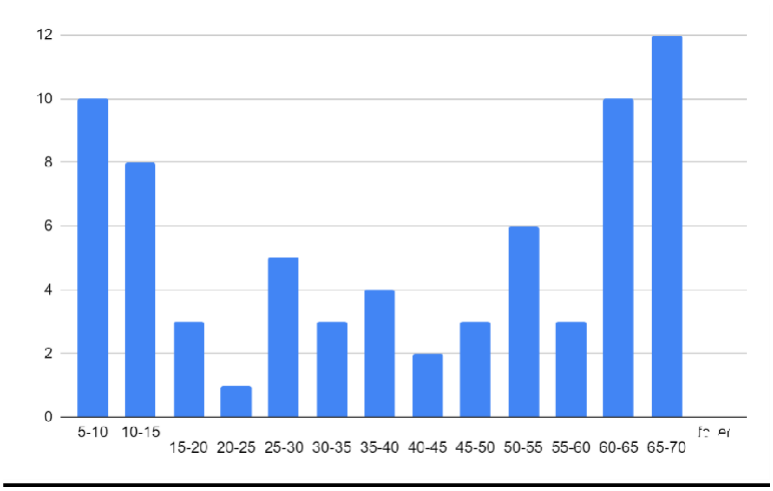


Fig 2: Affected Patients Distribution In PercentageAmong Age-Groups(N=70)

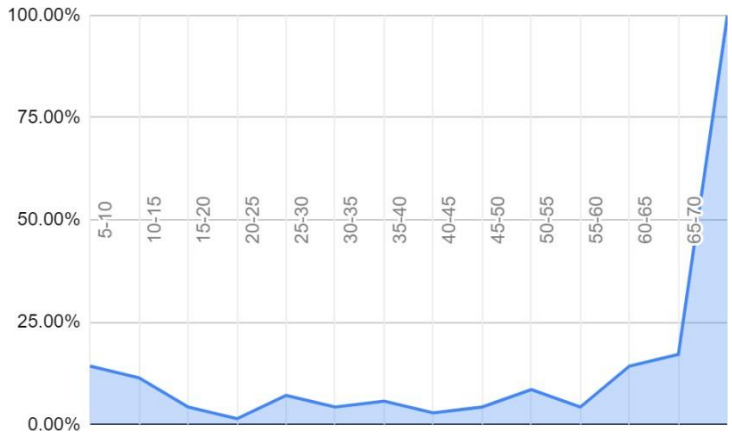


Fig 3: Age Distribution In Percentage Form (N=70)

Table 8: Gender Distribution Among Patients (N=70)

Gender	No of Patients
Male	38
Female	32
Total	70

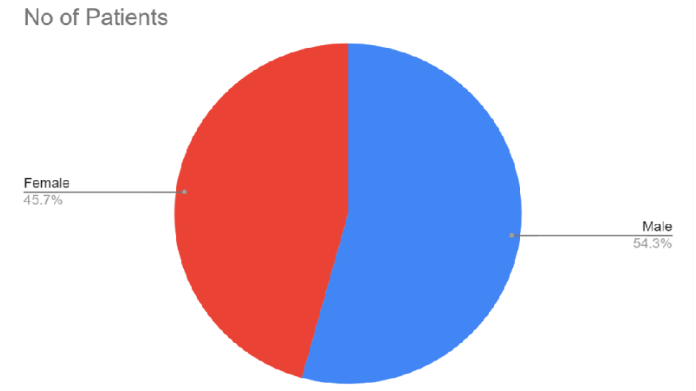


Fig 4: Gender Distribution In Percentage(N=70)

Table 9: Types of Influenza Affecting In Patients InPercentage(N=70)

Influenza	No of Patients	Percentage
Type A	47	67.14%
Type B	21	30.00%
Type C	2	2.86%
Type D	0	0%
Total	70	100%

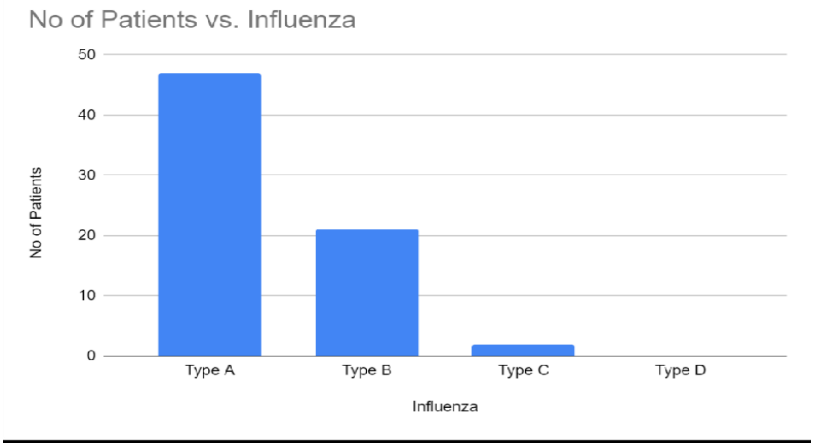


Fig 5: Number Of Patients Affected By DifferentTypes Of Influenza(N=70)

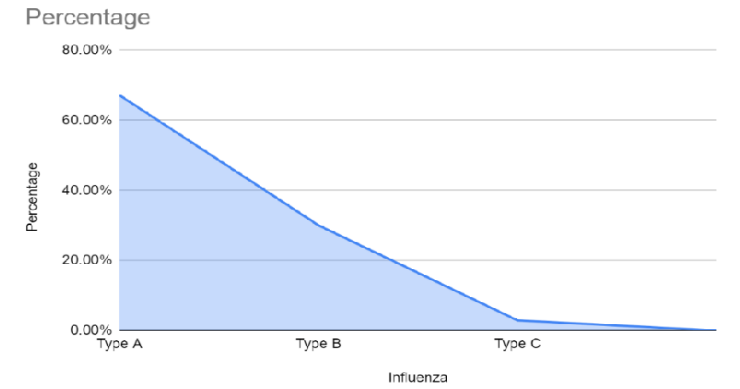


Fig 6: Occurance Of Types Of Influenza InPercentage(N=70)

Table 10: Degrees Of Fever In Patients And ItsNumber(N=70)

Fever & Degree (Fahrenheit)	No Of Patients	Percentage
99F-100F	11	15.71%
100F-101F	22	31.43%
101F-102F	28	40.00%
102F-103F	9	12.86%
Fever & Degree (Fahrenheit)	No Of Patients	Percentage
99F-100F	11	15.71%
100F-101F	22	31.43%
Total	70	100%

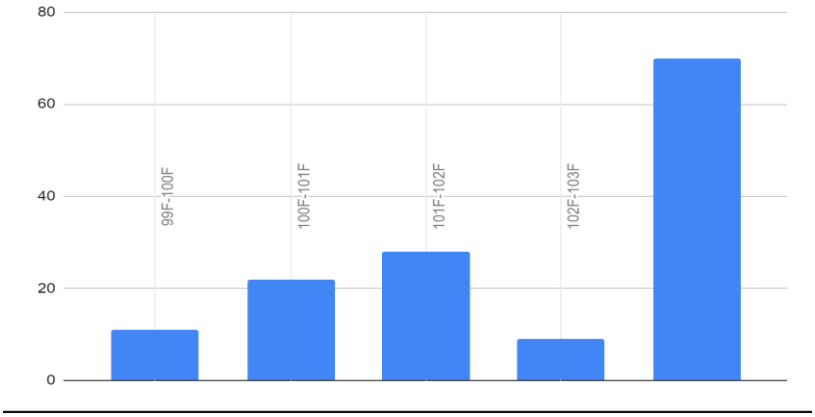


Fig 7: Occurance Of Fever In Viral Pneumonia InNumber Of Patients(N=70)

Severe illness

Table 11: Percentage Distribution In VaccinatedAnd Unvaccinated Patients Of Severe Illness(N=70)

Vaccinated	75%
Unvaccinated	25%
Total:	100%

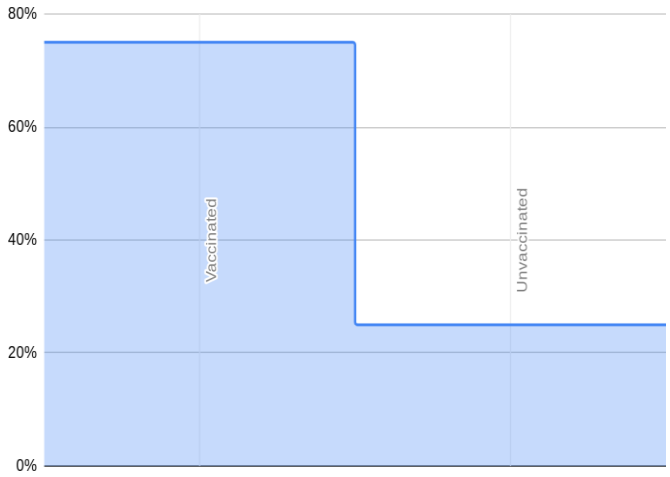


Fig 8: Percentage of Vaccinated AndUnvaccinated Patients (N=70)

Table 12: Vaccination Dosage And Their Status (N=70)

SNO	Age	Status of Vaccination	Schedulefor Dosage	Dosage
1	Children around 2-8Years of age	Not Vaccinated withInfluenza vaccine	2 doses	0.2mL eachat least 1 month apart
2	Children around 2-8Years of age	Vaccinated with 2Doses of influenzavaccine	1 dose	0.2 mL
3	Children,adolescents andadults around 9-49 yearsof age	Not applicable	1 dose	0.2 mL

DISCUSSION

In this study we conducted a study on the viral pneumonia associated-with influenza virus by collecting information from 70 subjects.

- In this retrospective study we had identified there are more male-patients are 38 number and females are 32 in number in (table no:8). And percentage ,54.4% are male patients who are affected and 45.7% are female patients who are affected in (figure no:4).
- We observed that by type A virus the affected patients are 47 in number, type B virus the affected patients are 21 in number, type C virus affected persons are 2 in number and type D virus affected are none , and are mentioned in (figure no:5). In percentage the values affected by Type A virus are 67.14%, type B virus are

30.00%, type C virusare 2.86% and type D virus are 0% (figure no:6)

- We identified that fever ranging from 99-100 degrees Fahrenheit are 11 in number, 100-101 degrees Fahrenheit are 22 in number, 101-102 degrees Fahrenheit are 28 innumber and from 102-104 degrees Fahrenheit are 9 in number in (table no:10).
- The study found that among collected data of 70 patients the percentage of patients ofhaving fever from 99-100 degrees Fahrenheit is 15.71%, 100-101 degrees Fahrenheit is 31.43%, 101-102 degrees Fahrenheit is 40.03% and from 102-104 degrees Fahrenheit is 12.86% in (figure no:7).
- We discovered that 25% unvaccinated patients and 75% vaccinated patients in(tableno:11).
- In table no: 16 we found in study and mentioned that in summer season the affected patients are 4 in number, in winter season are 45 in number and rainy season are 21 innumber.

SUMMARY AND CONCLUSION

We have conducted this study in AWARE GLENEAGLES GLOBAL HOSPITAL, Hyderabad, Telangana, India. For a period of 6 months from November 2022 to March 2023.The study aimed to identify an devaluate the viral pneumonia associated with influenza virus that have occurred in multispecialty hospitals. The findings of the study were as follows:

- Total number of cases reviewed:70.
- Total number of cases with different types of influenza:
  1. Type A - 47(67.14%)
  2. Typ.e B - 21(30.00%)
  3. Type C - 2(2.86%)
  4. Type D - 0(0%)
- Total number of male and female patients:
  1. Male - 38(54.3%)
  2. Female - 32(45.7%)
- Age wise distribution in different age groups:
  1. 5-10 – 10 (14.29%)
  2. 10-15 - 8 (11.43%)
  3. 15-20 - 3 (4.29%)
  4. 20-25 -1 (1.43%)
  5. 25-30 -5 (7.14%)
  6. 30-35 -3 (4.29%)
  7. 35-40 -4 (5.71%)
  8. 40-45 -2 (2.86%)
  9. 45-50 -3 (4.29%)
  10. 50-55 -6 (8.59%)
  11. 55-60 -3 (4.29%)
  12. 60-65 -10 (14.29%)
  13. 65-70 -12 (17.18%)
- Total percentage of patients vaccination status:
  Vaccinated – 75%
  Unvaccinated – 25%
- Season wise distribution of influenza virus:
  Summer – 4(5.71%)
  Winter – 45(64.29%)
  Rainy season – 21(30.00%)
- Fever wise distribution of the patients:
  1. 99-100:15.71%
  2. 100-101:31.43%
  3. 101-102:40.00%
  4. 102-103:12.86%

This study we have conducted in a multi-specialty helped in identifying the treatment to this viral pneumonia associated with influenza virus. The outcome of the study maybe a great help to further conducting studies on this viral pneumonia.

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