*Original Article*

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# A Prospective Study on Epidemiology, Clinical Profile and Outcome of Hospitalized Cases of Swine Flu (H1N1) During 2018-2019 Outbreak in North West Zone of Rajasthan

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**Abstract**

*Background:* Since World Health Organization declared H1N1 (Swine flu) a pandemic disease on April 29, 2009, it is continuing to be a major public health problem and it has significant regional and seasonal variation. Therefore, this study was planned to evaluate epidemiology, clinical profile, course of illness and their outcome.

*Material and Method:* Present prospective cross-sectional study was conducted on RT-PCR confirmed cases of swine flu admitted in dedicated swine flu ward in the Department of Medicine, S.P. Medical College & Associated Group of P.B.M. Hospitals, Bikaner. All patients were subjected to detailed clinical examination and relevant investigation as per proforma. Clinical and epidemiological data were collected. All patients subjected for routine lab examination including complete blood count, renal function test, liver function test, fasting blood sugar, ABG, X-ray chest PA view and other specific investigation as per requirement.

*Result:* Most females belonged to age group 18-35 years and most of the malesbelonged to age group >55 years. Most of cases belonged to category C (62%) and urban residential area (55.7%). Most common symptom was cough (98.7%) followed by fever (91.1%), sore throat (86.1%), sputum (83.5%), nasal discharge (73.4%), breathlessness (72.2%), headache (58.2%), chest pain (27.8%) and palpitation (16.5%). Our study shows multiple organ involvement during the course of swine flu as indicated by increasing blood urea (36.7%), serum direct bilirubin (19%), serum creatinine (18.9%), SGOT (68.3%), SGPT (37.8%) and decreasing serum albumin (63.3%). Overall mortality rate in our study was 8.8%.It was high in females (9.1%) as compare to males(8.6%).All deceased belonged to category C and cough was the most common presenting symptom followed by sore throat, nasal discharge, sputum and fever.

*Conclusion:* Our study shows there are certain factors which can affect outcome in the cases of swine flu. Female gender, elderly age, co morbidity and the duration of illness(6-10 days) are the important factors associated with poor outcome. Early recognition and alertness is important to reduce morbidity and mortality. Patients should also be screened for multiple organ involvement at the time of hospitalization by laboratory test like CBC, RFT, LFT for early diagnosis of multiple organ involvement so as to treat appropriately to prevent multiple organ failure and mortality.

**Keywords:** RT-PCR; Swine Influenza; Multiple Organ Failure.

## Introduction

Swine flu virus (H1N1) is a type of influenza A virus which resulted from a triple genetic re-assortment of human, avian, and swine influenza viruses.1,2it causes swine flu (H1N1 influenza) whichis continue to be major health problem worldwide with repeated outbreaks since it was declared pandemic by World Health Organization in 2009.3In India there are continue to be cases of swine flu since then with intermittent outbreaks, there were 27,236cases in 2009 and 20,604 in 2010 then there was a fall in the number of cases followed by resurgence of outbreaks during 2015 (42592 cases) and 2017 (38811 cases)as per data published by National Centre for Disease Control Government of India.Mortality was also variable in different outbreaks (2010-8.56%, 2015- 7.02%, 2017- 5.85%, 2018-7.39%). Since the current circulating strain (A/Michigan/7/2009 [H1N1] pdm09) is different4 from the previous pandemic strains (A/California/7/2009), and during the month of November 2018, we observed

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a sudden increase in the cases of swine flu, a new epidemic was anticipated,therefore, this study was planned to evaluate clinical profile, outcome and prognostic indicator in hospitalized cases of swine flu (H1N1).

## Material and Methods

Present prospective cross-sectional study was conducted in the Department of Medicine, S.P. Medical College & AssociatedGroup of P.B.M. Hospitals, Bikaner during November 2018 to March 2019. All the consecutive cases of swine flu confirmed by RT-PCR admitted in dedicated swine flu ward were included in the study.Written informed consent was taken from all the subjects or their legal guardians before enrolling for the study.

*Inclusion Criteria*

1. Patients who were positive for RT-PCR for H1N1 admitted in dedicated swine fluward.
2. Patient giving consent to participate in the study.
3. Age >18 years

*Exclusion Criteria*

1. Patients not giving informed consent.
2. Patients having influenza infections other than swine flu.

All patients were subjected to detailed clinical history and physical examination as per proforma. Nasophryngeal and orophryngeal swab samples were taken from all the patients for RT-PCR and processed at dedicated swine flu lab at the department of microbiology to confirm the diagnosis of swine flu. Laboratory investigations done in all the cases include complete blood count, renalfunction test, liver function test, fasting blood sugar, Arterial Blood Gas analysis,X-ray chest PA view and other specific investigation as per requirement.

Severity of swine flu at the time of hospitalization was classified according to Ministry of Health & Family Welfare, Govt of India guidelines revised on 18/10/2016 into following categories: -

Category-A: - Patients with mild fever plus cough / sore throat with or without body ache, headache, diarrhea and vomiting.

Category-B: - It is further divided into B1 and B2. B1:-In addition to all the signs and symptoms mentioned under Category-A, these patient has high grade fever and severe sore throat. B2:- In addition to all the signs and symptoms mentioned under Category-A, individuals having one or more of the following high risk conditions (i) Children with mild illness but with predisposing risk factors (ii) Pregnant women (iii) Persons aged 65 years or older (iv) Patients with lung diseases, heart disease, liver disease kidney disease, blood disorders, diabetes, neurological disorders, cancer and HIV/ AIDS (v) Patients on long term cortisone therapy.

Category-C: - In addition to the above signs and symptoms of Category-A and B, if the patient has one or more of the following: Breathlessness, chest pain, drowsiness, fall in blood pressure, sputum mixed with blood, bluish discoloration of nails and worsening of underlying chronic conditions.

All patients were treated as per WHO guideline5 with oseltamivir and followed up during hospital stay.

*Statistical Analysis*

Anonymised data were analysed using SPSS software version 17.0. Chi square test, ANOVA test, Student 't' test were used for continuous variables. Pearson's correlation and multiple linear regression analysis were used to measure association between variables to correlate various parameters with mortality.

## Result

Clinical profile of the cases is shown in table 1. Out of total 79 cases there were 35 males (44.3%) and 44 females (55.7%).Mean age of females was 47.36±16.80 years ranging 21-79 years and that of males was mean age 52.97±18.51 years ranging 19-92 years.Most of cases belonged to category C (62%) and urban residential area(55.7%).Most common symptom was cough (98.7%) followed by fever (91.1%), sore throat (86.1%), sputum (83.5%), nasal discharge (73.4%), breathlessness (72.2%), headache (58.2%), chest pain (27.8%) and palpitation (16.5%).

52(65.8%) of our patients were having one or more co morbidities out of which commonest was the Hypertension (20.3%) followed by Diabetes mellitus (15.2%), Congestive heart failure(15.2%),Chronic obstructive pulmonary disease(13.9%),Ischemic heart disease (13.9%), Pregnancy (10.1%), Tuberculosis (6.3%), Interstitial lung disease (2.5%), Bronchial asthma (2.5%) and Hypothyroidism (2.5%). (Table 2)

**Table 1:** - Clinical Profile of the Cases

| Parameter | | No of cases | % |
|---|---|---|---|
| Age Group (Years) | 18-35 | 20 | 25 |
| | 36-55 | 27 | 34 |
| | >55 | 32 | 41 |
| Sex | Male | 35 | 44 |
| | Female | 44 | 56 |
| Residence | Urban | 44 | 56 |
| | Rural | 35 | 44 |
| Duration of illness (days) | <3 | 14 | 17.7 |
| | 3-5 | 59 | 74.7 |
| | >5 | 6 | 7.6 |
| History of contact present | | 8 | 10.1 |
| Comorbidity | Yes | 53 | 67 |
| | No | 26 | 33 |
| Severity of Swine flu (Category) | B1 | 15 | 19 |
| | B2 | 15 | 19 |
| | C | 49 | 62 |
| | **Symptoms** | | |
| Cough | | 78 | 98.7 |
| Fever | | 72 | 91.1 |
| Sore throat | | 68 | 86.1 |
| Sputum | | 66 | 83.5 |
| Nasal Discharge | | 58 | 73.4 |
| Breathlessness | | 57 | 72.2 |
| Headache | | 46 | 58.2 |
| Chest Pain | | 22 | 27.8 |
| Palpitation | | 13 | 16.5 |
| Hypotension | | 1 | 1.3 |
| | **Physical Examination** | | |
| Pulse rate | Bradycardia | 0 | - |
| | Normal | 59 | 74.7 |
| | Tachycardia | 20 | 25.3 |
| Blood Pressure | Hypotension | 1 | 1.3 |
| | Normal | 71 | 89.9 |
| | Hypertension | 7 | 8.8 |
| Upper Respiratory | Tonsillitis | 2 | 2.5 |
| | Erythematous & edematous Phyrinx | 20 | 25.3 |
| | Sinusitis | 2 | 2.5 |
| Lower Respiratory | Crepts | 48 | 60.8 |
| | Rhonchi | 1 | 1.3 |
| | Crepts+Rhonchi | 29 | 36.7 |
| | Clear | 1 | 1.3 |
| SpO2 | <85 | 9 | 11.4 |
| | 85-94 | 37 | 46.8 |
| | ≥95 | 33 | 42.8 |

**Table 2:**- Various Comorbidities present in cases of swine flu.

| Comorbidity | No of cases | % |
|---|---|---|
| COPD | 6 | 7.6 |
| COPD+HT | 1 | 1.3 |
| COPD+IHD+CHF | 1 | 1.3 |
| COPD+TB | 3 | 3.8 |
| DM | 3 | 3.8 |
| DM+HT | 5 | 6.3 |
| DM+IHD+HT+CHF | 1 | 1.3 |
| DM+HT+ILD+TH | 1 | 1.3 |
| DM+CHF | 1 | 1.3 |
| DM+CHF+IHD | 1 | 1.3 |
| IHD+HT | 1 | 1.3 |
| IHD+HT+CHF | 2 | 2.5 |
| IHD+CHF | 4 | 5.1 |
| IHD | 1 | 1.3 |
| ILD | 1 | 1.3 |
| TH | 4 | 5.1 |
| TH+HT | 1 | 1.3 |
| BA | 1 | 1.3 |
| BA+PREGNANCY | 1 | 1.3 |
| TB | 1 | 1.3 |
| TB+HT | 1 | 1.3 |
| CHF | 2 | 2.5 |
| PREGNANCY | 7 | 8.9 |
| HT | 3 | 3.8 |

Classification of the cases according to severity of swine flu is shown in table 3.

Hemogram in our cases revealed N/L ratio was <2 in majority of the cases (96.2%). Our study also suggests that patients presenting with 2 or more of influenza like symptoms (cough, fever, sore throat, nasal discharge and headache), a decrease in total leukocyte count and a N/L ratio less than 2 indicates the possibility of swine flu. Low N/L ratio was also associated with poor outcome (table 4)

68 cases (86.1%) had increased CRP level.22% of them required mechanical ventilation.The mean level of CRP was high in died patients (156.23±63.44 vs 65.90±70.88; p=0.002). (table 5). Different radiological findings on skiagram chest PA view are shown in table 6. Respiratory support requirement in cases of swine flu is shown in figure 1.

**Table 3:** Correlation of various parameters in relation to severity (category) of swine flu.

| Parameter | | No of cases (%) | Category of swine flu | | | p |
|---|---|---|---|---|---|---|
| | | | B1 | B2 | C | |
| No of cases | | 79(100) | 15(19) | 15(19) | 49(62) | |
| Age | 18-35 | 20(25) | 9(60) | 4(27) | 7(14) | 0.003 |
| | 36-55 | 27(34) | 5(33) | 6(40) | 16(33) | |
| | >55 | 32(41) | 1(7) | 5(33) | 26(53) | |
| Sex | Male | 35 (44) | 6(40) | 3(20) | 26(53) | 0.073 |
| | Female | 44 (56) | 9(60) | 12(80) | 23(47) | |
| Residence | Urban | 44 (56) | 6(40) | 5(33) | 33(67) | 0.027 |
| | Rural | 35 (44 | 9(60) | 10(67) | 16(33) | |
| Duration of illness (days) | <3 | 14 | 2 | 4 | 8 | 0.962 |
| | 3-5 | 59 | 13 | 10 | 36 | |
| | >5 | 6 | 0 | 1 | 5 | |
| Comorbidity | Yes | 53(67) | 0 | 4 | 49 | <0.00001 |
| | No | 26(33) | 15 | 11 | 0 | |

**Table 4:** Correlation of Neutrophil, lymphocyte and N/L ratio with outcome.

| Outcome | Absolute | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Neutrophil | | | Lymphocyte | | | N/L | | |
| | Mean | SD | Range | Mean | SD | Range | Mean | SD | Range |
| Death | 2325.21 | 2241.57 | 239.40-6542 | 2795.98 | 1956.79 | 933.98-6169.20 | 0.55 | 0.22 | 0.17-0.84 |
| Survive | 2499.69 | 1851.26 | 354.20-9424.0 | 2506.93 | 1604.43 | 728.20-11465.40 | 1.29 | 0.97 | 0.29-7.60 |
| Total | 2484.23 | 1873.12 | 239.40-9424.0 | 2532.55 | 1626.21 | 728.20-11465.40 | 1.23 | 0.95 | 0.17-7.60 |
| t | | 0.234 | | | 0.447 | | | 2.010 | |
| p | | 0.816 | | | 0.656 | | | 0.048 | |

**Table 5:** Serum CRP in relation to mechanical ventilation.

| Prognostic Factors | | No. of Cases | % | Mechanical Ventilation | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Invasive | | Non Invasive | | No. | |
| | | | | No. | % | No. | % | No. | % |
| Serum CRP | 0-5 | 11 | 13.9 | 0 | - | 1 | 9.1 | 10 | 90.9 |
| | >5 | 68 | 86.1 | 6 | 8.8 | 9 | 13.2 | 53 | 77.9 |

**Table 6:** Distribution of cases according to Chest X-ray findings.

| Chest X-ray | Outcome | | | | Total | |
|---|---|---|---|---|---|---|
| | Survive (n=72) | | Death (n=7) | | | |
| | No. | % | No. | % | No.w | % |
| B/L Lower Lobe Consolidation | 30 | 88.2 | 4 | 11.8 | 34 | 43.0 |
| Left Lower Lobe Consolidation | 12 | 92.3 | 1 | 7.7 | 13 | 16.5 |
| Right Lower Lobe Consolidation | 10 | 90.9 | 1 | 9.1 | 11 | 13.9 |
| Right Middle Lobe Consolidation | 9 | 100 | 0 | - | 9 | 11.4 |
| B/L Hilar Prominence | 4 | 80.0 | 1 | 20.0 | 5 | 6.3 |
| Left Middle Lobe Consolidation | 5 | 100 | 0 | - | 5 | 6.3 |
| B/L Patchy Consolidation | 1 | 100 | 0 | - | 1 | 1.3 |
| Right Lung Consolidation | 1 | 100 | 0 | - | 1 | 1.3 |

**Table 7:** Statistical analysis of various clinical prognostic factors.

| Parameters | | Total | | Death (n=7) | | Survive (n=72) | | $x^2$ | p |
|---|---|---|---|---|---|---|---|---|---|
| | | No. | %. | No. | % | No. | % | | |
| Age (mean±SD) | | | | 54.86±21.42 | | 49.36± 17.38 | | 0.783 | 0.436 |
| Duration of illness | | | | 4.00±1,29 | | 3.60± 1.39 | | 0.735 | 0.464 |
| Sex | Female | 44 | 55.7 | 4 | 9.1 | 40 | 90.9 | 0.007 | 0.936 |
| | Male | 35 | 44.3 | 3 | 8.6 | 32 | 91.4 | | |
| Category | B | 30 | 38.0 | 0 | - | 30 | 100 | 4.702 | 0.030 |
| | C | 49 | 62.0 | 7 | 14.3 | 42 | 85.7 | | |
| Clinical Symptoms | Cough | 78 | 98.7 | 7 | 9.0 | 71 | 91.0 | 0.098 | 0.754 |
| | Fever | 72 | 91.1 | 5 | 6.9 | 67 | 93.1 | 3.695 | 0.055 |
| | Sore Throat | 68 | 86.1 | 6 | 8.8 | 62 | 91.2 | 0.001 | 0.977 |
| | Sputum | 66 | 83.5 | 6 | 9.1 | 60 | 90.0 | 0.026 | 0.871 |
| | Nasal Discharge | 58 | 73.4 | 6 | 10.3 | 52 | 89.7 | 0.595 | 0.440 |
| | Breathlessness | 57 | 72.1 | 6 | 10.5 | 51 | 89.5 | 0.703 | 0.402 |
| | Headache | 46 | 58.2 | 4 | 8.7 | 42 | 91.3 | 0.004 | 0.951 |
| | Chest Pain | 22 | 27.8 | 3 | 13.6 | 19 | 86.4 | 0.861 | 0.353 |
| | Palpitation | 13 | 16.5 | 1 | 7.7 | 12 | 92.3 | 0.026 | 0.871 |
| | Hypotension | 16 | 20.3 | 0 | - | 16 | 100 | 0.865 | 0.649 |
| Comorbid Condition | COPD | 11 | 13.9 | 2 | 18.2 | 9 | 81.8 | 1.375 | 0.241 |
| | TB | 5 | 6.3 | 0 | - | 5 | 100 | 0.519 | 0.471 |
| | DM | 12 | 15.2 | 1 | 8.3 | 11 | 91.7 | 0.005 | 0.944 |
| | IHD | 11 | 13.9 | 1 | 9.1 | 10 | 90.0 | 0.001 | 0.977 |
| | ILD | 2 | 2.5 | 0 | - | 2 | 100 | 0.199 | 0.655 |
| | BA | 1 | 1.3 | 0 | - | 1 | 100 | 0.199 | 0.655 |
| | CHF | | | 1 | 14.3 | 11 | 15.3 | 0.005 | 0.944 |
| | Thyroid | 6 | 7.6 | 0 | - | 6 | 100 | 0.631 | 0.427 |
| | Pregnancy | 8 | 10.1 | 1 | 12.5 | 7 | 87.5 | 0.146 | 0.702 |
| | HTN | 16 | 20.3 | 0 | - | 16 | 100 | 1.951 | 0.163 |
| Physical Examination | Pallor | 28 | 35.4 | 2 | 7.1 | 26 | 92.9 | 6.41 | 0.726 |
| | Cyanosis | 3 | 3.8 | 0 | - | 3 | 100 | 0.303 | 0.582 |
| | Clubbing | 4 | 5.1 | 1 | 25.0 | 3 | 75.0 | 1.359 | 0.244 |
| | Icterus | 1 | 1.3 | 0 | - | 1 | 100 | 0.098 | 0.754 |
| | Edema | 16 | 20.3 | 3 | 18.8 | 13 | 81.3 | 2.430 | 0.119 |
| | Crepts | 41 | 51.9 | 4 | 9.8 | 37 | 91.2 | 0.085 | 0.771 |
| | Crepts+Rhonchi | 38 | 48.1 | 3 | 7.9 | 35 | 92.1 | | |
| Treatment Ventilation | No | 63 | 79.7 | 0 | - | 63 | 100 | 67.855 | <0.001 |
| | Invasive | 6 | 7.6 | 6 | 100 | 0 | - | | |
| | Non Invasive | 10 | 12.7 | 1 | 10.0 | 9 | 90.0 | | |

Overall mortality rate in our study was 8.8%. It was high in females (9.1%) as compare to males(8.6%).All deceased belonged to category C and cough was the most common presenting symptom followed by sore throat, nasal discharge, sputum and fever.Evaluation of various clinical and laboratory prognostic factors are shown in table 7 and 8. Clinical profile of died patients are shown in table 9. On linear regression analysis, of various prognostic indicator in relation to outcome in case of swine flu we found that SGOT, CRP, SPO2, Duration of Illness, N/L ratio, Serum albumin and age had highly significant correlation ($p<0.001$). (table 10 and figure 2)

**Table 8:** Statistical analysis of various laboratory prognostic factors.

| Parameters | | Survive | | Death | | t | p |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | | |
| Lab Investigation | Hb | 10.72 | 2.40 | 11.10 | 2.69 | 0.395 | 0.694 |
| | Polymorph | 2325.21 | 2241.57 | 2499.69 | 1851.26 | 0.234 | 0.816 |
| | Lymphocyte | 2795.98 | 1956.79 | 2506.93 | 1604.43 | 0.447 | 0.656 |
| | N/L | 0.79 | 0.44 | 1.09 | 0.97 | 0.803 | 0.425 |
| | Monocyte | 5.57 | 5.25 | 2.44 | 1.20 | 1.562 | 0.122 |
| | Platelet | 2.22 | 0.96 | 1.80 | 0.90 | 1.121 | 0.266 |
| | RDW | 15.12 | 3.16 | 16.29 | 4.04 | 0.911 | 0.365 |
| | MCV | 85.46 | 25.23 | 85.14 | 8.49 | 0.033 | 0.974 |
| RFT | Blood Urea | 46.24 | 42.47 | 103.55 | 79.39 | 3.119 | 0.003* |
| | Serum Creatinine | 1.18 | 0.83 | 1.99 | 1.74 | 2.117 | 0.033* |
| LFT | Bilirubin D | 0.33 | 0.23 | 1.11 | 1.32 | 4.494 | <0.001* |
| | SGOT | 65.89 | 69.47 | 202.86 | 209.29 | 3.902 | <0.001* |
| | SGPT | 61.15 | 65.59 | 74.71 | 53.30 | 0.529 | 0.598 |
| | S. ALP | 114.52 | 163.37 | 172.29 | 95.27 | 0.917 | 0.362 |
| | Total Protein | 6.37 | 0.65 | 6.09 | 0.72 | 1.099 | 0.275 |
| | Albumin | 3.61 | 0.48 | 3.21 | 0.36 | 2.079 | 0.041* |
| ABG | Ph | 7.42 | 0.07 | 7.43 | 0.10 | 1.411 | 0.162 |
| | HCO3- | 24.54 | 4.69 | 25.63 | 5.81 | 0.574 | 0.568 |
| | Na+ | 133.33 | 5.56 | 134.71 | 9.34 | 0.586 | 0.559 |
| | K+ | 3.52 | 0.85 | 3.50 | 1.35 | 0.050 | 0.961 |
| | SPO2 | 92.84 | 6.18 | 78.91 | 17.80 | 4.542 | <0.001* |
| | FIO2 | 33.97 | 18.03 | 75.71 | 20.70 | 5.777 | <0.001* |
| | PaO2 | 73.43 | 37.58 | 35.94 | 5.75 | 2.621 | 0.011* |
| | PaO2/FIO2 | 250.90 | 128.41 | 50.26 | 12.92 | 4.108 | <0.001* |
| CRP | | 65.90 | 70.88 | 156.23 | 63.44 | 3.244 | 0.002* |

* Significant ($p<0.05$).

**Table 9:** Clinical profile of patients died in swine flu.

| | Died Patient | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Patient ID | 7 | 16 | 24 | 31 | 33 | 45 | 51 |
| Age (yrs) | 70 | 32 | 87 | 25 | 60 | 50 | 60 |
| Gender | Female | Female | Male | Female | Male | Female | Male |
| Duration of Illness (Yrs) | 5 | 3 | 6 | 3 | 3 | 3 | 5 |
| Category | C | C | C | C | C | C | C |
| Comorbidity | AF | No | COPD | Pregnancy | IHD | DM+CHF | COPD |
| X-ray Finding | B/L Lobe Consolidation | B/L Lower Lobe consolidation | B/l Lower Lobe Consolidation | B/L Hilar Prominence | Lt Lower Lobe Consolidation | Rt Lowe Lobe Consolidation | B/L Lowe Lobe Consolidation |
| Residence | Urban | Urban | Rural | Urban | Urban | Urban | Urban |
| Mechanical Ventilation | Invasive | Invasive | Invasive | Invasive | Invasive | Non Invasive | Invasive |
| TLC | 3800 | 2200 | 3800 | 4500 | 3500 | 4500 | 3400 |
| N/L | 2.61 | 0.94 | 0.56 | 1.13 | 0.71 | 1.33 | 0.88 |
| Hb | 11.5 | 12.0 | 7.7 | 8.4 | 13.8 | 9.5 | 14.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BU | 87.6 | 48.3 | 159.70 | 31.20 | 102.4 | 42.50 | 253.2 |
| SC | 1.75 | 0.67 | 2.58 | 0.68 | 1.76 | 0.91 | 5.61 |
| SGOT | 28.0 | 75.0 | 37.0 | 346.0 | 360.0 | 33.0 | 541.0 |
| SGPT | 12.0 | 64.0 | 19.0 | 131.0 | 134.0 | 42.0 | 121.0 |
| S. Alp | 103 | 110 | 61 | 138 | 199 | 306 | 289 |
| Na+ | 117 | 133 | 143 | 136 | 132 | 136 | 146 |
| K+ | 1.73 | 3.61 | 4.99 | 2.80 | 3.46 | 2.44 | 5.50 |
| pH | 7.56 | 7.48 | 7.26 | 7.45 | 7.49 | 7.41 | 7.33 |
| $PaO_2/FiO_2$ | 80.0 | 70.0 | 90 | 60.0 | 100 | 40.0 | 90.0 |
| SPO2% | 96.00 | 92.00 | 89.00 | 71.00 | 43.40 | 83.00 | 77.70 |

**Table 10** Multiple Linear Regression Analysis (ANOVA) in relation to Outcome.

ANOVAJ

| Model | | Sum of Squares | df | Mean Squar | F | Sig. |
|---|---|---|---|---|---|---|
| Sex | Regression | .001 | 1 | .001 | .006 | .937[a] |
| | Residual | 6.379 | 77 | .083 | | |
| | Total | 6.380 | 78 | | | |
| Serum Creatinine | Regression | .434 | 2 | .217 | 2.777 | .069[b] |
| | Residual | 5.945 | 76 | .078 | | |
| | Total | 6.380 | 78 | | | |
| SGOT | Regression | 1.239 | 3 | .413 | 6.024 | .001[c] |
| | Residual | 5.141 | 75 | .069 | | |
| | Total | 6.380 | 78 | | | |
| CRP Titre | Regression | 1.369 | 4 | .342 | 5.052 | .001[d] |
| | Residual | 5.011 | 74 | .068 | | |
| | Total | 6.380 | 78 | | | |
| SPO2 | Regression | 1.721 | 5 | .344 | 5.392 | .000[e] |
| | Residual | 4.659 | 73 | .064 | | |
| | Total | 6.380 | 78 | | | |
| Duration of illness | Regression | 1.721 | 6 | .287 | 4.432 | .001[f] |
| | Residual | 4.659 | 72 | .065 | | |
| | Total | 6.380 | 78 | | | |
| N/L ratio | Regression | 1.894 | 7 | .271 | 4.283 | .001[g] |
| | Residual | 4.486 | 71 | .063 | | |
| | Total | 6.380 | 78 | | | |
| Serum Albumn | Regression | 2.112 | 8 | .264 | 4.329 | .000[h] |
| | Residual | 4.268 | 70 | .061 | | |
| | Total | 6.380 | 78 | | | |
| Age | Regression | 2.117 | 9 | .235 | 3.808 | .001[i] |
| | Residual | 4.262 | 69 | .062 | | |
| | Total | 6.380 | 78 | | | |

a. Predictors: (Constant), sex1

b. Predictors: (Constant), sex1, sc.

c. Predictors: (Constant), sex1, sc, sgot.

d. Predictors: (Constant), sex1, sc, sgot, crp.

e. Predictors: (Constant), sex1, sc, sgot, crp, spo21.

f. Predictors: (Constant), sex1, sc, sgot, crp, spo21, dura.

g. Predictors: (Constant), sex1, sc, sgot, crp, spo21, dura, nl.

h. Predictors: (Constant), sex1, sc, sgot, crp, spo21, dura, nl, salb.

i. Predictors: (Constant), sex1, sc, sgot, crp, spo21, dura, nl, salb, age.

j. Dependent Variable: outcome.

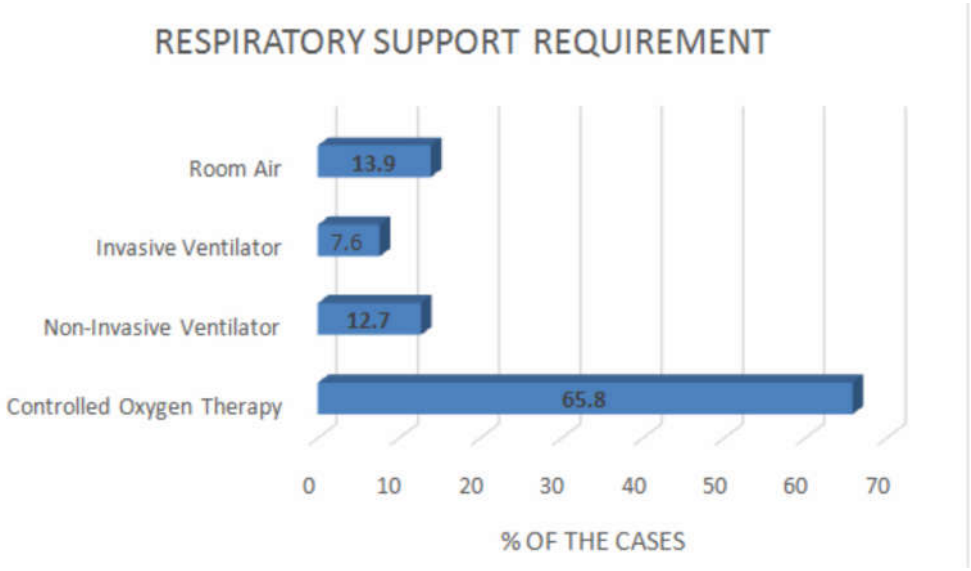


**Fig. 1:** Respiratory support requirement in cases of swine flu.

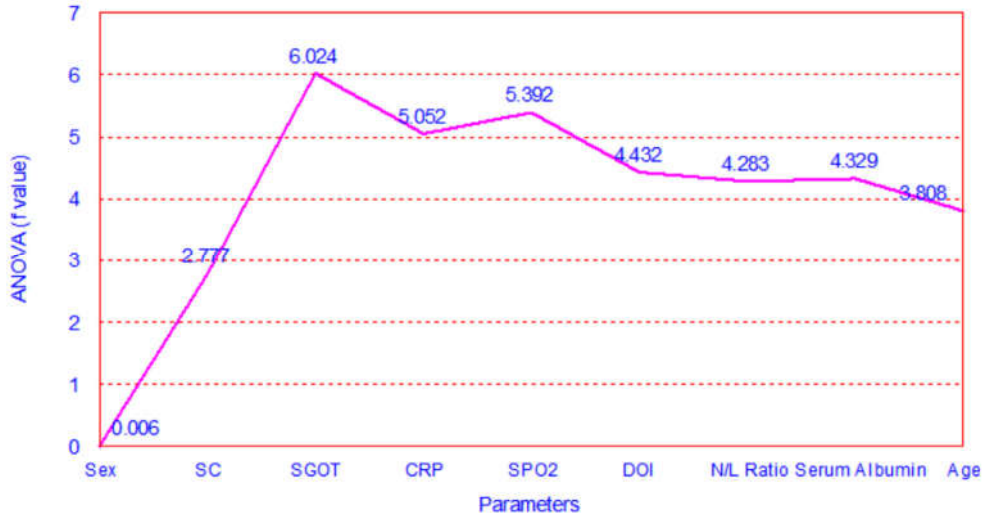


**Fig. 2:** Multiple Linear Regression Analysis (ANOVA) in relation to Outcome.

Classification of the cases according to severity of swine flu is shown in table 3.

Hemogram in our cases revealed N/L ratio was <2 in majority of the cases (96.2%). Our study also suggests that patients presenting with 2 or more of influenza like symptoms (cough, fever, sore throat, nasal discharge and headache), a decrease in total leukocyte count and a N/L ratio less than 2 indicates the possibility of swine flu. Low N/L ratio was also associated with poor outcome (table 4).

68 cases (86.1%) had increased CRP level.22% of them required mechanical ventilation.The mean level of CRP was high in died patients (156.23±63.44 vs 65.90±70.88; p=0.002). (table 5). Different radiological findings on skiagram chest PA view are shown in table 6. Respiratory support.

**Discussion**

This was a prospective cross sectional study conducted in the Department of Medicine Sardar Patel Medical College, Bikaner on patients of Swine flu who were admitted in designated Swine flu ward from December 2018-March 2019.During this period a total 447 cases were screened for H1N1 out which 259 cases were positive for H1N1 confirmed by RT-PCR in virology lab of SPMC Bikaner.79 cases among them were admitted in the hospital and taken in the study.

In our study the mean age of the cases was 49.85±17.68 years ranging from 18-92 years. There were 44 females (55.7%; mean age 47.36±16.80 years ranging 21-79 years) and 35 males (44.3%; mean age 52.97±18.51 years ranging 19-92 years). We found slight female preponderance M:F;1:1.26 similar to study done by Prasadet al6 who reported M:F;1:1.2 but Dhawale and Jayant7 andTulloch et al8 found significantly high incidence of Swine flu in females (M:F;1:1.67,1:2.2 respectively).

As our study was done only on hospitalized cases, therefore maximum number ofthe cases belonged to category C(62%).Although cases belonged to category B1 and B2 were also admitted (19% each). Most of the cases of category C belonged to Urban area and age more than 55 years.

In our study cough was the most common presenting symptom (98.7%) followed by fever (91.1%), sore throat (86.1%), sputum (83.5%), nasal discharge (73.4%), breathlessness (72.2%), headache (58.2%), chest pain (27.8%) and palpitation (16.5%). Aviram et al9, Arbat et al10 and Kshatriya et al11 also reported cough as the most common presenting symptom while Bakhshayeshkaram et al 12, Wang et al13,Nandhiniand Sujatha14, Prasadet al6 and Tulloch et al8 reportedfever as the most common presenting symptom.

52(65.8%) of our patients were having one or more co morbidities out of which commonest was the Hypertension (20.3%) followed by Diabetes mellitus (15.2%), Congestive heart failure(15.2%),Chronic obstructive pulmonary disease (13.9%), Ischemic heart disease (13.9%), Pregnancy (10.1%), Tuberculosis (6.3%), Interstitial lung disease (2.5%), Bronchialasthma (2.5%) and Hypothyroidism (2.5%). Prasad et al117 reported co morbidities in 77.61% of their cases which were Diabetes mellitus (21.05%), Hypertension (21.05%) ,COPD (9.21%), Pregnancy (9.21%),Coronary artery disease (7.89%) and Bronchial asthma (6.57%). Mehta et al15 also reported Diabetes mellitus (13.6%) as the commonest co morbidity followed by Pregnancy (6.8%), COPD/Asthma(4.5%), Chronic renal failure (3.4%) and Chronic liver disease (2.3%). Kashinkunti et al16 and Chudasama et al17 reported that common risk factors for swine flu in India were found to be Diabetes mellitus and Hypertension while that in the US was Bronchial Asthma and COPD. Pregnancy has been reported as the most constant risk factor with high disease mortality18. Our findings also correlated with the same.

N/L ratio in our study was <2 in majority of the cases (96.2%).Indavarapuand Akinapelli19 reported N/L ratio <2 in 92.7% cases and concluded that N/L<2 along with a decrease in WBC count can be used as a screening tool in patients presenting with influenza like symptomswhile awaiting throat swab culture reports for confirmation.He reported its sensitivity as 92.7% and specificity as 96.36% with positive predictive value of 96.22% and a negative predictive value of 92.8%.Thus our study also suggest that patients presenting with 2 or more of influenza like symptoms (cough,fever,sore throat,nasal discharge and headache),a decrease in total leukocyte count and a N/L ratio less than 2 indicates the possibility of swine flu19.

Commonest radiological findings in our cases was consolidation which was observed in 93.6% of the cases. Out of them 34 had bilateral lower lobe pneumonia. Unilateral consolidation was more commonly in right lung (26.6%) as compared to left lung (22.9%). Lower zone was commonly affected 73.41% as compare to middle zone 71.7%. Requirement for ventilation highest in the in the bilateral lower lobe consolidation (26.47%) followed by bilateral hilar prominence, left middle lobe consolidation (20% each), right lower lobe consolidation (18.18%), left lower lobe consolidation (15.3%) and right middle lobe consolidation (11.1%). The highest mortality in bilateral hilar prominence (20%), bilateral lower lobe consolidation (11.8%), right lower lobe consolidation (9.1%) and left lower lobe consolidation (7.75). Patients presented with bilateral hilar prominence and left middle lobe consolidation have shorter duration of illness comparison to patients presented with bilateral lower lob consolidation, left lower lobe consolidation, right lower lobe consolidation and right middle lobe consolidation. Jartti et al20 also reported consolidation as the commonest radiological finding (93%) while Kshatriya et al11 and Prasadet al6 reported consolidation only in 41.53% and 11.84% of the cases respectively. Aviram et al9 reported ground glass opacity (69%) as the commonest radiological finding followed

by consolidation (59%), patch opacity (41%) and nodular opacity (28%). Lower zone was commonly affected the most (73.41%) followed by middle zone (17.7%). Similar observation has also been reported by Kshatriya et al11 in contrast Aviram et al9 reported that middle lung zones were the most frequently involved sites followed by lower lung zones in their study.

Our study shows multiple organ involvement during the course of swine flu as indicated by increase in blood urea (36.7%), serum direct bilirubin (19%), serum creatinine (18.9%), SGOT (68.3%), SGPT (37.8%), serum CRP (86.1%) and decrease in serum albumin (63.3%). Punpanich and Chotpitayasunondh21 also reported multiple organ involvement in cases of Swine Flu. Although swine flu is primarily considered as respiratory illness but it can affect multiple organs by Systemic Inflammatory Response Syndrome.

16 cases (20.2%) required mechanical ventilation in our study. Out of them 10 (12.7%) required non invasive and 6 (7.8%) required invasive ventilation. Non invasive ventilation was required more commonly in 36-55 years age group and invasive ventilation was required more commonly in elderly age group (>55 years).Requirement for ventilation was high in patients presented in hospital after 72 hours. 75% of the cases who required ventilator support were having duration 3-5 days. Most of the cases having co morbidity also required ventilator support (21.5%).66.7% of cases presented with severe hypoxia (<85%) required ventilator support while 21.7% cases having Spo2 85-94% required ventilator support. Requirement of mechanical ventilation was more in females (25%) as compare to males (14.3%). Anand et al22did study on 54 cases of hospitalized cases of swine flu and reported that 35% patients requiring ventilator support with a mortality of 74% among them. He also found more requirement of ventilator support in females and found 65% of their cases who were put on ventilator were having co morbidity.

Overall mortality rate in our study was 8.8%. It was high in females (10%) as compare to males(8.6%).All deceased belonged to category C and cough was the most common presenting symptom followed by sore throat, nasal discharge, sputum and fever.6 out of 7 cases died had one or more co morbidities, commonest was Chronic obstructive pulmonary disease (28.6%) followed by ischemic heart disease(14.3%), congestive heart failure (14.3%), diabetes mellitus (14.3%) and pregnancy (14.3%). Similarly, Aviram et al9 also found high mortality in swine flu associated with co morbidities like Chronic obstructive pulmonary disease (14%), ischemic heart disease (14%) and Pregnancy (14%).

Out of 79 patients, 8(10.13%) were pregnant females. ICU admission was needed in 37.5% and mortality was 12.5% among them. 3 Pregnant femaleswere admitted in ICU and all of them were in the third trimester and needed mechanical ventilation (1 invasive and 2 non invasive). ICU admission rate and mortality in pregnant females with swine flu was high in our study as compared to previous workers.23,24,25So our study also emphasize that pregnant females are at increased risk of morbidity and mortality as compared to females who are not pregnant. This is due to the changes in their immune systems to accommodate the developing fetus and adaptations in body as a result of the hormonal and physical changes.[26]

Out of 79 cases, 16 patients were required mechanical ventilation (20.2%). Among them 7 died (43.8%; $p<0.001$). Patients who required ventilator support are associated with high mortality because of Acute respiratory distress syndrome and because they were at advanced stage when admitted.[27]

Overall mortality in our study was 8.8%. Mortality in swine flu has been reported between 4.45% to 19.08%.9,28 On Multiple Linear Regression Analysis (ANOVA) in relation to Outcome we found that female gender, elder age (>55 years), category C at the time of presentation, comorbidity, duration of illness 3-5 days at the time of presentation, high blood urea, high serum creatinine, high SGOT, SGPT, high alkaline phosphatase, hypoalbuminemia, low Spo2 (<85%), Fio2, Pao2, Pao2/Fio2, high CRP titre, bilateral lower lobe pneumonia and bilateral hilar prominence on skiagram were associated with poor outcome. Myles et al29 reported independent predictors of severe outcomes among hospitalized patients were increasing age, pre-existing chronic lung disease(excluding asthma or COPD), neurological disease, recorded obesity, delayed admission, dyspnoea, radiological pneumonia, alteredconsciousness, needfor supplemental oxygen, CRP levels ≥100 mg/liter and intravenous fluid replacement on admission. Nguyen-Van-Tam et al30 showed that patients with a severe outcome were more likely to be recorded as obese and to have pulmonary disease other than Asthma or COPD (cystic fibrosis, fibrosis alveolitis and congenital lung defects), altered consciousness level, shortness of breath, radiologically confirmed pneumonia, CRP level ≥ 100 mg/liter, peripheral oxygen saturation of <94% on air or to have required supplemental oxygen or intravenous fluids on admission than

those managed on standard wards. We did not find any correlation of BMI with outcome.

## Conclusion

Our study shows there are certain factors which can affect outcome in the cases of swine flu.Female gender,elderly age,co morbidity and the duration of illness(3-5 days) are the important factors associated with poor outcome.Early recognition and alertness is important to reduce morbidity and mortality. Patients should also be screened for multiple organ involvement at the time of hospitalization by laboratory test like CBC,RFT,LFT for early diagnosis of multiple organ involvement so as to treat appropriately to prevent multiple organ failure and mortality.

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