

Impact of influenza on hematological and serological markers

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Objective: To observe the frequency and association of hematological and serological markers in influenza patients.

Methodology: This single-centered retrospective descriptive study was done in Makkah, Saudi Arabia for a 26 months period. We included all admitted confirmed H1N1 patients of both genders using simple random technique. H1N1 was confirmed by a qualitative RT-PCR test through a nasopharyngeal swab. The complete data of patients were extracted from electronic medical records. Blood complete and serological tests detail was documented. Data were analyzed by SPSS version 23. Independent samples t test was applied to see the association of independent variables with influenza A and influenza B patients.

Results: Out of 170 patients, 107(62.9%) were influenza A and 63(37.0%) were influenza B. Anemia was observed almost same (31.8% vs

31.7%) in influenza A and B ($p=0.994$). Leukopenia was seen 43.9% ($n=47$) and 25.4% ($n=16$) in influenza A and B patients, respectively ($p=0.891$). Thrombocytopenia was documented in 20.6% ($n=22$) influenza A while 4.8% ($n=3$) in influenza B ($p<0.001$). Deranged liver function tests showed non-significant association ($p=0.621$) between influenza A and B patients. Abnormal renal function tests showed significant association between influenza A and Influenza B.

Conclusion: Anemia, Leukopenia, and abnormal liver function test frequencies were almost same in influenza A and B patients with non-significant association. Thrombocytopenia and abnormal renal function tests showed significant association between influenza A and B patients. (Rawal Med J 202;46:270-273).

Keywords: Influenza A and B, anemia, leukopenia, thrombocytopenia.

INTRODUCTION

Influenza spread worldwide and 70 countries documented 30,000 H1N1 positive cases in 2009.^{1,2} Globally, H1N1 patients reported deaths reached up to 575,400 in 2009.^{3,4} Incidence of influenza A was 74% in USA 2011 season while influenza B frequency was 0.1-44.6% in the USA & Canada; 6.4-62% in Taiwan but was lower in Europe, Korea, South Asia, South America & New Zealand (0-16.4%).³ Saudi Arabian studies showed incidence of influenza A 6%,⁵ and 19.6%⁶ and influenza B data is very limited.

Influenza is clinically characterized by nonspecific symptoms (such as fever, cough, upper respiratory symptoms, malaise, and headache) and signs that are common to other infections.¹ It affect all age groups but highest incidence seen in young population.² It is usually a self-limiting disease but can be complicated and life-threatening among patients who are vulnerable due to coexisting

chronic diseases and immune-compromised status.³ Recent reports document some clinical differences in influenza cases.⁴ Clinical presentation differs depending on the type of virus that caused the illness.^{7,8}

During influenza epidemics, influenza-like illness (ILI) should be differentiated from other respiratory viruses.³ So the diagnosis of influenza is always confirmed by clinical decision and RT-PCR of influenza viruses.⁹ The WHO used ('old') and new revised (January 2014) case definition of influenza.^{10,11} When considering future pandemic planning, the rapidly performed diagnostic tests with good sensitivity are always considered.¹² Influenza B posed less of a disease burden than influenza A and there is ability of influenza A to cause severe pandemics.¹³

Significant number of H1N1 infected patients had involvement of liver, which increases mortality in such patients.¹⁴⁻¹⁶ Systemic viral infections have

impact on hematological markers and renal involvement. Saudi Arabia is a hot zone for outbreaks of infectious diseases like influenza especially Makkah region. Saudi Ministry of Health reported 15850 confirmed cases of H1N1 in 2009.¹⁷ Determining the hematological and serological markers abnormalities in influenza infection and to see its association between its strains (Type A & B) is important for epidemiological decision-making such as control and surveillance strategies and for clinicians to understand better the clinical evaluation.¹⁸

METHODOLOGY

This single-centered retrospective descriptive study was done in Makkah, Saudi Arabia from May 2016 to June 2018. Inclusion criteria were either gender with all ages and confirmed H1N1 case by qualitative RT-PCR test by nasopharyngeal swab. While exclusion criteria was patients with active malignancy, organ transplant with immunosuppressive therapy, hemo-globinopathies, advanced liver and renal failure patients.

We included all admitted confirmed patients by simple random technique. The complete data of patients were extracted from electronic medical records. Blood complete and serological tests in detail were documented. Anemia was defined as a hemoglobin level <12.5 gm/dl and leukopenia was defined as a total leukocyte count of less than 4×10^3 /cubic millimeter (cu mm). Thrombocytopenia was defined as a platelet count of less than 150,000/cu mm. Liver function test (LFT) and renal function test (RFT) values more than upper normal limits were considered abnormal. Patients were divided into two groups (influenza A

& Influenza B patients).

Statistical Analysis: All data analysis was performed using SPSS version 23. Independent samples t-test was applied to see the association of independent variables (anemia, leukopenia, thrombocytopenia, RFTS, LFTS) between influenza A and influenza B group of patients. $p < 0.05$ was considered significant.

RESULTS

Out of 170 patients, 107(62.9%) were influenza A and 63(37.0%) were influenza B. Most patients belonged to old age group (58.2%) followed by adult group (32.9%) (Table 1). Anemia was observed almost same (31.8% vs 31.7%) in influenza A and B patients with non-significant association ($p .994$). Leukopenia was seen 43.9% ($n=47$) and 25.4% ($n=16$) in influenza A and B patients respectively with non-significant association ($p .891$). Thrombocytopenia was documented 20.6% ($n=22$) in influenza A and 4.8% ($n=3$) in influenza B with significant association ($p < .001$) between influenza strains (Table 2).

Table 1. Demographic data of patients (n=170).

Variable		H1N1 status		Total
		influenza A (n=107)	influenza B (n=63)	
Age (years)	Child: 0-12	28 (63.6%)	16 (36.3%)	44
	Adolescent: 13-18	2 (33.3%)	4 (66.7%)	6
	Adult: 19-59	36 (64.3%)	20 (35.7%)	56
	Old: >60	41 (64.1%)	23 (35.9%)	64
Gender	Male	61 (61.6%)	38 (38.4%)	99
	Female	46 (64.8%)	25 (7.0%)	71
Comorbidity	Yes	42 (66.7%)	21 (33.3%)	63
	No	65 (60.7%)	42 (39.3%)	107
Outcome	Improved	106 (63.5%)	61 (36.5%)	167
	Death	1 (33.3%)	2 (66.7%)	3

Table 2. Haematological data.

Variable	H1N1 Status	Positive patient	Total Cases	Mean	Std. Dev.	df	p value
Anemia.(Hb.<12.5 gm/dl)	A+ve	34 (31.8%)	107	1.68	.468	168	0.994
	B+ve	20 (31.7%)	63	1.68	.469	129.7	
Leukopenia (wbcs $< 4 \times 10^3$ /cumm)	A+ve	47 (43.9%)	107	1.64	.633	168	0.891
	B+ve	16 (25.4%)	63	2.05	.750	113.3	
Thrombocytopenia (platelets: $<150 \times 10^3$ /cumm)	A+ve	22 (20.6%)	107	1.79	.406	168	0.000
	B+ve	3 (4.8%)	63	1.95	.215	166.4	

Table 3. Serological data.

Variable	H1N1 Status	Positive Patient	Total Cases	Mean	Std. Dev.	df	p value
Deranged LFTS. (> than ref. range)	A+ve	27 (25.2%)	107	1.75	.436	168	0.621
	B+ve	17 (26.9%)	63	1.73	.447	127.5	
Deranged RFTs. (> than ref. range)	A+ve	27 (25.2%)	107	1.75	.436	168	0.005
	B+ve	23 (36.5%)	63	1.63	.485	119.2	
Death	A+ve	1 (0.9%)	107	1.01	.097	168	0.033
	B+ve	2 (3.2%)	63	1.03	.177	84.2	

Deranged liver function tests difference was non-significant ($p=0.621$). Renal function tests were found deranged in with significant association ($p=0.005$) (Table 3). All deaths were due to respiratory arrest and documented as 0.93% ($n=1$) in influenza A and 3.1% ($n=2$) in influenza B patients.

DISCUSSION

In this study, anemia was documented in 31.7% while 9.1% in Wang et al study.¹⁹ This higher frequency of anemia in our study can be because of higher frequency of comorbidities (37.0%) than comparative study. Anemia frequency documented 30.8% in Saudi Arabia by Agha et al, which is almost same as seen in our study.¹⁰ Our study found that Leukopenia was observed 37.0% ($n=63$) while it was observed 43.3% in Wang et al study, 9.4% in Agha et al study, and 25.8% in Turkish population.^{19,10,20}

Leukopenia tendency was lower in influenza B, which is considered as mild illness as compared to influenza A.¹³ Thrombocytopenia was observed 20.6% in influenza A and 4.8% in influenza B patients and its trend was almost similar as compared to earlier studies.^{12,15,21} Wang et al showed 3.4% thrombocytopenia.¹⁹

Previous studies did not differentiate influenza cases into subtypes.^{12,15,19} Influenza subtypes and studied population age and disease severity can influence on platelets trends. Almost same trend was seen in Polakos et al study (23.3%), but decreased incidence seen in Agha et al (16.8%) and Wang et al Study (5.3%).^{15,10,19}

Renal involvement in our study was observed 25.2% ($n=27$) and 36.5% ($n=23$) in influenza A and B patients, respectively. Data from Chile showed 25%, 66.7% from Canada, and 63.6% from

Argentina studies had abnormal renal functions.^{18,22,23} Altayep et al. did a study in Saudi Arabia documented renal involvement in 7.4% of patients.²⁴ Two studies from Argentina and Canada analyzed renal involvement in critically ill patients showed results of 66.7% and 63.6%, respectively.^{19,21}

The fatality rate of influenza was 1.7% ($n=3$) during this period, which was almost same seen in Saudi Arabia, United States, and the United Kingdom.²¹ It was a single center experience, all patients were Saudi residents and vaccination status of patients was not evaluated.

CONCLUSION

Thrombocytopenia and abnormal renal functions showed strong association between influenza A and influenza B patients.

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