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Molecular Detection of Adenovirus Genotype 3 in Adult Patients with Respiratory Infection

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ABSTRACT

Background The DNA virus known as adenovirus was initially identified in the 1950s in soldiers who were suffering from pneumonia that was unusual. There are now seven species (A–G) of human adenovirus (HAdV) with over 100 genotypes. Disease types and severity vary depending on the genotype of infection by adenovirus. In children as well as adults, human adenovirus type three is a significant respiratory infection that spreads and causes complications.

The main objective of this study: was to identify adenoviruses genotype 3 by real time PCR from plasma sample of adult patients with respiratory infection. This research was carried out at Kirkuk Teaching Hospital/Azadi Teaching Hospital and Gynecology, Pediatrics and Woman Hospital in Kirkuk City between the first of November 2024, and the fifth of February 2025. One hundred patients' plasma was tested for adenovirus genotype 3 by using Real Time PCR Technique, there were 42 (42%) female patients and 58 (58%) male patients. The findings indicated that 76 patients (76%) had negative results and 24 patients (24%) had positive result. Adenovirus type-3 DNA detection did not significantly differ between males and females (52.26% and 47.74%, respectively; $p>0.05$). The investigation revealed an insufficient correlation between location, age and gender with positive results.

Keywords: *HAdV, DNA, RT- PCR*

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INTRODUCTION:

Adenovirus is a dual-stranded, linear, without envelop virus that is a member of the *Mastadenovirus* species and family Adenoviridae. The HAdV about 70–90 nm double-stranded DNA virus with an icosahedral shape and a roughly 36 Kb genome [(1)]. Based on genome homology, HAdV's more than 100 genotypes are divided into seven species (A–G) [(2)]. Human adenovirus type 3 (HAdV-3) respiratory tract infections cause serious morbidity and mortality in both adults and children, globally15% to 87% of all adenoviral respiratory infections are caused by HAdV-3, which has lately emerged as the primary cause of acute respiratory infections globally [(3)]. Immunocompromised hosts are susceptible to severe or widespread AdV infections, but immunocompetent patients are rarely affected [(4)]. Infections happen all year round with no discernible seasonality, nevertheless, outbreaks typically occur in the colder months or during the springtime. Reactivation, acquisition from external sources, or contact to infected people (aerosolized droplet breathing, corneal infection, or oral spread of feces) can all lead to infection [(5)]. The period of incubation phase lasts between two and fourteen days. Those with immunocompetent conditions, illness produces type-specific immunity, and symptoms usually pass away on their own (within two weeks) [(6)].

The current research objective was to identify viral DNA genotype 3 among adult's patients with respiratory infection.

Material and Methods

The present cross-sectional study enrolled one hundred patients with respiratory infection (54 males and 46 female) who attended to Kirkuk Teaching Hospital was the center of this investigation /Azadi Teaching Hospital and Gynecology, Pediatrics and Women Hospital in Kirkuk state from January 11, 2024, until March 3, 2025. Each patient completed a short survey. Adenovirus DNA genotype 3 was examined in the plasma of 100 individuals with respiratory infections after five milliliters of blood were drawn.

Inclusion criteria was including patients above 17 years with signs of respiratory infection while excluded criteria including patients under 18 years and child with or without signs of respiratory infection.

The statistical evaluation was conducted using the test known as the chi-square test. P values were deemed statistically significant if they were lower than 0.05 and insignificant if they were greater than 0.05.

Results and Discussion:

The current investigation indicated that 24% of patients with respiratory infection have adenovirus genotype 3 with 8% of the control group with significant relation ($p<0.05$) (Table 1).

Human adenovirus-3 is associated with outbreaks in communities and institutions in addition to occasional infection. It is evident that, especially in Asian countries, HAdV type 3 respiratory infections have grown to be a serious worldwide problem in recent years. [(7)] . Bastug *et al* [(8)] found that Adenovirus genotype 3 was the most prevalent genotype among patients in Turkey with HAdV respiratory infections (39.1%). According to study, the most common genotype of respiratory infections in southern China is HAdV type 3 [(8)]. The incidence of HAdV type 3 among four types (From A to E without D type) recognized in situations of severe respiratory infections in medical centers in China, with adenovirus type 3 as the maximum predominant HAdV types [(9)]. In study done in South America, Colombia,they found that the main causes of respiratory infection is due to HAdV type 3 among other HAdVs[(10)]. Our study with agreement with Abdullah *et al* who reported 27.5% of HAdV type 3 in admitted patients were older than 18 years in USA[(11)].

These results suggest that the prevalence of HAd type3 may vary by region. Numerous additional factors, such as the type of clinical sample, the ages, occupations, underlying conditions, and sampling period throughout the patients' illnesses, may also have an impact on these variations in HAdV type3 prevalence.

The distribution of adenovirus infection among adult with respiratory infection patients was not significant based on gender (Table 2). Despite the fact that there was no discernible variation (P>0.05), the rate of man (5**4**.**1**6%) was greater than that of women. (**4**5.84%). In research prepared in China , Guangzhou city on patients of all ages, Wang *et al* [(12)] discovered a non-significant correlation between patients' male and female gender with different species of infection by adenovirus include HAdV type 3 .In onther study done in China, YangXi FY *et al*[(13)] also found no statistically significant differences according to gender. Rahman [(14)], in patients with respiratory infection that caused by adenoviral, could not find any statistically significant correlation between males and females (p value=0.61).

In regard to age, patients within the (40–49) age group had the greatest adenovirus type3 rate (41.67%) followed by age groups (18-28, 29-39) (33.33%,12.5% respectively) (Table 3), the findings were not statistically significant (p>0.05). in study done in China, Liu *et al* [(15)] found the high adenovirus type 3 outbreak occurred among military age group. Deshun *et al* [(16)] revealed that the adenovirus viral rate type 3 infection was 13.13% in age group 15->65 patients with respiratory infection in study done in Huzhou, China and the relation was non-significant (p =0.47). In study done in Southern of Brazil, Pscheidt *et al*, shown that the adenovirus infection rate was (12.6%) in patients with acute respiratory infection among age group (20-39) years [(17)].

These age-group differences could be caused by the patients' immune conditions, the genetic variation of adenovirus type3, and the probability that older patients will have a lower immune response.

The research revealed that 54.50% among patients who have contracted adenovirus were from cities, while 45.50% came from the countryside (Figure 1). In study done in Nigeria , The prevalence rate of adenovirus concurrent infections among residents of cities was a little greater (39%) than that among rural settlers (33%; p<0.05). [(18)]. Khoshnaw *et al* [(19)] discovered no association between residence and Hadv infection. These discrepancies in the results could be caused by inadequate health care and the population densities in cities and rural regions. Economic considerations may also contribute to the high rate of urban residents brought on by rural-urban migration, which would cause these cities to become more crowded and congested.

Table 1: The rate of adenovirus genotype type 3 among adult patients with respiratory infection

Adenovirus type 3	**The study groups**			
	Patients with Respiratory Infection		**Control group**	
	No.	**%**	**No.**	**%**
Total positive	24	24	4	8
Negative	76	76	46	92
Total	100	100	50	100
X^2	6.17			
P. value	0.01			

Table 2: Distribution of adenovirus genotype type3 among patients with respiratory infection accordi ng to sex.

Sex	Patients with Respiratory Infection		Adenovirus type3 positive
	No.	%	No. (%)
Male	**58**	(58%)	**13**(54.16)
Female	**42**	(42%)	**11**(45.84)
Total	**100**	**100%**	**24%**
X^2			**0.26**
P			**>0.05**

Table 3: Human adenovirus type3 infection distribution among adult patients with respiratory infection according to age

Age groups (Years)	No. of patients	Adenovirus type 3	
		No.	%
18-28	19	8	(33.33)
29-39	31	3	(12.50)
40-49	28	10	(41.67)
50-60	12	2	(8.34)
61-71	10	1	(4.16)
Total	100	24	(100)
X^2		0.49	
P. value		>0.05	

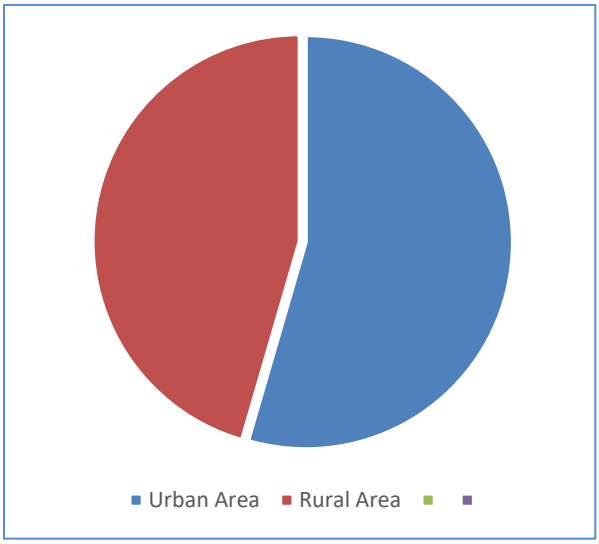

Figure 1: Distribution of adenovirus type 3 infections by residence in adult respiratory illness patients

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