

Study the Prevalence of Upper Respiratory Tract Infections disease in high mountain area Hunza, Gilgit-Baltistan via Statistical Analysis

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Abstract

It is known that Upper respiratory tract infections (URTI) are among the most known causes of outpatient appointments globally. The current study investigates the prevalence of UTRI among population of Hunza District, Gilgit-Baltistan, may help to reduce the mortalities and comorbid health issues by taking prompt actions. The mountainous region Hunza is situated at high altitude, experienced cold weather conditions and have not better human health care facilitates. The continuous negligence may lead to the outbreak of this disease in whole Hunza District. A cross-sectional study and Exploratory Data Analysis (EDA) were applied to investigate the prevalence of UTRI and used monthly data from the year 1st July- 2014 to 31-March -2016. The current study showed positive UTRI, 66.2% in age group ≤ 20 years, similarly 23.5% age group in 21-40 years old, further 6.9% in age group 41-60 years old whereas 3.20% in age groups of 61-80 years old. The overall gender-based prevalence of UTRI in all age group showed higher 53.1% in males as compared to 46.9% in females. URTI become burning health concerns all over the world, especially in less developing regions and must pay a high cost to the people of the society. The clinical study, significant results are convinced and suggested for further analysis of this disease on broad scale in the society.

Keywords: Upper respiratory tract infections (URTI), prevalence, disease, statistical analysis.

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1. INTRODUCTION

It is known that respiratory diseases occurred due to the exposure of nasty pathogens that cause severe injuries and mutations in pulmonary tissues of organism resulting in the disruption of gaseous exchange between organs and tissues. Upper respiratory tract infections (URI / URTI) where acute infection fashioned illness transpire, mostly involved upper respiratory tract (URT) with the larynx pharynx, sinuses, and nose [1]. It was observed that the prevalence of URTI due to helminths or fungal infections were less common or rare [2]. The pulmonary tract infections were mostly associated with viral, bacterial or by their combined interaction in an individual [3, 4].

The procedures were supported by a corresponding logical assessment of the literature examining the measured characteristics and test performance in adults with chronic respiratory conditions [5, 6]. The main toxicities and signs contained within the viral rhinitis, dysphonia, stuffy nose, otitis media, sore throat, sinus, and tonsillopharyngitis [7]. Exposure to emitted nitric oxide in the air, as well as indoor and outdoor air pollution, is associated with concerns related to upper respiratory tract infections [8, 9]. It has been noted that cold and common respiratory viruses were main agents of asthmatic infections in adults [10]. The prevalence of upper and lower respiratory tract infections was reported in school children's, 80% episode of reduced peak expiratory flow while rhinovirus was found in 80% of wheezing episodes and 85% of upper respiratory system infections [10]. Different humanoid pneumonia viruses (hMPV) reported in young children that were responsible for respiratory tract disease to severe pneumonia and bronchitis [11]. It was studied that, in addition to other common conditions such as middle-ear infection and sinus, viral URI in youngsters are often obscured [12]. General physicians and practitioners get superior results by implies economical, less dedicated apparatus and continuous research, with focused more on the clinical features and measure on these issues [13]. There is low oxygen available to respire in the environment of high-altitude zone resulting inhabitants are more prone to experience the respiratory disease [14].

The basic goal of this study analysis is to inspect the prevalence and age-related patterns of hospitalizations related with URTI in the high mountain area of district Hunza, Gilgit-Baltistan, Pakistan.

2. METHODOLOGY AND DATA ANALYSIS

2.1. SOURCE OF DATABASE

The monthly case-based disease datasets were obtained from the Aga Khan Health Centre Aliabad district Hunza, Gilgit-Baltistan, from the years 1st July 2014 to 31st March 2016. Before the sample collection, patients were conversant by the

doctor about the test, and samples were taken for culture and sensitivity analysis. The study was organized after obtaining approval from the universities and hospital ethics committees, and all ethical principles were followed throughout the research.

2.2. STATISTICAL ANALYSIS:

Several studies have applied descriptive frequency analysis of outpatient records to estimate URTI incidence, patient demographics, and symptom patterns [4, 15, 16, 17]. For example, a cross-sectional outpatient clinic study reported that URTI accounted for 13.3% of total hospital visits, with cough and fever being the most repeated symptoms [17]. These studies demonstrate that frequency-based analysis is a useful method for understanding the epidemiology of URTI in outpatient populations.

Cross sectional study and Exploratory Data Analysis (EDA) which includes basic statistical approaches frequency distribution and inferential statistics including mean, standard deviation (SD) and percentages measurement were applied for methodological study. A sample Student's t-test and the Chi-square test were applied to illustrate whether differences in the data were statistically significant, with $p < 0.05$ considered as the threshold for significance [16]. The results were also illustrated using graphical representations. Data analysis was performed using SPSS version 17 and Microsoft Excel.

3. RESULTS AND DISCUSSION

It is observed that URTIs are presently known diseases in society and are considered a major cause of disability, death, and outpatient care, mostly during the winter season in colder areas. Children aged less than five years lose their lives mainly due to upper respiratory tract infections (URTIs). The most dangerous infectious agents causing acute respiratory tract infections include infections and bacterial viruses such as cold, respiratory syncytial infections, rhinovirus, influenza symptoms, and Human Parainfluenza Viruses (HPIVs) [18, 19, 20].

3.1. INVESTIGATION OF GENDER GROUP FOR URTI CASE

This research was chosen to estimate the prevalence of URTI in Hunza region. The incidence of URTI infection for the study period was greater as compared to other infections in Hunza district. It is observed that there are total 1385 URTI cases noted for the duration of the research time. The datasets were categorized under the gender and age groups. The findings indicated that URTI were more frequently observed in male patients, 735 (53.07%) with a mean of 1.4245 ± 0.7323 , compared to female patients, 650 (46.93%) with a mean of 1.5338 ± 0.8156 . These findings were consistent with the results of the research carry out (Resm et al., 2016) as shown in Table: 1 and Fig.1.

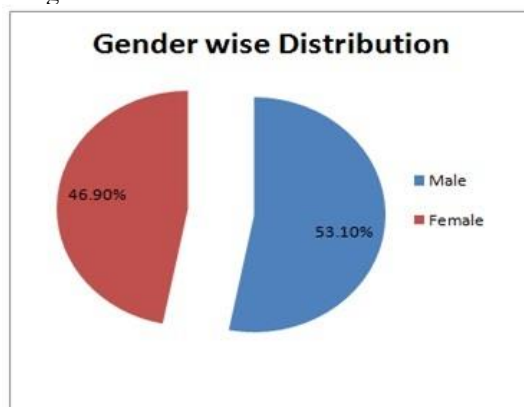


Fig. 1 Gender Wise Distribution of URTI patients

Table 1: Distribution of URTI according to GENDER Groups

GENDER	Frequency	Percent (%)	Mean	S. Deviation
MALE	735	53.1	1.4245	0.7322
FEMALE	650	46.9	1.5338	0.8156
Total	1385	100.0	1.4758	0.7742

3.2. INVESTIGATION AND INCIDENCE WITHIN AGE GROUP FOR URTI CASES

It is noted that the age group distribution of outpatients with URTI in Hunza district was analysed. A total sample data of 1,385 URTI cases was categorized according to different age groups, with patient ages ranging from 1 day to 100 years. The results revealed that the most affected age group in this study was 0–20 years, comprising 917 patients (66.2%) with a mean of 1.4460 ± 0.4973 . The second most prevalent group was 21–40 years, with 326 patients (23.5%) and a mean of 1.4969 ± 0.5007 . Similarly, the 41–60 years age group included 95 patients (6.9%) with a mean of 1.5684 ± 0.4979 , while the 61–80 years group contained 45 cases (3.2%) with a mean of 1.5112 ± 0.5056 . By comparison the age group greater than 81 years had the smallest number of patients, with only 2 cases (0.1%) and a mean of 2.0000 ± 0.0000 , as shown in Table 2 and Figure 2. A comparative analysis of gender and age groups was also presented in Figure 3.

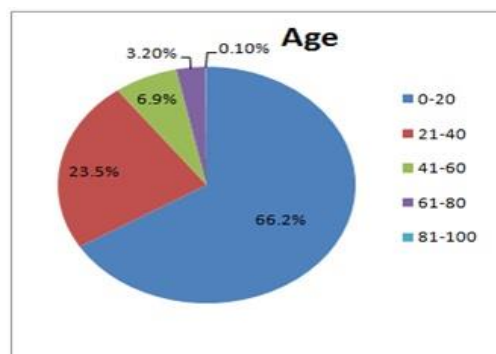


Fig 2. Distribution of Age groups of study subjects (URTl) from 1st July 2014 to 31th March 2016

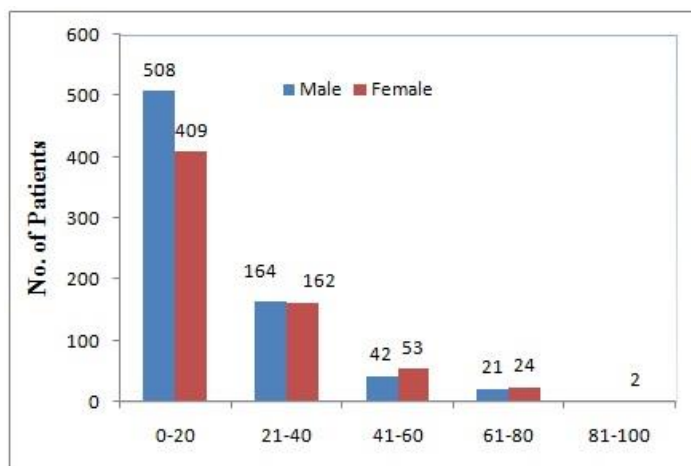


Fig 3. Histogram of Gender and Age group range of study subject (URTl) from 1st July 2014 to 31st March 2016

Table 2: Descriptive statistics of URTl according to Age group

Statistics	AGE GROUP					Total
	0-20	21-40	41-60	61-80	81-100	
Frequency	917	326	95	45	2	1385
Percent (%)	66.2	23.5	6.9	3.2	0.1	100
Mean	1.4460	1.4969	1.5684	1.5111	2.0000	1.4693
Std. Deviation	0.49735	0.50076	0.49792	0.50553	0.00000	0.49924
Std. Error	0.01642	0.02773	0.05109	0.07536	0.00000	0.01341

3.3. INTERPRETATION OF CHI-SQUARE GOODNESS OF FIT TEST ANALYSIS

Tables 3(a) and 3(b) present the distribution patterns of the observed incidences of URTl across different gender and age groups, along with the expected frequencies assuming the null hypothesis is true. The tables also include the results of the chi-square goodness-of-fit test and the equivalent p-values. Additionally, the residual column shows the change between the observed and estimated frequency values.

Results of this research indicated that males were further vulnerable to upper respiratory tract infections than females ($\chi^2 = 5.217$, $p < 0.05$), indicating a statistically significant association. The results also indicated that the age group greater than 20 years had a greater incidence of URTl compared to other age groups ($\chi^2 = 2074.275$, $p < 0.05$), such values were statistically considerable at the 95% confidence interval.

Table 3: The Chi-square and p-value for test groups

(a) Gender Group

Gender	Observed N	Expected N	Residual	Chi-Square Test	p-value
MALE	735	692.5	42.5	5.217	0.022

FEMALE	650	692.5	-42.5		
Total	1385				

(b) Age Group

Age	Observed N	Expected N	Residual	Chi-square Test	p-value
0-20	917	277.0	640.0	2074.275	0.000
21-40	326	277.0	49.0		
41-60	95	277.0	-182.0		
61-80	45	277.0	-232.0		
81-100	2	277.0	-275.0		
Total	1385				

In conclusion, a 1-sample t-test was applied individually to the gender and age group, as well as for the comparison between gender and age groups. The data analysis results indicated a considerable change in the prevalence of URTI between both gender and age groups as $P < 0.05$. These results are presented in Table 3(a), and Table 3(b). It is observed that the mean value was measured 1.469 ± 0.423 for the gender group, while 1.476 ± 0.774 for the age groups. These values are considered as near to the assumed value of 1. Similarly, the significant value of the test statistics is 0.0000 i.e. far lower than the threshold value 0.05. Therefore, the null hypothesis is rejected, indicating that at least one of the means is considerably different, as shown in the table 4 (a) and Table 4(b).

Prevalence of UTRIs was studied due to the greatest known prevalence transmittable infections in the mountainous area of Hunza, village Aliabad, and found that there are no better facility and access to necessary treatment. A total of 5,996 cases with approximately 40–50 diverse kinds of diseases were confirmed throughout the study time interval. The reported common diseases included URTI, UTI, acute viral gastroenteritis, fungal infections, general fever, hypertension (HTN), asthma, and several others. Among these, infectious diseases URTI was identified as the most prevalent and frequently occurring disease.

Table 4: Comparison of sample statistics and the student's 't' test for both group gender and Age group**a. One Sample statistics**

GROUPS	N	Mean	Std. Deviation	Std. Error Mean
GENDER	1385	1.4693	0.49924	.01341
AGE	1385	1.4758	0.77415	.02080

b. The student's 't' test for study groups

GROUPS	Test Value = 1					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper

GENDER	34.985	1384	0.000	0.46931	0.4430	0.4956
AGE	22.874	1384	0.000	0.47581	0.4350	0.5166

The results showed that most people visited during the year 2014. It has been confirmed that adult and child age group (under 20 years old) was most affected group. In this way, comparison of consultation of gender group in overall diseases, male to female patients' ratio reported was 41.8% (or 2509) and 58.2% (or 3487) cases respectively.

Current study detected a multiple range of common respiratory disease, but it was not exhaustive and certainly it may have to neglect yet undesirable URTIs. This epidemiological study was conducted to analyse the pattern of Upper Respiratory Tract Infections (URTI) in the Hunza district. The age-wise distribution showed that URTI was most common in individuals aged ≤ 20 years, which is considered 66.2% of the total cases. The second highest occurrence was observed in the 21–40 years age group, representing 23.5% of the cases.

The study also found that URTI prevalence was slightly higher among males (53.1%) as compared to females (46.9%). Furthermore, the chi-square test results were statistically significant for both the age distribution groups and gender categories, indicating a meaningful association between URTI prevalence, age, and gender.

4. CONCLUSION

It is known that Respiratory tract infections are recognized as known transmittable diseases and a significant public health concern worldwide. The objective of this research was to inspect the prevalence of URTI in the Hunza district. The occurrence of this disease in human beings is due to the exposure or contact with nasty pathogens. This study conducted on the patients of different ages affected by upper respiratory tract infections, the detailed case history was documented in Aga Khan Health Centre Aliabad, Hunza.

On methodological analysis, statistical approaches, such as frequency distribution and inferential statistics were applied prudently. In this study the student's *t*-test and the Chi-square test were applied to estimate the statistically considerable of the URTI disease datasets. The results demonstrated a relationship between URTI and age in the Hunza region. It was observed that URTI occurred most frequently in individuals aged ≤ 20 years, while the 21–40 years age group showed the second highest prevalence. The study also indicated that the prevalence of URTI was slightly higher in males as compared to females. The chi-square test results were found highly significant for all groups of age and gender.

These results highlighted that URTI has become burning health concerns all over the world, especially in less developing regions and has to pay a high cost to the people of society. The clinical study, significant results are influenced and suggested for further analysis of URTIs on broad scale in society. URTIs persists as a main public health problem in cold regions, particularly among vulnerable age groups. Protective plans such as better hygiene practices, vaccination programs, and public health awareness are recommended to minimize the burden of URTIs in Hunza district and nearby remote areas.

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