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ORIGINAL ARTICLE

An analysis of risk factors for ENT diseases: A case study of D. G. Khan and Rajanpur Districts, Punjab, Pakistan.

Mujahid Hussain[1], Muhammad Ejaz[2], Aamna Khan[3]

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ABSTRACT… Objective: To determine the core risk factors of Ear, Nose and Throat (ENT) diseases at D. G. Khan and Rajanpur districts of Punjab, Pakistan. **Study Design:** Cross Sectional Case Control study. **Setting:** A sample of 1553 individuals including two categories, ENT Diseased (Case) and ENT diseased free (Control) respondents including both males and females was collected from different hospitals of D. G Khan and Rajanpur Districts. **Period:** June 2021 to June 2022. **Material & Methods:** Data for this study have been collected by formulating a questionnaire. That questionnaire was then completed by face to face interviewing. Chi-squared test is used to check the association between the assumed risk factors and ENT diseases. Odds ratios are calculated to measure the strength of association between assumed risk factors and ENT diseases. Looking at the dichotomous nature of the response variable, a binary logistic regression model is also applied to assess the overall influence of potential risk factors on developing the ENT diseases. **Results:** In our sample of 1553 respondents, 41.47% are females and 58.53% are males. The percentage of clinically diagnosed ENT diseased patients is 54.92% and those of controlled ones is 45.08%. Among the diseased respondents, 57% have ear disease, 19.2% have nose disease and 23.8% have throat disease. Age, education, family status, family system, marital status, slow physical activity, smoking, Naswar, Paan, family history, occupation, work place, water, ventilation, nutrition and tea are found to be the most significant risk factors of developing the ENT diseases. **Conclusions:** The occurrence of ENT diseases can be reduced by giving the awareness to the people about its risk factors.

Key words: Binary Logistic Regression, ENT Diseases, Odds Ratio, Risk Factors.

INTRODUCTION

According to World Health Organization (WHO); "Health is a state of complete mental, physical and social well-being and not merely the absence of disease or infirmity." Life is exposed to the risk of numerous diseases. Our study's main target was the ear, nose, and throat (ENT) condition. This study focuses on those individuals who lack extensive knowledge of ENT illness and are unable to determine the number of risk factors that may contribute to the development of this condition. The prevalence of ENT disorders is rapidly rising and affects a sizable section of the population. The quality of a person's life can be significantly affected by ENT dysfunction, which in certain situations could be a serious medical emergency. Due to the frequency of ENT disorders and associated consequences, the majority of persons affected manage their ENT concerns without seeking medical treatment. ENT symptoms are frequent in the community, with periods based on gender, age, and work. By raising people's understanding of the ENT contributing variables, this issue can be mitigated. It is crucial that those who are impacted by this issue understand how to properly care for and treat themselves. There are many ENT disorders from basic issues like allergies to serious issues like malignancies, that have an impact on people's life and are emerging as a public health issue. While some ENT conditions are acquired, some are inherent. Prior research work related to this problem assumed only few important risk factors.

1. M.Phil (Statistics), Assistant Professor, Govt Associate College, D.G Khan, Pakistan.
2. Ph.D (Statistics), Assistant Professor Statistics, Bahauddin Zakariya University, Multan, Pakistan.
3. Ph.D, Lecturer Statistics, Bahauddin Zakariya University, Multan, Pakistan.

Correspondence Address:
Dr. Muhammad Ejaz
Department of Statistics
Bahauddin Zakariya University, Multan, Pakistan.
ejazamin@bzu.edu.pk,

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Many researchers observed only symptoms of ENT problems and very little work is accessible that covers all the features of this problem. Now, at this time it is compulsory that more work should be done that covers all-important and causative risk factors for raising this problem. Moreover, this information is useful for health institutions and ENT specialists so that they take reasonable measures for minimizing the risks of emerging this problem in the population. Awareness of preventive measures can support to minimize ENT problem which is one of the major health problems in Pakistan. The reason why we have conducted this study is the fact that the people of D. G. Khan and Rajanpur Districts are comparatively more exposed to ENT diseases than the other districts of South Punjab. Therefore, we aimed to find the potential risk factors of ENT diseases in the above stated districts. More specifically, the data have been collected from Teaching Hospital D. G. Khan, THQ Hospital Jampur (Rajanpur) and from different private clinics of both D. G. Khan and Rajanpur Districts of Punjab, Pakistan. Twenty important variables (Risk factors) have been included in this study that were surveyed from each ENT patient (case) and ENT diseased free (control) respondent.

A variety of research on different aspects of ENT diseases has been done such as ENT in the context of global health[1], Africa's challenged ENT services[2], management technique in the diagnosis of ENT diseases[3], The Role of Allergen-Specific Immunotherapy in ENT Diseases[4], ENT diseases presenting to a tertiary care hospital[5], Prevalence of ENT diseases[6], Analysis of ENT diseases at Khyber teaching hospital[7], An audit on ENT diseases in a tertiary health institution in Southwestern Nigeria[8] among others.

MATERIAL & METHODS

Settings

This is a cross sectional case control study focused on determining the potential risk factors of ENT diseases in D. G. Khan and Rajanpur Districts of Punjab, Pakistan. The survey was conducted during the period of June 2021 and June 2022.

The primary sample of 1553 individuals including two categories (ENT Diseased, 853 and ENT diseased free, 700 respondents) from D. G. Khan and Rajanpur Districts were collected by face to face interviewing through a questionnaire. Our sample consists of both male and females respondents including children and adults. Purposive sampling technique was used to gather information from different private clinics, Teaching Hospital D. G. Khan and Tehsil Headquarter Hospital (THQ) Jampur (Rajanpur).

A sample of size n for this study has been determine by using the following equation[9]

$$n = \frac{z^2_{\alpha/2}.p(1-p)}{e^2},$$

where p is the proportion of diseased people in the population, $z_{\alpha/2}$ is value taken from standard normal curve at $\alpha/2$ level of significance and e is the margin of error in estimating the proportion of diseased people in the population.

The information regarding the age, gender, education, living area, occupation, distance of residence/work place of people from polluted area, physical inactivity, work place, drinking water, ventilation, smoking behaviour, family status, family system, marital status, nutritional status, taking tea, number of cups of taking tea in a day, addicting Naswar, chewing Paan and family history of both the ENT diseased and ENT diseased free respondents was taken through an adequate questionnaire.

STATISTICAL METHODS

To determine the risk factors of ENT diseases, we use Chi-squared test and odds ratio. We also apply the binary logistic regression to determine the overall influence of the considered explanatory variables on the prevalence of ENT diseases.

	ENT Disease	
	Present	Absent
Exposed Group	a	b
Un-exposed Group	c	d

Table-I. A 2×2 Contingency table

For testing the association between two variables as shown in Table-I, we use the Pearson's Chi-squared test. The Chi-squared test statistic is given as

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i},$$

where O_i are the observed frequencies and E_i are the expected frequencies. This statistic has an approximate χ^2 distribution with $k-1$ degree of freedom if the null hypothesis H_0 (there is no association between two stated variables) is true. In order to measure the strength of association between two variables of Table 1 for example, we also estimate the odds ratio (O.R) as

$$O.R = \frac{\Omega_1}{\Omega_2} = \frac{\text{Odds of ENT diseases in the exposed group}}{\text{Odds of ENT diseases in un} - \text{exposed group}} = \frac{a/b}{c/d} = \frac{ad}{bc}$$

where O.R = 1.0 indicates no association and the strength of association increases with an increase in its value.

Further, we fit a binary logistic regression to assess how the assumed risk factors overall contribute in developing the ENT diseases. Logistic regression estimates the probability of an event occurring, such as ENT diseased or ENT diseased free respondent, based upon given risk factors (independent variables). As the resulting outcome is a probability, thus dependent variable is bounded between 0 and 1. A binary logistic regression model is given as

$$\text{logit}[P(X)] = \log\left(\frac{P(X)}{1-P(X)}\right) = \alpha + \sum_{i=1}^{k} \beta_i X_i, i = 1, 2, \ldots, k,$$

where $P(X)$ is the probability of an individual having ENT diseases given the risk factors X_1, X_2,…,X_k. Also, α is the intercept and β_i, i = 1, 2, …,k are coefficients of the considered risk factors. For data analysis, we use SPSS version 20 and Minitab 17.

RESULTS

Descriptive analysis shows that among the sample of 1553 respondents 644 (41.47%) respondents are female and 909 (58.53%) are male as shown in Figure-1. In our sample 54.93% are clinically diagnosed ENT diseased (case) and 45.07% are control. Among ENT diagnosed patients 43.1% are female and 56.9% are male patients. Among the ENT diseased people, 43.6% are illiterate while only 6.2% graduates and 95.54% people live in dust and noise polluted area.

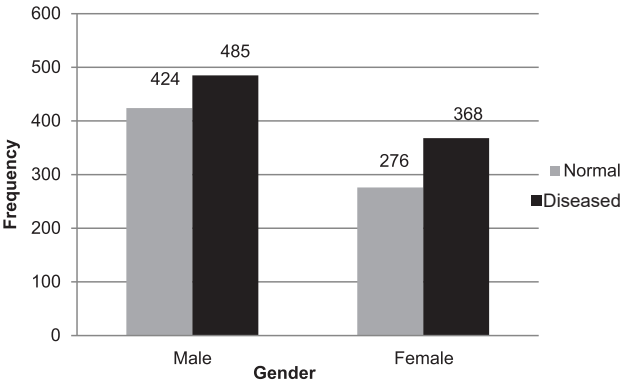

Figure-1. Chart of ENT diseased and ENT diseased free (Normal) people by their gender

Among ENT diseased people, 68.81% people drink hand pump water, 14.3% people are smokers, 39.2% are passive smokers, 49.2% are married, 56.5% belongs to poor family background, 40.6% people belong to middle class family background, 23.4% have family history of ENT disease.

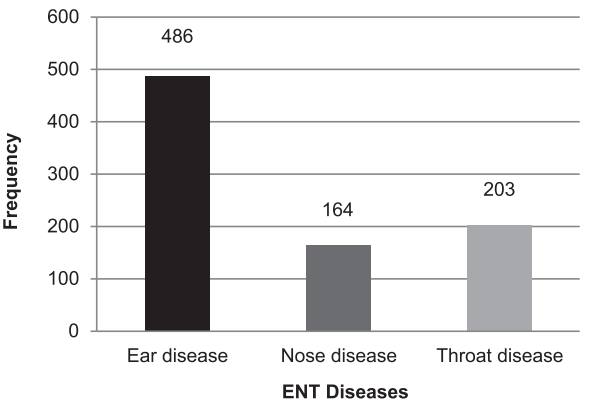

Figure-2. Chart of ENT diseases

Figure-2 shows that among 853 ENT diseased respondents, 57% suffer from ear disease, 19.2% suffer from nose and 23.8% suffer from throat disease. Among the ear disease patients Chronic Suppurative Otitis Media (CSOM) was the most common ear disease (26.54%). Among the patients with nasal symptoms most common problem was allergic rhinitis (43.90%) while sinusitis was seen in 20.73% patients. In the

patients with throat problems most common were tonsillitis (21.7%), sore throat (20.2%), Pharyngitis (16.3%) and Allergy (14.2%).

In the whole sample of 1553 respondents, 830 (53.44%) are in age 11-35 years. The odds of ENT diseases in age group 51-65 years are 7.14 times higher than the age group of 11-35 years. When we compare the odds of ENT diseases of females with those of male respondents, we find that the odds in females are 1.16 times higher than those of male respondents.

In our sample, illiterate people are 28.46%, primary level education are 30.91%, Matriculation are 25.63% and graduate or higher education are 15%. The odds of ENT diseases in illiterate people are 18.05 times higher than the literate people. In the same fashion, we interpret the odds ratios for the other risk factors such as polluted area, physical activity, occupation, drinking water, ventilation, place of living, smoking, economic status, family system, tea intake, addicting Naswar, chewing Paan and family history.

Risk Factors	χ^2	d. f	p-value
District	28.02	1	0.000*
Age	165.57	6	0.000*
Gender	2.18	1	0.139
Education	270.32	3	0.000*
Area	75.75	3	0.000*
Distance	7.01	2	0.030*
Physical Activity	330.75	2	0.000*
Occupation	108.39	3	0.000*
Work Place	51.82	3	0.000*
Water	70.12	2	0.000*
Ventilation	171.30	2	0.000*
Smoking	39.84	2	0.000*
Nutritional Status	47.07	1	0.000*
Marital Status	47.07	1	0.000*
Economic Status	277.65	2	0.000*
Family System	210.63	2	0.000*
Taking Tea	5.10	1	0.000*
Cups of Tea (per day)	55.63	6	0.000*
Naswar Addiction	19.99	1	0.000*
Chewing Paan	26.86	1	0.000*
Family History	15.05	1	0.000*

Table-II. Chi-Squared Test for Association between ENT Diseases Status (case/control) and assumed Risk Factors
A p-value with * represent the significant variable at α = 0.05 for ENT diseases.

Table-II shows the results of Chi-squared test for association between the considered risk factors and ENT Diseases. We find that age, education, area of living, distance from polluted area, physical activity, occupation, work place, water, ventilation, smoking, nutritional status, marital status, family status, family type, taking tea, cups of tea, addicting Naswar, chewing Paan, family history are significant risk factors of developing ENT Diseases in the people of DG Khan and Rajanpur Districts.

Risk Factors	Coef.	S.E Coef.	p-value
Constant	1.74370	0.768605	0.023
Age	-0.029537	0.007493	0.000*
Gender	-0.026734	0.158200	0.866
Education	-0.603763	0.084715	0.000*
Area	-0.002635	0.117931	0.982
Distance	-0.017266	0.004658	0.000*
Physical Activity	-1.91130	0.159567	0.000*
Occupation	-0.136967	0.114572	0.232
Work Place	0.704790	0.127081	0.000*
Water	-0.482971	0.165251	0.003*
Ventilation	1.41925	0.165249	0.000*
Smoking	0.423102	0.122646	0.001*
Nutritional Status	0.0929567	0.138267	0.501
Marital Status	0.524543	0.225137	0.020*
Family Status	-0.846728	0.139127	0.000*
Family System	0.644486	0.118420	0.000*
Taking Tea	0.291146	0.244325	0.233
Cups of Tea	-0.313835	0.086042	0.000*
Naswar Addiction	0.119533	0.207390	0.564
Chewing Paan	0.774725	0.322933	0.016*
Family History	0.536310	0.168323	0.001*

Table-III. Evaluation of Risk Factors for ENT Diseases by Binary Logistic Regression
A p-value with * represents the significant variable at α = 0.05 for ENT diseases.

Table-III shows the results of binary logistic regression. We find that drinking water, marital status, chewing Paan, age, education, distance from polluted area, physical activity, work place, ventilation, smoking behavior, family status, family system, cups of taking tea and family history are significant risk factors while gender, area, occupation, nutritional status, taking tea and addicting Naswar are not significant for the prevalence of ENT diseases.

In Table-III, the estimated coefficient of -0.026734

for gender e.g., represents the change in the log of odds i.e., P(ENT disease)/P(no ENT disease) when the subject male compared to female, with the other variables held constant. Similar is the interpretation for the other variables included in the model.

DISCUSSION

Hearing loss problem and many other ENT diseases occur in old age. Among the different age groups formed in our study, the maximum odds ratio of occurring ENT diseases is for the age group 51-65 years as compared to the age group of 11-35 years. Previous research shows that males have high risk than females to develop ENT diseases but gender is found to be an insignificant variable in our study. The illiterate people are more likely to develop ENT diseases as compared with the literate people. The likelihood of developing the ENT diseases in illiterate people increases with the increase in level of education of the compared group. The people with a slow physical activity are more likely to develop the ENT diseases when compared with those having a normal physical activity. It is an interesting finding that the people living in the villages in ventilated houses are more likely to develop ENT diseases compared with the people living in cities having poor ventilation in their houses. People who drink hand pump water in these two districts are more likely to prevail the ENT diseases when compared with those who drink mineral or filtered water. The odds of developing the ENT diseases in passive smokers are higher than those of non-smokers. The people belong to lower class are more likely to have ENT diseases than the people belong to middle class family background. Married people are more likely to have ENT diseases than unmarried people. Also, the people living in joint family system are more likely to have ENT diseases than the people living in nuclear family system. The people addicting Naswar and chewing Paan are more likely to develop the ENT diseases when compared with those of non-addicting Naswar and Paan. Finally, the people having family history of ENT diseases are more likely to have ENT diseases than people having no family history.

CONCLUSION

In our study, we found that the likelihood of ENT diseases are more common in old age people as one can expect. When we take into account other factors, we concluded that the prevalence of ENT diseases in the selected Districts may be reduced by educating the populace, sanitizing the workplace, increasing physical activity, drinking filtered water, quitting smoking, averting Naswar, and Paan, improving economic status, improving nutrition and intake of tea, and most importantly by raising the living standards.

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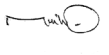
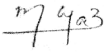
AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Mujahid Hussain	Data collection, Statistical analysis and writing of the draft.	
2	Muhammad Ejaz	Interpretation of the result, reviewing and editing of the final draft.	
3	Aamna Khan	Interpretation of the result, Reviewing and editing of the draft.