Research article

DETERMINATION OF RISK FACTORS OF GASTROENTERITIS THROUGH STATISTICAL TECHNIQUE IN PUNJAB, PAKISTAN

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Abstract

The main aims of this study are to find out the significantly associated risk factors with Gastroenteritis and their predictive strength through a regression model. A case control study was conducted on 400 patients including 200 cases and 200 controls from April 2007 to September 2007 at emergency departments of two teaching hospitals of Lahore, Mayo Hospital and Services Hospital. Risk factors associated with Gastroenteritis were determined and the collected data was entered on SPSS version 15. Chi-square test was applied to find any association of factors at 5% level of significance. A multivariate analysis and multiple logistic regression modeling technique was performed to find the significantly associated risk factors with gastroenteritis. Out of 400 patients about 51.5% males and 48.5% females and about 43.0% cases did not married and younger. Results from multivariate analysis showed that, Patients who have household income, Parents education, attended unusual event, pound nearby home, poor drainage system, use of antibiotics, and drinking juices from an open shop (Rahri) were the significant risk factors associated with gastroenteritis with estimated risk about, 0.779, 0.551, 1.763, 1.746, 2.065, 1.633, 1.764, respectively as compared to others. Among these household income and parents education have negatively association while all others were positively associated with gastroenteritis disease. Parents education, attended unusual event, pound nearby home, poor drainage system, use of antibiotics, and drinking juices from an open shop (Rahri) were the significant risk factors associated with gastroenteritis

Key words: Gastroenteritis, Risk factors, regression model

INTRODUCTION

Gastroenteritis is defined as inflammation of stomach and intestinal mucosa due to infections or irritation. Around the world diarrhea remains one of the most common illnesses among children. Although diarrhea kills about 4 million people in developing countries each year, it remains a problem in developed countries as well. Diarrhea is common in all age groups but more common in infants. Annually at least 1500 million episodes of diarrhea occur in

children under age of 5 years [1]. Children younger than 5 years are at much higher risk of death from diarrhea than older children and adults, and infants, younger than 1 year are at the highest risk of death. Studies from Pakistan reported that 43% to 78% of deaths from diarrhea among children younger than 5 years occur in the first year of life [2].

Viral pathogens are the most common cause of gastroenteritis in industrialized countries.[3,4] Mead et al. have estimated that of the 38.6 million annual cases of gastroenteritis in the United States, 30.8 million (80%) are the result of viral infections[5.] Among viral causes, Rotavirus[6-8] is the most common cause of severe diarrhea (about 40% of cases) in infants and young children in both developing and developed countries. Potential known risk factors for gastroenteritis are contact with others with gastroenteritis (in and outside the household); swimming or other water-related sports; foreign travel; use of antimicrobial drugs, consumption of (raw or well-done) chicken, pork, beef, organ meat, meat in dough, fish, crab, shrimp, oysters, mussels, raw vegetables, salad, fruits, dried fruits, rice, raw milk, ice cream, soft cheeses, runny eggs, raw eggs, take-away fast-food, take-away bread rolls, take-away kebab, take-away Chinese food, meal services, food from canteen, food from reception, food from barbecue, eating out in a restaurant, and contact with farm animals (with or without diarrhea)[7-9].

The present study is designed to identify some of the common risk factors that prevail in our community. A numerous studies have been conducted internationally to find out the risk factors of Gastroenteritis but limited literature is available in Pakistan. If there were some studies already conducted, they have applied weak statistical analysis. Hence in this study some advance statistical tools has been applied to evaluate risk factors associated with gastroenteritis.

Materials and Methods

This was a hospital based case control study of about 400 patients including 200 cases with gastroenteritis and 200 controls without gastroenteritis. A convenient sample survey was conducted on a self designed questionnaire during the period of April 2007 to September 2007 from the emergency wards of two teaching hospitals at Lahore city i.e. Mayo Hospital and Services Hospital. Patients of all ages and sex were included in the study. The data was collected in different visits from the emergency patients of the hospital. The interview was taken personally from all patients and parents of the infants. Multiple logistic regression modeling technique was used to find significantly associated risk factors.

Results

Out of 400 patients about 51.5% males and 48.5% females and about 43.0% cases did not married and younger. Average age of cases and control was (21.23±5.02 & 35.23 ±8.36) respectively. About 84.5% cases belong to urban areas and others from rural areas. Majority of the cases belong to poor socio-economic status because average monthly household income of cases was about 5000 Rs. Average family size of cases and controls was 8 and 4 respectively. Hence overall results depicts that family size of cases is high as compared to controls. An individual education is also plays a pivotal role to reduce the risk of disease. Majority of cases were illiterate or less education. Father and mother education is also very important factor. In this study found that patients associated with GE have about 67.0% uneducated father and 77.5% mothers. Among the occupational categories most of the cases were belong to laborer and house wives category.

A multivariate analysis was performed to find the significantly associated risk factors. Multiple logistic regressions was the useful technique because dependent variable was dichotomous (Yes/No) and all other variables were the covariates. For the selection of variables forward likely hood ratio test was applied. All categorical risk factors have specified the lowed risk category as a base category. There are about Thirty three variables including age, gender, and educational status of parents, area, family status, family size, socio-economic conditions and clinical factors. Among these factors only three variables are quantitative that are age, monthly income and family size. Now the final model from table (1) indicates that among the socio-economic factors marital status, monthly house hold income, father education were the significantly associated risk factors at 5% level of significance. While among the

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clinical factors; unusual event, pound nearby home, poor drainage system, use of antibiotics, and drinking juices from an open shop (Rahri etc.) were significant.

Wald test was applied to check the significance of risk factors individually. Similarly odds ratios along with their 95% CI interval were also compute. This will give the estimated risk of disease in the presence of these risk factors. The co-efficient of marital status, monthly income and father education have negative association while others were positive. In marital status base category was "ever married" patients. Negative sign of coefficient indicates that risk of disease decreases as we move from ever married patient to married patients. Father education also have negative coefficient sign indicating that, if individuals father is educated then risk of disease decreases by 0.551 times as compared to uneducated father.

Similarly patients who have like, attended unusual event, pound nearby home, poor drainage system, use of antibiotics, and drinking juices from an open shop (Rahri etc.) have high risk of about 1.746, 2.065, 1.633, 1.764, respectively as compared to others. Column of 95% CI of odds ratio does not include exactly 1 hence these factors are significantly associated with GE. In order to check the overall model adequacy "Hosmer and Lemeshow Test" (Chi-square= 10.88, p-value=0.28) gives the significant results indicating that model is best fit. Similarly, the value of "Nagelkerke R Square" found to be 20.33% expressing the variation explained by the fitted model.

After calculating the fitted logistic regression model, predicted probabilities were also computed to draw a ROC (Receivers operating curve), figure (1). ROC gives the overall prediction of the fitted model. Area under this ROC plot is found to be 69.7% for our fitted model. Further more risk factors for urban/rural settings were assessed and almost same factors were found there. This indicates that no significantly different results in urban/rural settings of patients.

Discussion

Gastroenteritis is basically the infection of stomach and intestines and may caused by different paracites or bacteria. Its symptoms includes diarrhea, vomiting, abdominal cramping, fever and nausea etc. it is the leading cause of infant and children mortality as well as in young population in developing countries. Worldwide, acute gastroenteritis (AGE) is the third most common cause of death in children under 5 years of age, after perinatal diseases and lower respiratory tract infections[10].

The main objectives of this study are to find the significantly associated risk factors in our population. Patients of all ages and sex were recruited. A descriptive and analytical analysis was performed to evaluate those risk factors. This disease is seasonal and normally fluent in summer and rainy season. There are numerous studies have been conducted to find different risk factors of gastroenteritis in different populations and countries but little literature available in our country. Most of the people were found to be un-educated and poor socio-economic conduction.

In 2003, Heyworth and his colleagues described the presence of persons who had gastroenteritis inside the home, contact with persons who had gastroenteritis outside the home, antibiotic use and sore throat as the major risk factors for gastroenteritis[11]. Similarly in 1993, Hedberg CW et all said in their study that person-to-person transmission is probably the mode of viral gastroenteritis in most cases[12]. In 2001, Raja Asif Masood found that the source of infection in acute Gastroenteritis Cases Presenting in Holy Family Hospital Emergency Department in Post Flood Period was mainly contaminated water (67%)[13].

Poverty, less age, early weaning, the lack of toilets and rainy season were described as the significant risk factors for gastroenteritis[14]. The main risk factors in our study was found to be pond nearby home, poor drainage system, use of antibiotics, drinking juices from an open shop. These food or drinking liquids are contaminated with the organisms resulting Gastroenteritis. Similarly touching of contaminated surface by hand can transfer the bacteria or any parasite.
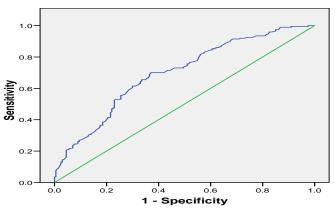
It is the government duty to provide a special care to the drainage system of communities. In Punjab, drainage system oftenly remains out of order. This spread dirty water outside the system and this defiantly spread the

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infection among the residing population. Excessive use of antibiotics and use of antibiotics without the prescription of a specialist doctor must be avoided. People should try to avoid from eating and drinking anything from the unhygienic restaurants and shops. The food system in restaurants must be checked by government through some committee. Government should inform people through advertisement to avoid drinking juices from open places and must take proper actions to remove ponds in the areas where they are situated. Government should introduce Rota vaccination with polio vaccination to reduce mortality rate in infants.

Table 1: Logistic Regression Output from the Overall Data (n=400)

Variables	B	S.E.	Wald	P-value	Odds Ratio	95.0% C.I.for Odds Ratio	
						Lower	Upper
Marital status	-0.829	0.243	11.599	0.001	0.436	0.271	0.703
Monthly income	-0.25	0.388	0.414	0.002	0.779	0.364	1.667
Father education	-0.596	0.241	6.103	0.013	0.551	0.344	0.884
Attended Unusual events	0.567	0.27	4.399	0.036	1.763	1.038	2.993
Pound nearby home	0.557	0.247	5.106	0.024	1.746	1.077	2.832
Poor drainage system	0.725	0.273	7.033	0.008	2.065	1.208	3.53
Use of antibiotics	0.49	0.221	4.901	0.027	1.633	1.058	2.52
Drinking juices from an open shop(Rahri)	0.568	0.24	5.606	0.018	1.764	1.103	2.822
Constant	**-1.093**	**0.481**	**5.16**	**0.023**	**0.335**		

ROC Curve

Diagonal segments are produced by ties.

Conclusion

This study enables us to ascent the piece of information about the exact knowledge of risk factor of Gastroenteritis in our population. These factors were found different from risk factors of western countries.

In this study, Parents education, attended unusual event, pound nearby home, poor drainage system, use of antibiotics, and drinking juices from an open shop were statistically significantly associated with gastroenteritis. All risk factors associated with Gastroenteritis are preventable and with proper awareness in society and little attention of government can save precious lives of hundreds of thousands people and mortality related to Gastroenteritis can be reduced.

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