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STATISTICAL MODELLING OF THE OPINION AND PERCEPTION OF PEOPLE ABOUT DENGUE DISEASE

Qamruz Zaman[1], Bilal Ahmad[1], Kiran Ali[2], Habib Shah[3], Danish Wasim[4], Sidra Nawaz[1], Junaid Ahmad[1], Gohar Ayub[5]

[1]Department of Statistics, University of Peshawar, Pakistan.
[2] Research officer at Jinnah Medical College, Peshawar, Pakistan.
[3]Institute of Numerical Sciences Kohat University of Science, Pakistan.
[4]Department of Management Sciences, Abasyn University Peshawar, Pakistan.
[5]Department of Mathematics and Statistics, University of Swat, Swat, Pakistan

[1]cricsportsresearchgroup@gmail.com; [5]goharayub@uswat.edu.pk

ABSTRACT

The present research was conducted to know the opinion and perception of the people about the dengue disease. According to the opinion of the people, the best four factorscombinations was, indicated that covering water containers, cutting trees near houses,drying stagnant water and using mosquito nets were the important factors in preventing the dengue disease. A sample of 322 respondents consisting of 222 case i.e. patients and 100 control. was collected from the three major hospitals of Peshawar. Out of 322 respondents, 186 nearly 58% were selected from the LRH, 94 participants were selected from KTH and 13% i.e. 42 were selected from HMC. Further out of 322 persons, 222 (698.94%) were dengue patients and 100 (31.06%) were healthy. Further 230 (71.43%) were illiterate and 92 (28.57%) were literate. Similarly, 56 (17.4%) respondents were below 25 years of age, 142 (44.1%) were below 35 years of age, 30.1% were below 45 years of age and 27(8.4%) respondents were above 45 years of age group. The analysis showed the association between the fever and gender, hospitals, age group, family income, education, marital status, knowledge about dengue virus, wearing complete dress. Further, Significant variables were the knowledge about the Use of mosquito net, Use of window net etc.

Key words: *Dengue fever, Case control, Logistic Regression, chi-squaredistribution, Odds Ratio, TURF etc.*

INTRODUCTION

Statistics plays an important role in every field of life. The field spread from daily life to laboratory the names given to the subject vary from field to field. In sports it is called sports statistics, in geographic called geo statistics, in biostatistics while it is familiar with the name of medical statistics in medicine. Nowadays, every article of medical field is full of the tools of statistics. Doctors need the knowledge of the subject for their promotion they usually analyze the severity of disease by using statistical methods. The disease may be seasonal or non-seasonal, epidemic, or non-epidemic one of such type of disease is the Dengue fever.

Dengue is a epidemiological disease which instigated by a virus known as dengue virus belongs to the Flaviviride‟s virus family. Its transmitted to human beings by the two special species of Aedes mosquitoes known as aegypti and albopictus. Thedengue virus consists of four types

of serotypes that cause the disease. These serotypes range from symptoms to severe fever. The severe form of this fever is known as Dengue Hemorrhagic Fever (DHF). The joints pain, muscular pain, pain in eyes, rashes fever and headache are known as the symptoms of the dengue. The patients with DHF may reach to blood from nose, bleeding from gums and blood in urine and it may lead to death if not treated properly [1]. DHF is a mosquito-based disease transmitted in a form of virus in human beings and reported spreading in both developed, developing and under developing countries of the World. The development of the disease occurs in couple of days in human beings [2].

Scientists and researcher are continuously searching the determinants which may help in reducing the mosquitoes‟ habit in human territories [3]. Every human can be affected by dengue fever who have weak immune system. The children and old age citizen of the society being at high risk of this disease. The serotype of the disease effect the immune of human being and can affect the person up-to four times. The dengue fever transmitted from disease person to healthy one when the mosquito with DHF bites and virus trans to blood [4]. The blood from the nose of patient known as the most severe form of DHF and known as the dengue shock syndrome (DSS) and death of the patient occurs [5]. Hundreds of thousand cases reported every year around the world and one of the common diseases especially in South-East Asia where every year approximately 15000 deaths reported [6]. The determination of significant factors of the dengue fever is a great concern of academician. This determination includes information about the causes, symptoms, and precautions of patients about dengue [7-8].

Dengue Around the Globe

Begonia et al [9] studied the understanding of the population about dengue. The studied showed that about 61.45 % of people in China found with sufficient information regarding dengue. The precautionary measures used by the people commonly found as electric and solar fans, mosquito nets and coils. While about 33.3% of the people of the selected population utilized the insect spray and pest control as the measures against dengue fever. A study showed that understanding regarding dengue fever is not sufficient for significant precautions against dengue fever [10].

Around the globe approximately 3.6 billons or 55 percent of the population observed at risk of dengue fever [11]. The World Health Organization (WHO) estimated about 5 billion patients every year reported of dengue fever [12, 13]. In Thailand, the very first case of dengue was reported in 1958 [14]. Since 1958, the dengue is one of the significant health issues and spreading rapidly [15]. Accordingly, WHO the symptoms of the disease found in 15 % of the population while approximately 5 lacs people hospitalize every year around the World [16]. Every year the number of patients suffering by dengue admitted to hospital and number of deaths in the central regions of United States, South-East Asia and regions of South-Pacific. Most of the countries of World continuously engaged arrangement of precautionary measure against the dengue fever [17].

Many researches demonstrated that dynamic determinations of dengue‟s symptoms n early school can be used as one of the significant indicators in reducing the risk of disease especially in the rural areas of country [18]. Dengue fever is one of mosquito borne diseases and becoming highest community well-being trial [19]. In 2013, the WHO reported that in 170 countries of the Globe,about more than 70 percent of the population is at risk of dengue fever [20]. The developing countries of World are significantly affecting by dengue fever. The dengue outbreaks in both areas i.e., rural and urban areas of developing countries [21]. The severe outbreak reported in 2015 in Taiwan where the dengue affected about 42000 cases and approximately more than 200 deaths due to associated risk factors of the dengue fever [22]. Literature showed that there has found a correlation analysis between atmospheric situation and the significant risk factors of the dengue disease [23-26]. The studies showed that factors related to climate in country and dengue fever found statistically significantly associated. The study concluded that climatic factors helped in the transmission of the dengue fever among the nationals of Taiwan [27]. In Saudi Arabia, many climatic factors showed a positive significant relationship with the incidence rate of the dengue fever. The climatic factors included temperature,

intensity of sun light and percentage of precipitation [28].

Dengue in Pakistan

The first case of dengue was reported in Karachi, Pakistan in 1994 [29]. Dengue in Pakistan rapidly spread with high prevalence rate due to increase in population, lack of water management, ineffective control program of dengue, national and international travelling of peoples and local and global business. The statistics regarding the cases of dengue in Pakistan showed that about 700 cases recorded from 3 regions from 1995 to 2004. About more than 16000 cases reported in 2005 in Karachi, which showed a rapid increase in prevalence of dengue disease [30]. In early 2013, approximately more than 6000 positive cases with more than 20 deaths due to dengue reported from the northern area of Pakistan i.e. Swat [31].

The incidence and prevalence of dengue virus still high and the population is at risk from this. The government and local bodies did all necessity actions and precautionsto control the spread of disease but still the number of deaths increased due to dengue fever every year in Pakistan. The evident of information and data about dengue and preventive measures to people dengue infection need to aware. It is necessity of time to aware people about dengue virus to hit back this epidemic. That‟s way awareness campaigns are launched all over the world including Pakistan to aware people about dengue virus [32]. The forecasting of dengue is difficult due to high variations overthe period of time [33]. In previous studies different statistical modelling procedures have used for the predictions of the dengue disease. This includes auto regressive integrated moving average (ARIMA) model [34], seasonal auto regressive integrated moving average (SARIMA) model [35–37], support vector machines (SVMs) [38], and artificial neural networks (ANNs) [39].

1.1 Symptoms of Dengue fever

The symptoms of this disease start within three to fourteen days of the infection, in which a person feels pain at the back of the eyes, fatigue, vomiting, rigorous joint and muscles pain, headaches, mild bleeding and skin rash [4].

1.2 Treatment for Dengue fever

Dengue infection has no specific cure, if a person believes that he may have the dengue fever, so the person must stay away from medicines with aspirin because that could further worsen the bleeding. One should take only the pain reliever medicines with acetaminophen. One must also take rest, must take plenty of fluidsand might also see the doctor for checkup. If in the first 24 hours, the person feels thathe feels worse after the fever goes down, one must immediately go to the hospital to diagnose the complication [5].

1.3 Significance of the study

The study will highlight the knowledge and perception of the local people about this dengue disease. Further, it will also identify the flaws and latent factors which need to be improved to cope with this disease. Based on the above information, the health department will be capable to plan and cope this dengue disease.

1.4 Aims and Objectives

The aims and objectives of this research work are:

- To determine the prevalence of people awareness about dengue disease
- To use advanced statistical models to determine the different risk factors of dengue
- To study association and strength of association among various risk factors of Dengue using Chi-Square and Odds Ratio analysis

2 METHODOLOGY

2.1 Universe of the study

The data will be collected through a well-defined questionnaire consisting of the population of Peshawar city. We will go for a pilot survey which will prove the reliability and validity of the study. In Peshawar city, we collect the data from the major hospitals that is Hayatabad medical complex (HMC), Khyber teaching hospital (KTH), and the lady reading hospital (LRH) Peshawar.

Sample design

As the study is mainly concerned with the qualitative aspect of the topic like attitude, knowledge and practice so a non-probability

sampling technique i.e. convenience sampling technique will be used to collect the data from different respondents in Peshawar.

Data Collection

Data collection based on three hospitals in district Peshawar. Dengue virus is found around the country. These hospitals are selected from district Peshawar in Khyber Pakhtunkhwa. The data collection will be done by qualitative (in terms of nature of variables) method. The selected three hospitals in district Peshawar are used for selecting the sample. Qualitative data will be collected through questionnaire. However, due to time and cost constraints only district Peshawar will be selected for data collection. A representative sample of the patients of dengue would be taken from the three main hospital of district Peshawar on the basis of the followingformula;

$$n = \left(\frac{z}{e}\right)^2 pq$$

Where z = 1.96 at 95% confidence interval "p" is the proportion rate of dengue

$q = 1 - p$

Applying the formula by taking $P = 0.7$, $q = 0.3$ a simple of size n = 320 dengue patients will be selected as sample multi-stage sampling will be used for collection of data 220 sample are dengue patients and the remaining 100 sample is control Patients.The sample size will be distributed into three hospitals in district Peshawar. Three main hospitals are LRH, KTH and HMC.

3 ANALYSIS FOR FIRST OBJECTIVE

3.1 To determine the prevalence of people awareness about dengue disease.

3.1.1 Description of the Data

To fulfill the objectives of the study, three major hospitals namely, Leady Reading Hospital (LRH), Khyber Teaching Hospital and Hayatabad Medical Complex (HMC) were selected. With the help of case control study design, the data was collected from the 322 respondents through the cross-sectional study based on the well-defined questionnaire.

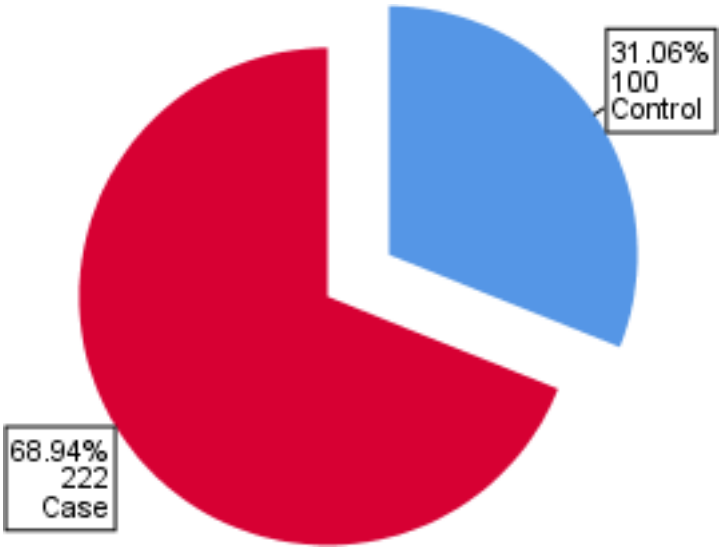
3.1.2 Analyses for the first objective

The descriptive statistics tools are used for achieving the first objective. From Table 3.1, it is clear that out of 322 respondents, 186 nearly 58% were selected from the LRH, 94 participants were selected from KTH and 13% i.e 42 were selected from HMC.

Table 3.1: Distribution of data from the selected Hospitals

Hospitals	Frequency	Percent
Leady Reading Hospital	186	57.8
Khyber Teaching Hospital	94	29.2
Hayatabad Medical Complex	42	13.0
Total	322	100.0

Further from the below pie diagram (Fig.3.1), it is revealed that out of 322 persons, 222 (698.94%) were dengue patients and 100 (31.06%) were healthy. The healthy persons are the attendant of patients. They may be husband, wife, friends, neighbor etc.



Figurev3.1: Distribution of respondents

Table 3.2 covered the three main categorical variables i.e. Hospitals, Gender and Casecontrol variable. Out of 186 respondents of LRH, 91 were male patients and 35 were male attendants. Similarly, out of 60 female respondents, only 20 were health females and 40 were patients. Out of 94 respondents of KTH, 39 were male patients and 20 were male attendants. Similarly, out of 35 female respondents, only 10 were health females and 25 were patients. Out of 42 respondents of LRH, 18 were male patients and 10 were male attendants. Similarly, out of 14 female respondents, only 5 were health females and 9 were patients.

Table 3.2. Gender wise distribution of case control in three selected hospitals

				Control	Case
				Count	Count
Hospitals	Leady Reading Hospital (LRH)	Gender	Male	35	91
			Female	20	40
	Khyber Teaching Hospital (KTH)	Gender	Male	20	39
			Female	10	25
	Hayatabad Medical Complex (HMC)	Gender	Male	10	18
			Female	5	9

Table 3.3 covered the three main categorical variables i.e. Hospitals, Area of Residence and Case control variable. Out of 186 respondents of LRH, 61 patients were belonged to urban areas and 21 were the attendant of that area. Similarly, out of 104 rural residents, only 34 attendants were from rural area and 70 patients were from rural areas. Out of 94 respondents of LRH, 23 patients were belonged to urban areas and 10 were the attendant of that area. Similarly, out of 61 rural residents, only 20 attendants were from rural area and 41 patients were from rural areas. Similarly, Out of 42 respondents of LRH, 9 patients were belonged to urban areas and 10 were the attendant of that area. Similarly, out of 23 rural residents, only

5attendants were from rural area and 18 patients were from rural areas.

Table 3.3. Gender wise distribution of case control in three selected hospitals.

				Control	**Case**
				Count	**Count**
Hospitals	Leady Reading Hospital	Area of Residence	Urban	21	61
			Rural	34	70
	Khyber Teaching Hospital	Area of Residence	Urban	10	23
			Rural	20	41
	Hayatabad Medical Complex	Area of Residence	Urban	10	9
			Rural	5	18

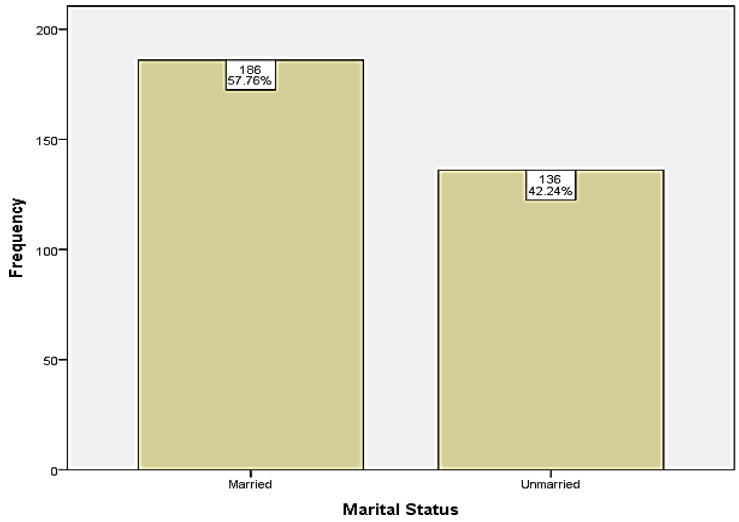


Figure 3.2: Marital Status of respondents

Figure 3.2. Shows that on asking the 322 respondents about their marital status, 186(57.76%) were married and 136 (42.24%) were unmarried.

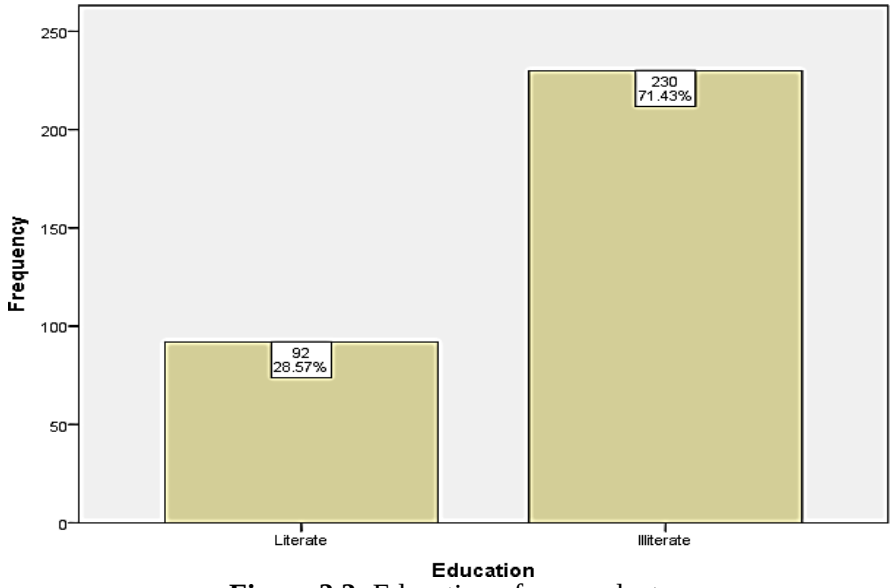


Figure 3.3: Education of respondents

Figure 3.3. shows that on asking the 322 respondents about their education, 230 (71.43%) were illiterate and 92 (28.57%) were literate. The data in Table 3.4 shows 56 (17.4%) respondents were below 25 years of age, 142 (44.1%) were below 35 years of age, 30.1% were below 45 years of age and 27(8.4%)respondents were above 45 years of age group.

Table 3.4. Age distribution of respondents

Age Group	Frequency	Percent
<=25 years	56	17.4
25<age<=35	142	44.1
35<age<=45	97	30.1
>45	27	8.4
Total	322	100.0

The data in Table 3.5 shows 29 (9%) respondents were belonged to the family having less than equal to Rs. 10000 income, 265 (82.3%) were belonged to the family having less than equal to Rs.20000 income, 5.9% were belonged to the family less than equal to Rs. 30000 income and only 2.8% families earning greater than 30000.

Table 3.5. Distribution of Family Income of Respondents

	Frequency	Percent
<=10000	29	9.0
10000< to <=20000	265	82.3
20000< to <= 30000	19	5.9
> 30000	9	2.8
Total	322	100.0

TURF Analysis for finding the main factors for preventing the disease

TURF stands for Total Unduplicated Reach and Frequency analysis procedure is used for selecting the factors which are useful for preventing the disease. The stepwise procedure is used for analyzing the factors one by one. Six factors are considered for knowing the knowledge about preventing the disease. These are i) Dengue fever can be prevented by covering water containers ii) Dengue fever can be prevented by drying stagnant water iii) Dengue fever can be prevented by using window nets iv) Dengue fever can be prevented by using mosquito nets v) Dengue fever can be prevented by cutting trees near houses and vi) Dengue fever can be prevented by smoldering. Maximum six variable combinations are considered in this case, although we have six factors so obviously the last combination which consists of all the factors will give 100 % coverage. So we don‟t display it here. Figure 3.4. gives the step wise detail of each best selected model along with the detail of each combination with respect to reach and frequency. Each table consists of four columns. Column 1 is used for the variable combination, columns 2,3 and 4 show the reach of the respondent i.e. the total number of respondents who are in favour of the questions. Column 3 gives the percentage of reach out of total respondent i.e. 322 in this case. The frequency column shows the sum of frequency of each factor under study.

Table 4.6 summarized the results for single factor. Decision of selecting the best model is based on the reach of respondent. In this case, maximum reach value is 284 (88.2%). So in case of one factor, 88.2% respondents are in the opinion that covering water containers easily protect us from this deadly disease.

Table 3.6: Maximum Group Size: 1. Reach and Frequency

Variables	Statistics		
	Reach	**% of Cases**	**Freq.**
Dengue fever can be prevented by covering water containers.	284	88.2	284
Dengue fever can be prevented by drying stagnant water.	261	81.1	261
Dengue fever can be prevented by using window nets.	226	70.2	226
Dengue fever can be prevented by using mosquito nets.	214	66.5	214
Dengue fever can be prevented by cutting trees near houses.	164	50.9	164
Dengue fever can be prevented by smoldering.	138	42.9	138

Best two factors combinations consisting of five are summarized in Table 4.7. The Reach values for the five models are 298, 294,286, 285 and 285. On the bases of highest percentage of Reach which is 92.5%, the combinations of two significant factors are Dengue fever can be prevented by covering water containers and Dengue fever can be prevented by using mosquito nets. In simple words 92.5% of the respondents are in the view that these are the two important factors which can prevent the disease. The frequency column is obtained by summing the frequencies of two factors which are 284 and 214. So sum of 284 and 214 is 498.

Table 3.7: Maximum Group Size: 2. Reach and Frequency.

Variables			Statistics		
			Reach	%of Cases	Freq.
Dengue fever can be prevented by coveringwater containers	*	Dengue fever can be prevented by using mosquito nets	298	92.5	498
Dengue fever can be prevented by coveringwater containers	*	Dengue fever can be prevented by drying stagnant water	294	91.3	545
Dengue fever can be prevented by coveringwater containers	*	Dengue fever can be prevented by cutting trees near houses	286	88.8	448
Dengue fever can be prevented by coveringwater containers	*	Dengue fever can be prevented by using window nets	285	88.5	510
Dengue fever can be prevented by coveringwater containers	*	Dengue fever can be prevented by smoldering	285	88.5	422

Five highest Reach values of three factors combination are displayed in table 3.8. The most important three factors in the opinion of respondents are Dengue fever can be prevented by covering water containers, Dengue fever can be prevented by drying stagnant water and Dengue fever can be prevented by using mosquito nets. The optioncovered the 94.1% out of total.

Table 3.8: Maximum Group Size: 3. Reach and Frequency.

Variables					Statistics			
					Reach	% of Cases	Freq	% of Responses
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by drying stagnant water.	*	Dengue fever can be prevented by using mosquito nets.	303	94.1	759	59.0
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	Dengue fever can be prevented by using mosquito	299	92.9	662	51.4

				nets.				
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by using mosquito nets.	*	Dengue fever can be prevented by using window nets.	298	92.5	724	56.3
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by smoldering.	*	Dengue fever can be prevented by using mosquito nets.	298	92.5	636	49.4
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	Dengue fever can be prevented by drying stagnant water.	295	91.6	709	55.1

The highest Reach value for the best four factors combinations is 304 (94.4%) Table 3.9, indicated that the Dengue fever can be prevented by covering water containers, Dengue fever can be prevented by cutting trees near houses, Dengue fever can be prevented by drying stagnant water and Dengue fever can be prevented by using mosquito nets are the important factors in preventing the dengue disease. The total frequency for the four responses is 923.

Table 3.9: Maximum Group Size: 4. Reach and Frequency.

Variables				Statistics		
				Reach	**%of Cases**	**Freq**
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	304	94.4	923
Dengue fever can be prevented by drying stagnant water.	*	Dengue fever can be prevented by using mosquito nets.				
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by drying stagnant water.	*	303	94.1	985
Dengue fever can be prevented by using mosquito nets.	*	Dengue fever can be prevented by using window nets.				
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by drying stagnant water.	*	303	94.1	897
Dengue fever can be prevented by smoldering.	*	Dengue fever can be prevented by using mosquito nets.				
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	299	92.9	888
Dengue fever can be prevented by using mosquito nets.	*	Dengue fever can be prevented by using window nets.				
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	299	92.9	800
Dengue fever can be prevented by smoldering.	*	Dengue fever can be prevented by using mosquito nets.				

Table 3.10 gives the information based on five factors combination. Dengue fever can be prevented by covering water containers, Dengue fever can be prevented by cutting trees near houses, Dengue fever can be prevented by drying stagnant water, Dengue fever can be prevented by using mosquito nets and Dengue fever can be prevented by using window nets are declared on the bases respondents response as five important factors for preventing the Dengue fever having Reach value is 94.4%..

Table 3.10: Maximum Group Size: 5. Reach and Frequency.

Variables							Statistics		
							Reach	**%of Cases**	**Freq**
Dengue fever can be prevented by covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	Dengue fever can be preventedby drying stagnant water.	*	304	94.4	1149
Dengue fever can be prevented by using mosquito nets.	*	Dengue fever can be prevented by using window nets.						
Dengue fever can be preventedby covering water containers	*	Dengue fever can be prevented by cutting trees near houses.	*	Dengue fever can be preventedby drying stagnant water.	*	304	94.4	1061
Dengue fever can be prevented by smoldering.	*	Dengue fever can be prevented by using mosquito nets.						
Dengue fever can be preventedby covering water containers	*	Dengue fever can be prevented by drying stagnantwater.	*	Dengue fever can be prevented by smoldering.	*	303	94.1	1123
Dengue fever can be prevented by using mosquito nets	*	Dengue fever can be prevented by using window nets.						

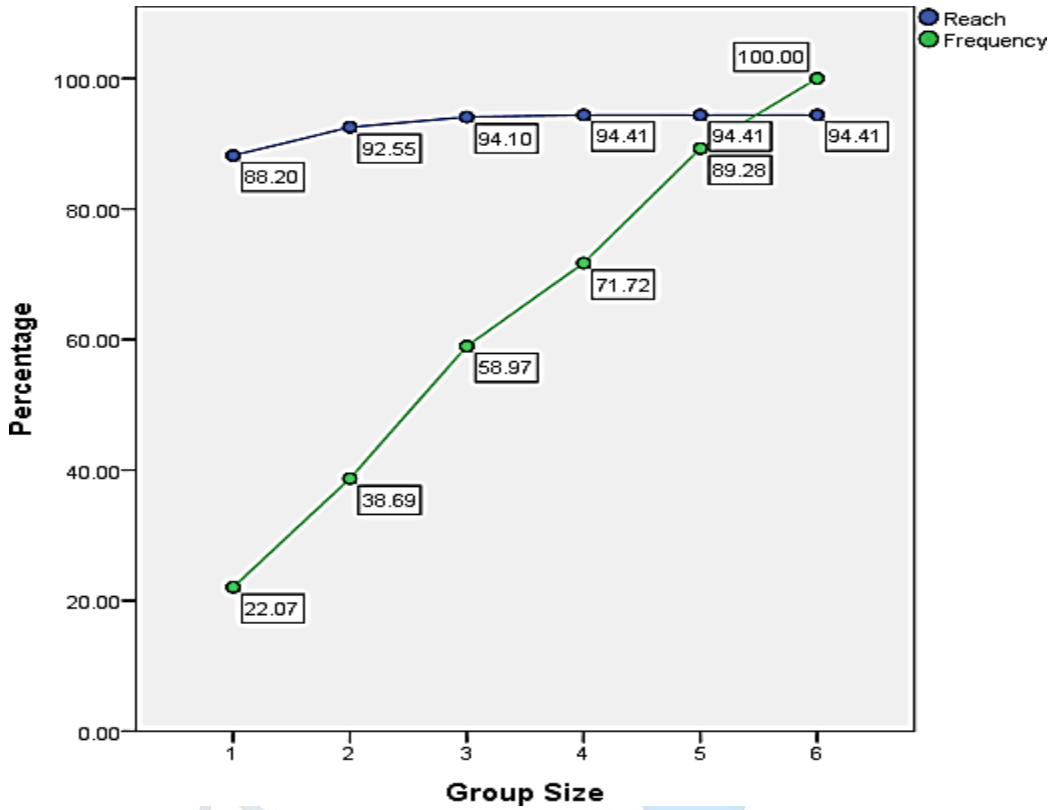


Figure 3.4: Reach and frequency by group size for preventing factors

3.1.3 TURF Analysis for finding the main factors related to the symptoms tothe disease

TURF analysis procedure is used for selecting the factors which are the symptoms of disease. The stepwise procedure is used for analyzing the factors one by one. Nine factors are considered for knowing the knowledge about the symptoms of disease. These are i) Severe joint and muscular pain is a symptom of Dengue ii) Sudden high fever is a symptom of Dengue iii) Skin rash is a symptom of Dengue iv) Nausea is a symptom of Dengue v) Pain behind eyes is a symptom of Dengue vi) Mild bleeding is a symptom of Dengue vii) Vomiting is a symptom of Dengue viii) Fatigue is a symptom of Dengue and ix) Severe headache is a symptom of Dengue. With the help of SPSS, maximum six variables and nine combinations display option was used. The last four combinations tables i.e. sixth, seventh, eight and nine give 100% coverage, so we do not consider them here. Figure 3.5. gives the step wisedetail of each best selected model along with the detail of each combination with respect to reach and frequency.Each table consists of four columns. Column 1 is used for the variable combination, columns 2,3 and 4 show the reach of the respondent i.e. the total number of respondents who are infavour of the questions. Column 3 gives the percentage of reach out of total respondent i.e. 322 in this case. The frequency column shows the sum of frequency of each factor under study. Table 4.6 summarized the results for single factor. Decision of selecting the best model is based on the reach of respondent.In this case, maximum reach value is 284 (88.2%). So in case of one factor, 88.2% respondents are in the opinion that severe joint and muscular pain is a symptom of Dengue.

Table 3.11. Maximum Group Size: 1. Reach and Frequency.

Variables	Statistics		
	Reach	Pct of Cases	Freq
Severe joint and muscular pain is a symptom of Dengue.	284	88.2	284
Sudden high fever is a symptom of Dengue.	277	86.0	277
Skin rash is a symptom of Dengue.	270	83.9	270
Nausea is a symptom of Dengue.	262	81.4	262
Pain behind eyes is a symptom of Dengue.	227	70.5	227
Mild bleeding is a symptom of Dengue.	226	70.2	226

Best two factors combinations consisting of six are summarized in Table 4.12. The Reach values for the six models are 312, 311,302, 302, 302 and 299. On the bases of highest percentage of Reach which is 96.9%, the combinations of two significant factors are Sudden high fever is a symptom of Dengue and Nausea is a symptom of Dengue are the symptoms of Dengue.

In simple words 96.9% of the respondents are in the view that these are the two important factors which are the symptoms of Dengue disease. The frequency column is obtained by summing the frequencies of two factors which are 277 and 262. So sumof 277 and 262 is 539.

Table 3.12.Maximum Group Size: 2. Reach and Frequency.

Variables			Statistics		
			Reach	% of Cases	Freq
Sudden high fever is a symptom of Dengue.	*	Nausea is a symptom of Dengue.	312	96.9	539
Sudden high fever is a symptom of Dengue.	*	Severe joint and musculapain is a symptom of Dengue.	311	96.6	561
Severe joint and muscular pain is a symptom of Dengue.	*	Skin rash is a symptom of Dengue.	302	93.8	554
Mild bleeding is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom ofDengue.	302	93.8	510
Mild bleeding is a symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	302	93.8	503
Severe headache is a symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	299	92.9	492

Six highest Reach values of three factors combination are displayed in table 4.13. Themost important three factors in the opinion of respondents are Mild bleeding is a symptom of Dengue, Sudden high fever is a symptom of Dengue and Severe joint andmuscular pain is a symptom of Dengue are the main three symptoms of Dengue disease. The option covered the 98.8% out of total.

Table 3.13. Maximum Group Size: 3. Reach and Frequency.

Variables					Statistics		
					Reach	**% of Cases**	**Freq**
Mild bleedingis a symptom of Dengue.	*	Sudden high fever isa symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue	318	98.8	787
Severe headache is a symptom of Dengue.	*	Sudden high fever isa symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue	317	98.4	776
Mild bleeding is a symptomof Dengue.	*	Sudden high fever is a symptom ofDengue.	*	Nausea is a symptom of Dengue.	317	98.4	765
Severe headache is a symptom of Dengue.	*	Sudden high fever isa symptom of Dengue.	*	Nausea is a symptom of Dengue.	316	98.1	754
Sudden high fever is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue	*	Nausea is a symptom of Dengue.	315	97.8	823
Sudden high fever is a symptom of Dengue.	*	Nausea is a symptom of Dengue.	*	Skin rash isa symptom of Dengue.	314	97.5	809

The highest Reach value for the best four factors combinations is 319 (99.1%) Table 4.14, indicated that the Dengue fever are spread due to Mild bleeding, Sudden high fever, Severe joint and muscular pain and Nausea. The total frequency for the four responses is 1049.

Table 3.14. Maximum Group Size: 4. Reach and Frequency.

Variables				Statistics		
				Reach	%of Cases	Freq
Mild bleeding is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	319	99.1	1049
Severe joint and muscular pain is a symptom of Dengue.	*	Nausea is a symptom of Dengue.				
Severe headache is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	319	99.1	1038
Severe joint and muscular pain is a symptom of Dengue.	*	Nausea is a symptom of Dengue.				
Mild bleeding is a symptom of Dengue.	*	Severe headache is a symptom of Dengue.	*	319	99.1	1002
Sudden high fever isa symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue				
Mild bleeding is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	318	98.8	1057
Severe joint and muscular pain is a symptom of Dengue	*	Skin rash is a symptom of Dengue.				
Mild bleeding is a symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	*	318	98.8	1035
Nausea is a symptomof Dengue.	*	Skin rash is a symptom of Dengue.				
Severe headache is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	318	98.8	1024

Nausea is a symptomof Dengue.	*	Skin rash is a symptom of Dengue.				

Table 3.15 gives the information based on five factors combination. Mild bleeding, Severe headache, Sudden high fever, Severe joint and muscular pain, Nausea and Skin rash are declared on the bases respondent's response as five important symptoms of Dengue disease having Reach value is 99.4%.

Table 3.15. Maximum Group Size: 5. Reach and Frequency.

Variables						Statistics		
						Reach	**% of Cases**	**Freq**
Mild bleeding is asymptom of Dengue.	*	Severe headache is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	320	99.4	1264
Severe joint and muscular pain is a symptom of Dengue	*	Nausea is a symptom of Dengue.						
Mild bleeding is a symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom ofDengue	*	319	99.1	1319
Nausea is a symptom of Dengue.	*	Skin rash is a symptom of Dengue						
Severe headache isa symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue	*	319	99.1	1308
Nausea is a symptom of Dengue.	*	Skin rash is a symptom of Dengue						
Mild bleeding is a symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom ofDengue	*	319	99.1	1276
Nausea is a symptom of Dengue.	*	Pain behind eyes is a symptom of Dengue.						

Mild bleeding is a symptom of Dengue.	*	Severe headache is a symptom of Dengue.	*	Sudden high feveris a symptom of Dengue.	*	319	99.1	1272
Severe joint and muscular pain is a symptom of Dengue	*	Skin rash is a symptom of Dengue						
Severe headache isa symptom of Dengue.	*	Sudden high fever is a symptom of Dengue.	*	Severe joint and muscular pain is a symptom of Dengue	*	319	99.1	1265
Nausea is a symptom of Dengue.	*	Pain behind eyes is a symptom of Dengue.						

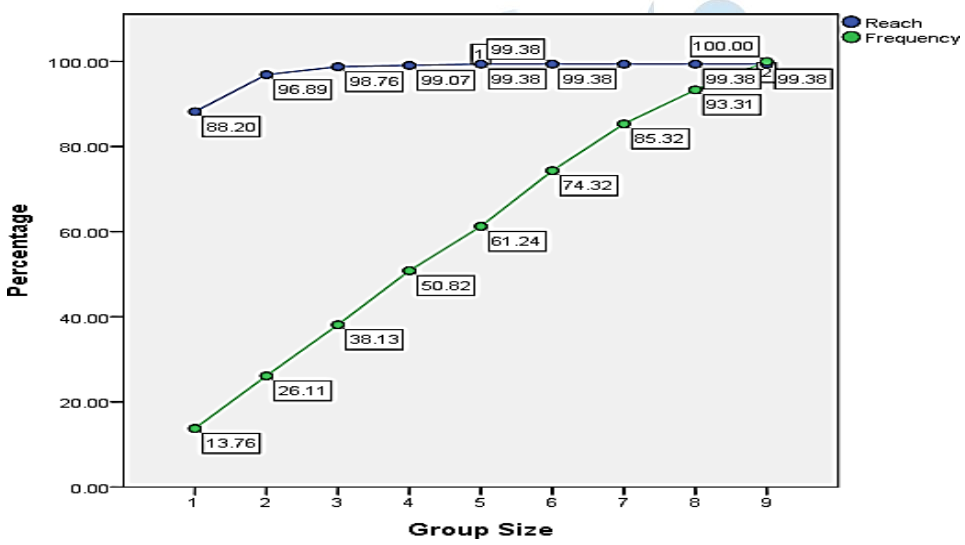


Figure 3.5: Reach and frequency by group size for symptomsRisk factors of dengue disease

3.2 To use advanced statistical models to determine the different risk factorsof dengue.

3.2.1 Procedure

For achieving the third second objective, logistic regression procedure is used.As the procedure is based on the dichotomous variable, so the response variable is defined as

Disease =	Yes = Case =	1
	No = Control =	0

And the explanatory variables considered for this study are:

Hospitals = 0	Lady Reading Hospital	
1	Khyber Teaching Hospital	
2	Hayatabad Medical Complex	
Gender =	1 Male	2 Female

Area of Residence = 1 Urban 2 Rural

Age Group of the Respondents = 1 Years	<= 25 Years	2	25< age<=	35
	3 35< age<= 45 Years	4	> 45 Years	
Marital Status=	1 married	2	Unmarried	
Education=	1 Literate	2	illiterate	

Dengue is transmitted by mosquitoes= 1 Yes 2 No

First case was detected in China= 1 Yes 2 No

Full sleeves shirt and long pant can prevent you from Dengue virus= 1 Yes 2 No

Keeping water container closed can prevent Dengue mosquitoes= 1 Yes 2 No Using mosquito net can prevent Dengue = 1 Yes 2 No How long does it take to show the Dengue symptoms? = 0 Don‟t Know

1 1 to 2 days

2 3 to 35 days

High fever and severe headache are the symptoms of Dengue= 1 Yes	2	No
Nausea and vomiting are also the symptoms of Dengue= 1 Yes	2	No
Extreme fatigue is a symptom of Dengue= 1 Yes	2	No
Dengue fever can be prevented = 1 Yes	2	No
Dengue is a serious disease = 1 Yes	2	No
Dengue can be transmitted directly from person to person= 1 Yes	2	No
Use of creams can prevent us from Dengue = 1 Yes	2	No
Attitude of the respondent = 1 Yes	2	No
Family Income=1 <= 10,000		

2 10,000 < age<= 20,000

3 20,000< age<= 30,000

4 > 30,000

Dengue can cause death= 1 Yes 2 NoUse of mosquitoes Spray can prevent Dengue fever = 1 Yes 2 No
Do you think the dengue situation is serious in the area you live in? = 1 Yes 2 No

Do you think the number of dengue cases increases after rainy days? = 1 Yes 2 No

From which source you have heard the word Dengue?= 1 TV 2 Radio

3 Newspaper 4 Health worker 5 Other
The community in my area needs public education about dengue = 1 Yes 2 No

.

3.2.2 Model Diagnostics

For detecting the outliers, three plots namely Cook‟s distance, Standardized residuals and the leverage values are used. From the Figure 3.6, it is clear that the observations are closed to each other and distances between the points are negligible. It clearly indicated the outlier free data.

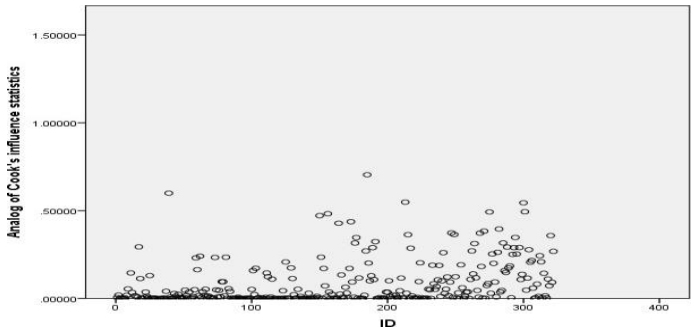


Figure3.6: Index plot of Cook's Distance

Again from the Figure 3.7 representing the leverage points. Again the data points areclosed to each other indicating no outlier.

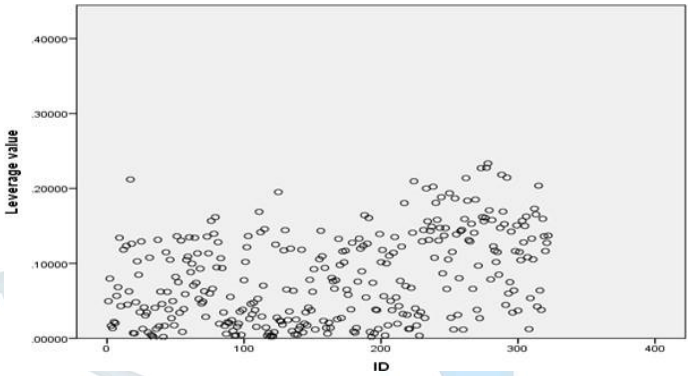


Figure 3.7: Index plot of leverage values

Figure 3.8 Revealed that the residuals points indicate the data is free from outliers too.

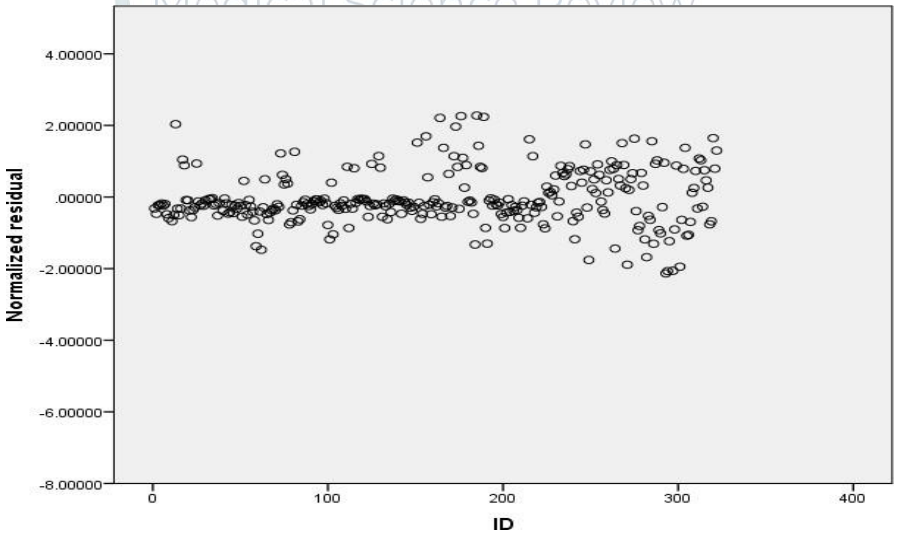


Figure 3.8: Index plot of standardized residuals

3.2.3 Forward Selection Procedure for Selecting the Parsimony Model

For selecting the best model by using the criterion of Nagelkreke R Square, Likelihood and Cox & 4.16. Snell I R Square, the forward selection procedure was used. Parsimony approach of model selection was used for the representative model; the model obtained is summarized in the Table

Table 3.16: Summary of the Best Model

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
5	85.215	0.651	0.886

The highest value of R-Square among all the models is obtained at Step-8 and it is 0.651. The corresponding Nagelkerke R Square value is 0.886 indicated that the88.6% of the variation is explained by the given model. The model having no predictor variables i.e. the null model gives the overall prediction. The correct prediction in this case is 68.9 shown in table 3.17.

Table 3.17. Null Model

Observed			Predicted		
			Group		Percentage Correct
			Case	Control	
Step 0	Group	Case	222	0	100.0
		Control	100	0	.0
	Overall Percentage				68.9

Table 3.18 shows the overall correct prediction of the research. It shows the 77% of the model.

Table 3.18. Full Model

Observed			Predicted		
			Group		Percentage Correct
			Case	Control	
Step 8	Group	Case	193	29	86.9
		Control	45	55	55.0
	Overall Percentage				77.0

By using the parsimony approach the model selected at step 8 is selected as the best. The best model is described in Table 3.19. The best model consists of 8 significant factors mainly Marital Status, First case was detected in China, Using window net can prevent Dengue, Use of creams can prevent us from Dengue, Attitude of the respondent, Age Group of the Respondents, From which source you have heard the word Dengue? and Hospitals. The table revealed that marital status is significantly associated with the Dengue disease. The odds ratio showed that married people are 2.597 times more affected with the Dengue than the unmarried. The odds ratio about the knowledge of the first tested country indicated that it is 1/0.352= 2.84 times among the control group about the disease than the patients. The odds ratio of 2.058 indicated the fact that the use of window net to protect the dengue is 2.058 times among the patients than the healthy people. The odds ratio about the knowledge of the use of creams to protect from the dengue is

2.335 times among the case group than the control group. The odds ratio about the knowledge of the attitude of respondents is 1/0.244= 4.10 times among the control group about the disease than the patients. The odds ratio showed that aged people are 1.553 times more affected with the Dengue than the young. The odds ratio about the knowledge of the source of dengue disease is 1/0.645= 1.55 times among the control group about the disease than the patients. Similarly, The odds ratio about the hospitalsis 1/0.366= 2.732 times among the control group about the disease than the patients. The four factors i.e. Marital Status, Using window net can prevent Dengue, Use of creams can prevent us from Dengue, Age Group of the Respondents gave the positive parameters values i.e. moving in the same direction as the disease. While First casewas detected in China, Attitude of the respondent, from which source you have heard the word Dengue? and Hospitals gave the results in favour of attendants of thepatients.

Table 3.19: The Best Selected Model

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 8	Married	.954	.337	8.003	1	.005	2.597
	OriginCountry	-1.043	.376	7.715	1	.005	.352
	Windownet	.722	.320	5.089	1	.024	2.058
	Cream	.848	.310	7.490	1	.006	2.335
	Attitude	-1.410	.327	18.566	1	.000	.244
	Agegroup	.440	.194	5.139	1	.023	1.553
	SourceofDengue	-.439	.096	20.979	1	.000	.645
	Hospitals	-1.005	.267	14.213	1	.000	.366
	Constant	.468	1.369	.117	1	.732	1.597

In terms of equation,

$$Logit(P) = 0.468 - 1.005\ Hospitals - 0.439\ Source\ of\ Dengue + 0.440\ Age\ group - 1.410\ Attitude + 0.848\ Cream + 0.722\ Window\ net - 1.043\ Origin\ Country + 0.954\ Married$$

3.3 To study association and strength of association among various risk factorsof Dengue using Chi-Square and Odds Ratio analysis.

3.3.1 Test for the Association:

Chi-square test is generally used to check the relationship between the categorical variables. In this study the response variables as well as the independent variables are not quantitative, so the test is used for this. Similarly, for checking the strength of dichotomous variables, the odds ratio procedure is popularly used.

3.3.2 Association between dengue and gender

Table 3.29. Shows the association between the fever and gender. The estimated odds ratio is 0.929 which is approximately 1, indicates the no association between the gender and disease. Similarly the chi-square value is very small close to 0and P-value is 0.77 is another indication that there is no association between gender and case control. In simple words disease is equally spread between male and females.

Table 3.29: Contingency table of Gender Vs Dengue Fever

		Case / Control		Total
		Control	Case	
Gender	Male	65	148	213
	Female	35	74	109
Total		100	222	322
Pearson Chi-Square		.086	1	P=0.77
Odds Ratio for Gender (Male / Female)		0.929 = 1		

3.3.3 Association between dengue and hospitals

Table 4.30. Shows the association between the fever and hospitals. The chi- square value is very small close to 0 i.e. 0.086 and P-value is 0.77 is another indication that there is no association between hospitals and disease. In simple words, patients are equally distributed among the three hospitals.

Table 3.30: Contingency table of Hospitals Vs Dengue Fever

		Case / Control		Total
		Control	Case	
Hospitals	Leady Reading Hospital	55	131	186
	Khyber Teaching Hospital	30	64	94
	Hayatabad Medical Complex	15	27	42
Total		100	222	322
Pearson Chi-Square		.650	2	P=.723

3.3.4 Association between dengue and age groups

Table 3.31. Shows the association between the fever and different age groups. The chi-square value is 3.655 and P-value 0.303 >0.05 is indication that there is no association between different age groups and disease. In simple words, disease is equally spread among all the age groups.

Table 3.31: Contingency table of Age Group of Respondents Vs Dengue Fever

		Case / Control		Total
		Control	Case	
Age Group of the Respondents	<=25 years	12	44	56
	25<age<=35	48	94	142
	35<age<=45	33	64	97
	>45	7	20	27
Total		100	222	322
Pearson Chi-Square		3.655	3	P=0.30

Association between dengue and family income

Table 3.32. Shows the association between the fever and family income. The chi-square value is 2.639 and P-value 0.451 >0.05 is indication that there is no association between family income and disease. In simple words, disease is equally spread among all the status people.

Table 3.32: Contingency table of Family Income Vs Dengue Fever

		Case / Control		Total
		Control	Case	
Family Income	<=10000	8	21	29
	10000< to <=20000	80	185	265
	20000< to <= 30000	9	10	19
	> 30000	3	6	9
Total		100	222	322
Pearson Chi-Square		2.639	3	P=.451

3.3.5 Association between dengue and education

Table 3.33. Shows the association between the fever and education. The estimated odds ratio of having healthy is 4.286 times for the literate people than the literate. This indicates the strength of association. Similarly, the chi-square value is very large 32.635 and P-value is 0.000 is another indication that there is a strong association between education and disease. In simple words disease is more common among the uneducated people than the educated people.

Table 3.33: Contingency table of Education Vs Dengue Fever

		Case / Control		Total
		Control	Case	
Education	Illiterate	50	42	92
	Literate	50	180	230
Total		100	222	322
Pearson Chi-Square		32.635	1	.000
Odds Ratio for Education (Literate / Illiterate)		4.286		

3.3.6 Association between dengue and marital status

Table 3.34. Shows the association between the fever and marital status. The estimated odds ratio of having fever is 2.549 times among the people than the unmarried. This indicates the strength of association. Similarly, the chi-square value is very large 14.774 and P-value is 0.000 is another indication that there is a strong association between marital status and disease. In simple words disease is morecommon among the married people than the educated people.

Table 3.34: Contingency table of Marital Status Vs Dengue Fever

		Group		Total
		Case	Control	
Marital Status	Married	144	42	186
	Unmarried	78	58	136
Total		222	100	322
Pearson Chi-Square		14.774	1	P=.000
Odds Ratio for Marital Status (Married / Unmarried)		2.549		

3.3.7 Association between dengue and knowledge about the dengue mosquitoes

Table 3.35 Shows the association between the fever and knowledge about the dengue mosquitoes. The estimated odds ratio of having fever is 0.303 times among the affected people than the unaffected i.e. healthy people. This indicates the strength of association. Similarly, the chi-square value is very large 20.031 and P-value is 0.000is another indication that there is a strong association between knowledge about the mosquitoes and disease. In simple words, the healthy people are more aware aboutthe dengue mosquitoes than the affected people.

Table 3.35: Contingency table of Knowledge about the dengue mosquitoes VsDengue Fever

		Group		Total
		Case	Control	
Dengue is transmitted by mosquitoes	Yes	36	39	75
	No	186	61	247
Total		222	100	322
Pearson Chi-Square		20.031	1	.000
Odds Ratio for Dengue is transmitted by mosquitoes (Yes / No)		0.303		

3.3.8 Association between dengue and knowledge about wearing the full sleevesshirts, long pant can prevent us from disease

Table 3.36. Shows the association between the fever and knowledge about the origin country of dengue. The estimated odds ratio of having knowledge about the sleeve shirt and long pant is 0.281 times among the healthy people than the affected people. This indicates the strength of association. Similarly, the chi-square value is very large 19.745 and P-value is 0.000 is another indication that there is a strong association between knowledge about the wearing the complete dress and disease. In simple words , the healthy people are more aware about the importance of complete dress than the affected people.

Table 4.36. Contingency table of Knowledge about wearing the full sleeves shirts,long pant Vs Dengue Fever

		Group		Total
		Case	Control	
Full sleeves shirt and long pant can prevent you from Denguevirus.	Yes	27	33	60
	No	195	67	262
Total		222	100	322
Pearson Chi-Square		19.745	1	.000

Odds Ratio for Full sleeves shirt and long pant can prevent you from Dengue virus. (Yes / No)	0.281		

3.3.9 Association between dengue and some of other factors are summarized inthe following table

Table 3.37. shows the association between the dengue fever and its relation with other dichotomous factors. The factors give the information about the significant knowledge of respondents and binary response variables. Since the calculation of odds ratio is based on 2×2 table, so only the dichotomous variables were considered. Significant variables are the knowledge about the Use of mosquito net can prevent Dengue having large value of Chi-square is 18.120, P-Value 0.000 and the value of odds ratio greater than 1 i.e. 2.831 indicates the affected people have more information about the use of net than unaffected. Similarly, the knowledge about the Use of window net can prevent Dengue having large value of Chi-square is 15.338, P-Value 0.000 and the value of odds ratio greater than 1 i.e. 2.778 indicates the affected people have more information about the use of window net than unaffected. Similarly, the knowledge about High fever and severe headache are the symptoms of Dengue having large value of Chi-square is 8.333, P-Value 0.004and the value ofodds ratio greater than 1 i.e. 2.013 indicates the affected people are more aware about symptoms (high fever and headache) than the unaffected people. Similarly, the knowledge about fatigue is the symptoms of Dengue having large value of Chi-squareis 19.509, P-Value 0.001and the value of odds ratio greater than 1 i.e. 2.952 indicates the affected people are more aware about the fatigue than the unaffected people. Similarly, the knowledge about the Dengue can be transmitted directly from person toperson having large value of Chi-square is 6.268, P-Value 0.012 and the value of odds ratio greater than 1 i.e. 1.885 indicates the affected people have more information about the transmission of virus than unaffected people. Significant variables are the knowledge about the Use of creams can prevent us from Dengue having large value of Chi-square is 26.523, P-Value 0.000 and the value of odds ratio greater than 1 i.e. 3.545 indicates the affected people have more information about the use of creams than unaffected. Significant variables are the knowledge about the Use of mosquitoes Spray can prevent Dengue fever having large value of Chi-square is 44.581, P-Value 0.000 and the value of odds ratio greater than 1 i.e. 5.291 indicates the affected people have more information about the use of mosquitoes Spray than unaffected people.

Table 3.37. Contingency table of Fever Vs Factors

		Chi-Square	P-Value	OddsRatio
Using mosquito net can prevent Dengue. (Y/N)	Disease	18.120	0.000	2.831
Using window net can prevent Dengue. (Y/N)	Disease	15.338	0.000	2.778
High fever and severe headache are the symptoms of Dengue. (Y/N)	Disease	8.333	0.004	2.013
Extreme fatigue is a symptom of Dengue. (Y/N)	Disease	19.509	0.001	2.952
Dengue can be transmitted directly from person to person.(Y/N)	Disease	6.268	.012	1.885
Use of creams can prevent us from Dengue. (Y/N)	Disease	26.523	.000	3.545

Use of mosquitoes Spray canprevent Dengue fever. (Y/N)	Disease	44.581	0.000	5.291

CONCLUSION AND DISCUSSION

The present research was conducted to know the opinion and perception of the people about the dengue disease. For this the case control research is conducted. A sample of 322 respondents consisting of 222 cases i.e. patients and 100 control. was collected from the three major hospitals of Peshawar i.e. Lady Reading Hospital, KhyberTeaching Hospital and Hayatabad Medical Complex. Out of 322 respondents, 186 nearly 58% were selected from the LRH, 94 participants were selected from KTH and13% i.e 42 were selected from HMC. Further out of 322 persons, 222 (698.94%) were dengue patients and 100 (31.06%) were healthy. The healthy persons are the attendant of patients. Out of 186 respondents of LRH, 91 were male patients and 35 were male attendants. Similarly, out of 60 female respondents, only 20 were health females and 40 were patients. Out of 94 respondents of KTH, 39 were male patients and 20 were male attendants. Similarly, out of 35 female respondents, only 10 were health females and 25 were patients. Out of 42 respondents of LRH, 18 were male patients and 10 were male attendants. Similarly, out of 14 female respondents, only 5 were health females and 9 were patients. Out of 186 respondents of LRH, 61 patients were belonged to urban areas and 21 were the attendant of that area. Similarly, out of 104 rural residents, only 34 attendants were from rural area and 70 patients were fromrural areas. Out of 94 respondents of LRH, 23 patients were belonged to urban areas and 10 were the attendant of that area. Similarly, out of 61 rural residents, only 20 attendants were from rural area and 41 patients were from rural areas. Similarly, Out of 42 respondents of LRH, 9 patients were belonged to urban areas and 10 were the attendant of that area. Similarly, out of 23 rural residents, only 5attendants were from rural area and 18 patients were from rural areas. On asking the 322 respondents about their marital status, 186 (57.76%) were married and 136 (42.24%) were unmarried.

Further 230 (71.43%) were illiterate and 92 (28.57%) were literate. Similarly, 56 (17.4%) respondents were below 25 years of age, 142 (44.1%) were below 35 years ofage, 30.1% were below 45 years of age and 27(8.4%) respondents were above 45 years of age group. The data showed that 29 (9%) respondents were belonged to the family having less than equal to Rs. 10000 income, 265 (82.3%) were belonged to the family having less than equal to Rs.20000 income, 5.9% were belonged to the family less than equal to Rs. 30000 income and only 2.8% families earning greater than 30000. TURF was used for selecting the factors which are useful for preventing the disease. Six factors were considered for knowing the knowledge about preventing the disease. These were i) covering water containers ii) drying stagnant water iii) using window nets iv) using mosquito nets v) cutting trees near houses and vi) smoldering.

In case of one factor, 88.2% respondents were in the opinion that covering water containers easily protect us from this deadly disease. Covering water containers and using mosquito nets were two important factors. Three significant factors combinationwas covering water containers, drying stagnant water and mosquito nets. The bestfour factors' combinations were, indicated that covering water containers, cutting trees near houses, drying stagnant water and using mosquito nets were the important factorsin preventing the dengue disease.

TURF analysis procedure was used for selecting the factors which are the symptoms of disease. The five symptoms were found to be Mild bleeding, Severe headache, Sudden high fever, Severe joint and muscular pain, Nausea and Skin rash were declared on the bases respondent's response as five important symptoms of Dengue disease having Reach value is 99.4%.

For detecting the outliers in all the three cases, three plots namely Cook‟s distance, Standardized residuals and the leverage values were used. Procedure indicated that the data is free of outliers. For selecting the best model by using the criterion of Nagelkreke R Square, Likelihood and Cox & Snell I R Square, the forward selection procedure was used. The best model consisted of 8 significant factors mainly Marital Status, First case was

detected in China, Using window net, Use of creams, Attitude of the respondent, Age Group of the Respondents, From which source you have heard the word Dengue?

Chi-square test and odds ratio were generally used to check the relationship between the categorical variables. The analysis showed the association between the fever and gender, hospitals, age group, family income, education, marital status, knowledge about dengue virus, wearing complete dress. Further, Significant variables were the knowledge about the Use of mosquito net, Use of window net etc.

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