COMPROMISED ENVIRONMENT AND HEALTH HAZARDS: CALCULATING THE ECONOMIC COSTS OF DENGUE, A CASE STUDY OF SWAT.

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CERTIFICATE

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I hereby declare that this my MPhil thesis titled Compromised Environment and Health Hazards: Calculating the Economic Costs of Dengue, A Case Study of Swat represents my own work which has been done after registration for the degree of MPhil at Pakistan Institute of Development Economics PIDE, and has not been previously included in a thesis or dissertation submitted to this or any other institution for a degree, diploma or other qualifications.

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Dedication

At first dedicating this work to Almighty Allah, without his mercy and sympathy I would not be able to accomplish this work, Almighty Allah gave me power and confidence to done project work and also Holy Prophet Hazarat Muhammad (Peace Be Upon Him) who is a light for humanity. I also dedicate this work to my lovely parents with deepest gratitude whose love and prayers have always been a source of strength for me, to my beloved brothers and sister who stands by me when things look bleak, my friends and relatives who encourage and support me, and all the people in my life who touch my heart, I dedicate this research.

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Abstract

This study identifies the potential determinants of dengue transmission and examines the awareness level and protective practices for dengue illness. Moreover, the study also calculates the direct and indirect costs faced by the dengue patients. Primary data were collected from 210 respondents in district Swat and two groups of respondents were selected for interviews: (i)affected group (dengue patients) and unaffected group (non-patients). Sample descriptive analysis were used to calculate the health cost of dengue patient. Linear Probability Model was applied to determine the potential determinants of dengue illness. Graphical and descriptive analysis were used to determine the awareness level and protective practices the respondents used during dengue outbreak. Total health cost of dengue illness per patient is calculated as Rs 18797.22 which included both direct and indirect cost. Average direct cost per patient of dengue illness was Rs 11018.38 and average indirect cost or productivity loss per patient due to dengue illness was Rs 7778.84. Averages period of the dengue illness were 12.05 days. The normal hydrological condition, solid waste, tire shop, and river near to home increase the probability of dengue illness. All the households have used various protective methods during dengue outbreak. Most of them used mosquito net, spray, eliminate standing water around the home, mosquito coils, and some other protective methods.

Table of Contents

CHAPTER 1 8

INTRODUCTION 8

1.1 Introduction: 8

1.2 Problem Statement 10

1.3 Objective of the Study 11

1.4 Significance of the Study 11

2 CHAPTER 2 12

LITERATURE REVIEW 12

2.1 Introduction 12

2.2 Review of Previous Studies 12

2.3 Studies on to Calculate the Direct Cost of Dengue Patient 12

2.4 Economic Burden of Dengue Infection With Reference to Pakistan 16

2.5 Estimated the Indirect Cost for Dengue Patient 16

2.6 Determinants of the Dengue Illness 18

2.7 Awareness and Prevention Practices of Dengue Control 20

2.8 Summary of Previous Studies 23

2.9 Contribution of the Present Study 23

3 CHAPTER 3 24

DATA DISCRIPTION AND RESEARCH METHODOLOGY 24

3.1 Introduction 24

3.2 Data Collection and Sampling Design 24

3.2.1 Questionnaire Design 24

3.3 Estimating Cost of Dengue Illness 24

3.3.1 Direct Cost 25

3.3.2 Indirect Cost 25

3.4 Econometric Analysis 25

3.5 To Estimate Cost of Illness 25

3.6 Determinants and Model of Dengue Illness for Swat 26

***3.7* Linear Probability Model of Determinants of Dengue Illness** 27

3.8 Descriptive and Graphical Analysis are Used for Awareness and Prevention Practices of Dengue Illness Control. 29

4 CHAPTER 4 30
DATA ANALYSIS 30
4.1 Introduction 30
4.2 Descriptive Statistics of Demographic Characteristics 30
4.3 Descriptive Statistics of Dengue Illness Health Cost 33
4.4 Patient Visited Hospital and Self-Medication 36
4.5 Patient Admitted in the Hospital and Type of Transport Uses 37
4.6 Potential determinants of Dengue Illness 39
4.7 To determine the Awareness Level of the Respondent About Dengue Illness. 42
4.7.1 Source of Information 44
4.7.2 People Would Like Various Channel of Communication to Get Knowledge About Dengue Illness. 45
4.8 To Determine the Prevention Practices of Dengue Control 49
4.8.1 Protective Methods Used By Household to Guard Against Dengue Spreading 51
5 CHAPTER 5 53
CONCLUSION AND RECOMMENDATION 53
5.1 CONCLUSION 53
5.2 LIMITATION OF THE STUDY 56
5.2 POLICY RECOMMENDATIONS 56
References 57
6 Appendix A 59

CHAPTER 1

INTRODUCTION

1.1 Introduction:

The low elevation coastal areas are mostly contributing to the dengue infection, and these areas are climatically suitable for growing of Aedes Aegypti; the mosquitoes capable of dengue fever (Machado,2012). Where changing weather condition can be one of the reasons to the rapid growth and subsequent disease outbreaks (Wu et al., 2007). The thickly populated areas with inadequate water sewerage, improper waste disposal and unplanned settlements are contributing to dengue vector growth (WHO, 2009). The survival of mosquito and growth from larval to adult mosquito, requires temperature range from 15^{o}C to 30^{o}C (Yang et al., 2009).

In the world dengue vector borne viral infection broadly spread everywhere, posing a severe health problem of public (Bhatt et al., 2013). The economic cost was annually measured in the billions of dollars, including both direct and indirect cost in America and South-East Asia (Shepard et al., 2011). The average cost of dengue patient was 161 US dollars for adults and 118 US dollars for children per head in Thailand (Okanurak et al., 1997). In Pakistan, average cost of dengue patient was calculated US$ 358.23 (Rafiq et al., 2015).

Climate change is most severe problem for the 21st century which affect human beings and biodiversity badly. It is happening because of greenhouse gases emission (IPCC, 2007). The main source of Greenhouse gas (GHG) emission are fuel combustion, industrialization, deforestation, and urbanization these are the factors which are changing in the global climate (Upreti, 1999). Global climate change in current years has also increased the risks to human health (Knapp et al.,

2017). Climate change has a significant impact on the spread of dengue and its mosquito vector (Li et al., 2018).

Dengue control and prevention depends on the effective vector prevention measures. The Aedes aegypti breeding are contributed by availability of refuse deposits containers for water storage, and environmental characteristics in poor urban communities. There is no proper treatment for dengue virus, but in the early stage detection and access to specific medical care lowers mortality. In majority of the hospitals the initial stage of dengue fever treatment is freely available but when the patient is complicated then there are some challenges financially to the patient because the complicated stage which has high cost. To control these costs, we should create awareness in the community about dengue virus.

Worldwide, about 2.5 billion people in most of countries are recently live at those areas which are higher risk of dengue outbreak in most of the countries (Sapir & Schimmer, 2005). The WHO and Centers for Disease and Prevention recommends the effective way of dengue prevention in most of community are education and awareness campaigns this can control vector breeding site. Various studies recommend for reducing vector breeding sites the education and awareness is more effective step at community level than chemicals (Gonez et al., 2002).

Background

The dengue outbreak started after 1970, only 9 countries undergone dengue epidemics. Most of countries in the WHO regions have experienced it as epidemic, such as Africa, Southeast Asia, America, America Mediterranean, and Western Pacific. Approximately 390 million, dengue cases are reported every year and mostly cases are reported in Asia, approximately 70% cases are reported in Asia, 16% in Africa and 14% in Latin America (Constenla et al.,2015). The South Asian countries are mainly responsible for the dengue infection viral in Pakistan. Majority cases

have been recorded from developing countries, such as Nepal, Sri Lanka, and India. In South Asia, Pakistan is one of the most affected country.

In Pakistan, the first dengue case was reported in 1994 from Karachi city and 2nd was reported in the next year from Quetta (Carroll et al., 2007). In 2006, total dengue cases were reported 3000 and 52 deaths. In 2007, the total suspected cases were 3342 with 12 deaths from all over Pakistan. Similarly, in 2008, the total cases were reported 3280 with 30 deaths similarly in 2010 the total cases more than 9000 were reported and 35 deaths from all over Pakistan. According to health department of Pakistan the 2011 damages were high as compared to the previous years, the total dengue cases were reported 22,562 with 363 deaths.

The above discussion concluded that, the thickly populated areas with inadequate water sewerage, unplanned settlements poor urbanization is contributing to dengue vector growth (WHO, 2009). Climate change has a significant impact on the spread of dengue and its mosquito vector (Li et al., 2018). Worldwide, about 2.5 billion people recently live at the areas of higher risk in more than countries (Sapir & Schimmer, 2005). The economic cost was annually measured in the billions of dollars, in the American and Asian countries (Shepard et al., 2011). There is no proper treatment or vaccine for the dengue virus but majority in the hospitals the initial stage of dengue fever treatment is freely available but when the patient is complicated then there will be some challenges financially to the patient because the complicated stage which has high cost. To control these costs the effective way of dengue prevention in most of the community the education and awareness campaigns that is control vector breeding site.

1.2 Problem Statement

During the last few years Dengue infection became an epidemic in various region of Pakistan. Due to high cost of treatment it becomes an economic burden on dengue patient of family. The outbreak

of dengue infection was frequent in 2011 than in previous years. New reported numbers of dengue patients rise to 50,000, at least 250 deaths (The News, Oct 2019). In Khyber Pakhtunkhwa, the total confirmed dengue fever cases were 7641 from 8th July to 12th November 2019 (WHO,2019). Due to dengue epidemic (attributed to direct cost and indirect cost of treatment) the socioeconomic status of the dengue patient family was disturbed.

1.3 Objective of the Study

1. To calculate total health cost of the dengue patient both direct and indirect.
2. To identify the potential determinants of dengue illness.
3. To determine the awareness level and prevention practices of dengue control.

1.4 Significance of the Study

Dengue fever has been on the rise in many parts of Pakistan. There is only one study was conducted in Pakistan on economic side but KPK was not included in that study. This study will be conducted to assess the total health cost of dengue patients from KPK side, and to check the awareness and knowledge use for the prevention of dengue control and find out the determinant of dengue illness in Swat, KPK. It will inform the policy maker to set health policy importance and to implement diseases control technologies.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides the review of previous studies regarding the health costs of dengue patient both direct and indirect cost, determinants of the dengue illness and the level of awareness and prevention practices to control the dengue illness. The cost of prevention impact of dengue outbreak is also reviewed. This is given in the following section.

2.2 Review of Previous Studies

Looking over the previous studies done, it is observed that most of the studies estimated about the direct cost of the dengue patients in which included hospitalized and ambulatory patients cost and also, they estimated indirect cost as well in various parts of the world. Most of the studies were conducted on the determinants of the dengue illness and the level of awareness and prevention practices to control dengue cases.

2.3 Studies on to Calculate the Direct Cost of Dengue Patient

Suaya et al., (2019) conduct the study to measure the cost of dengue case comprehensive in several countries in Asia and Americas. The study was based on the primary as well secondary and using macro-economic approach for unit cost of dengue patient and this is also prospective base. Findings shows that mean cost is I$ 1031 in the eight countries, but in Asia 2.7 time greater than in the Americas, aggregate cost for eight countries mean is I$ 587 million and Students lost days of school is 5.6 days and working lost 9.9 days per average dengue episode.

Baly et al., (2012) compared the economic cost of dengue outbreak with expenses during non-epidemic period in Guantanamo, Cuba. Primary data has been collected through questionnaires

from 400 peoples. The study focus on the average hospitalization cost per patient and statistical average has been used for the cost per patient. The findings revealed that the economic cost per inhabitant per month increased from USD 2.76 in months without dengue transmission to USD 6.05 mean while an outbreak. During outbreak, the cost per inhabitant for vector control program increased only from USD 0.21 to USD 1.88 per inhabitant per month.

Shepard et al., (2010) to calculate cost of dengue to Thailand society, direct medical care cost and indirect costs to household for lost income and school absence and for vector control. Both primary and secondary data was collected in this study. Using macro costing method to estimate unit cost of inpatient and ambulatory care with activity-based costing. The results show total annual cost of dengue US$ 158 Million, the Thailand per capita cost of dengue US$ 3.55.

Okanurak et al., (1998) calculate economic cost of dengue hemorrhagic (DHF) fever in 1994 outbreak in Thailand and his objective to estimate the direct cost of DHF patients. The data was collected from various sources, primary data was collected from the patients through questionnaires and secondary data was collected from prevention & control program and hospital records. A simple descriptive analysis is used for direct cost. The result revealed that the average direct cost of the DHF patients in Bangkok is US$ 184.06 and US$ 162.35 in Suphan Buri.

Thi et al., (2017) conducted a study on economic cost of dengue fever (DF) in Vietnam and objective of the study to identify treatment cost of dengue outbreak during 2013 to 2015 in Vietnam. The data were collected from hospital records and demographic characteristics were collected. Descriptive statistical analysis was used to estimate the treatment cost. The findings show that the total cost in 2013 is US$ 2103.92, in 2014 is US$ 21528.34 and similarly in 2015 total cost is US$ 37686.74 in general hospital of Vietnam.

Ling et al., estimate the cost and burden of dengue during epidemic and non-epidemic year in Taiwan. The aim of the study to calculate the economic cost of dengue infection. Secondary data was collected from disease control department in Taiwan and Wilcoxon rank sum test was used for the comparison the cost of dengue between epidemic and non-epidemic. The result shows that, the annual direct cost of dengue in 2000 is US$ 19398 to US$ 2749891 in 2014. For the epidemic years is US$ 2486872 and US$ 211081 for non-epidemic years and the epidemic year cost is 12 time greater than non-epidemic.

Halasa et al., (2012) conduct the study to estimate annual average aggregate economic cost of dengue cases treatment during the period of 2002 through 2010 in Puerto Rica. Data was collected from the various sources including patients, clinicians, insurers and combine with result of our previous research study on cost of dengue surveillance and vector prevention and using sensitivity analysis for examining a range of expansion factors as well statistical average approach was used for dengue patient. The findings show that average cost was estimated for per child $ 5387and $ 5518 was estimated for per adult. Ambulatory cost per child was calculated $ 1236 and $ 1293 was calculated for per adult. Similarly, fatal cost was estimated $ 474712 for per child and $ 407903 was estimated for per adult.

Castro et al., (2015) evaluate cost of dengue to the health system and individuals in Colombia from 2010 to 2012 his main objective to quantifying the various components of cost of a dengue. Using primary and secondary data a sensitivity analysis was used on the data using a bootstrap method. Results revealed that total cost per dengue case in 2012 was $202.3 for ambulatory patients, $497.9 for hospitalized patients and $2306 for patients with DHF.

Shepard et al., (2013) has analyses the economic and disease burden of dengue in 12 countries in Southeast Asia. Primary and secondary data was used for both direct and indirect unit costs of

dengue case using linear regression estimation. Results revealed that total direct cost is $ 451,297 annually, as well reported a burden of US$950m or about US$ 1.65 per capita in these 12 countries and the average annual numbers of reported cases in Southeast Asia was 3,86000 patients and 2126 deaths during 2001 to 2010.

Bajwalaa et al., (2019) evaluated the difference between private and government hospital the study focus to estimate the burden of dengue in terms of severity and different costs of treatment due to hospitalization for acute dengue illness for the year 2017–2018 in Surat city, Gujrat, India and used both primary and secondary data. A resource utilization approach is used to estimate the cost of illness in US dollars for dengue hospitalization. Findings indicate that the mean cost of hospitalization is US$ 86 in Gujrat, India. The cost of hospitalization is 28.8 times greater in private hospitals compared with government hospitals.

Garg et al., (2008) calculated economic burden of dengue within private and public sectors in India during 2006. Using both primary and secondary data was used, and histograms approach was used in SPSS to examine the normality of the cost data similarly the mean and median was used for unit cost. Finding shows that average total economic burden was estimated $21.7 million at private sector and $5.7 million at public sector and the median cost per patient was estimated US$432.2.

Shepard et al., (2014) find out economic burden of dengue patient in India. The aim of the study to calculate the direct medical cost of dengue patient during 2006 to 2012. Retrospective study is conducted in 10 medical collages of hospitalized dengue cases and pilot prospective study in India. The data collected from dengue patients through questionnaires and hospital records. The result shows that, the average hospitalized cost in public sector is US$ 197.03 and average cost in private sector is US$ 248.11.

Nadjib et al., (2019) conduct the study to calculate direct cost of dengue in Indonesia. The study was consisting of both primary and secondary data and this study is combination of prospective and retrospective method for both direct and indirect cost. Results shows that total direct cost per patient is US$ 678.1 for Yogykarta, US$ 875.05 for Bali and US$ 918.74 for Jakarta. Total direct cost was estimated US$381.15 million in Indonesia.

2.4 Economic Burden of Dengue Infection With Reference to Pakistan

Rafiq et al., (2015) conduct the study to estimate the economic burden of dengue infection in four major cities of Pakistan. Cross-sectional data was used for four cities Karachi, Faisalabad, Lahore, and Islamabad from July 2012 to March 2013. Cost per patient was estimated by taking the average cost borne by each patient and using Murray's formula was used for DALYs lost. Results shows that Direct cost per patient was calculated to be Rs.35,823 (US$358.23) and average duration of illness was 32±7.1 days.

2.5 Estimated the Indirect Cost for Dengue Patient

Shepard et al., (2010) to calculate cost of dengue to Thailand society, objective of the study to estimate indirect costs to household for lost income and school absence and for vector control. Both primary and secondary data was collected in this study. Using macro costing method to estimate unit cost of inpatient and ambulatory care with activity-based costing. The results indicate School lost laboratory confirmed 5.9 days, clinical 5.4 days, and entire cohort 5.5 days. Work lost laboratory confirmed 4.5 days, clinical 3.7 days, and entire cohort 3.9 days. Period affected laboratory confirmed 20.9 days, clinical 17.9 days, and entire cohort 18.6 days.

Okanurak et al., (1998) estimated economic cost of dengue hemorrhagic (DHF) fever in 1994 outbreak in Thailand and his objective to calculate the indirect cost of DHF patients. The data was collected from various sources, primary data was collected from the patients through

questionnaires and secondary data was collected from prevention & control program and hospital records. A simple descriptive analysis is used for indirect cost. The findings indicate that the opportunity cost of adult DHF patient is US$ 43.20 in Bangkok and US$ 35.20 in Suphan Buri, similarly opportunity cost of caretaker is US$ 51.30 in Bangkok and US$ 41.80 in Suphan Buri.

Halasa et al., (2012) conduct the study to estimate annual average aggregate economic cost of dengue cases treatment during the period of 2002 through 2010 in Puerto Rica. Data was collected from the various sources including patients, clinicians, insurers and combine with result of our previous research study on cost of dengue surveillance and vector prevention and using sensitivity analysis for examining a range of expansion factors as well statistical average approach was used for dengue patient. Results revealed that total average affected days was 30.9 days for child and 29.9 days for adult, its average cost was calculated $773 for a child and $916 was calculated for an adult.

Shepard et al., (2013) estimate economic and disease burden of dengue in 12 countries in Southeast Asia. Primary and secondary data was used for both direct and indirect unit costs of dengue case using linear regression estimation. The findings revealed that total indirect cost is $498,836 annually and DALYs is $213,839.

Garg et al., (2008) calculated economic burden of dengue within private and public sectors in India during 2006. Using both primary and secondary data was used, and histograms approach was used in SPSS to examine the normality of the cost data similarly the mean and median was used for unit cost. Results revealed that the total number of workdays lost was 7761 and per day cost was calculated US$10 the overall estimated value was US$0.42 million in private sector. Similarly, in public sector per day was calculated US$3 the total number of days was 7761 and the overall cost was calculated US$0.09.

Nadjib et al., (2019) conduct the study to calculate direct cost of dengue in Indonesia. The study was consisting of both primary and secondary data and this study is combination of prospective and retrospective method for both direct and indirect cost. Findings indicate that the total indirect cost per patient is US$ 113.8 for Yogykarta, US$ 336.14 for Bali and US$ 331.08 for Jakarta.

Rafiq et al., (2015) to calculate the economic burden of dengue infection in four major cities of Pakistan. Cross-sectional data was used for four cities Karachi, Faisalabad, Lahore, and Islamabad from July 2012 to March 2013. Cost per patient was estimated by taking the average cost borne by each patient and using Murray's formula was used for DALYs lost. Findings shows that Socio-economically,(58%) belonged to low, (28%) middle and (14%) to high socioeconomic groups of the dengue patients, average number of days lost of the patient were 13±8 days and DALYs lost per million population it was133.76.

2.6 Determinants of the Dengue Illness

Antonio et al., (2017) conduct the study and the aim of the study was to investigate relationship between environmental climatic condition and dengue incidence during 2010 and 2013 in Brazil. The data was collected from Dengue Prevention Department and National Metrological Department in Santo Andre and the Pearson correlation was utilized for analyzing the relationship between reported cases and environmental climatic factors. The results stated that, the highest number of dengue cases were notified in the months of Jan, Feb, Mar, Apr and, May from 2010 to 2013. The temperature value was closely related with reported dengue cases. The notified dengue cases statistically significant with humidity and PM_{10}. During 2012 the dengue incidence cases were significantly decline because many people was started the awareness campaigns.

Spiegel et al., (2007) characterized the relationship of present Aedes Aegypti with environmental social risk factor in Cuba. The primary data were used from with infestation and without infestation

groups. The logistic regression was run on the following data. Results revealed that, those household they were not active economically there was higher chances of having breeding of the dengue mosquitoes than those were active economically. The household their income increases by 10 Cuban Pesos their risk was reduce by 12%. In the household more than two people per bedroom, water pipe leakage and those have not seen a vector control these were associated with higher risk. The houses where the irregular water services and water tanks located at ground level and outside the house, they were with high risk factors.

Zahir et al., (2015), investigate the barriers in the prevention of dengue infection in Swat district KPK, Pakistan. The primary survey was conducted the data were collected from 354 residents in four villages of Swat district via questionnaires and the Chi Square Test was utilized to check the relationship between practice for control and barriers to prevention. Results revealed that, 92% of the residents identified their location was suitable for dengue mosquito breeding. The highest population density is suitable environment for the dengue, and the government was not active in controlling of dengue of mosquitoes that was stated by 78% of the respondents. 79% of the respondents does not followed the advice of the government and NGO. Due to high rainfall, 58.8% of the respondents claimed that it was difficult to remove and fill standing water. 76% of the respondents was used bed net, while 6% to protect themselves from dengue biting, they did not used mosquito repellents.

Bushra and Ghaffar, (2015) conduct the study to investigate the environmental factors which are contributed the dengue spread. Data were collected from National Institute of Health Islamabad, and Punjab, Sindh database. The climate data collected from Metrological Department and the OLS method was utilized for the regression. The results revealed that, higher number of cases were reported in densely populated area at all cities. The suitable area for the dengue transmission was

higher magnitude of drainage density and population density. The temperature and rainfall contributed the dengue spread and differently behave the monsoon condition in different cities. The heavy rain, normal temperature, and flooding during 2010 to 2011 contribute the dengue spread. The migration patter in all cities play a significant role in the spreading of dengue.

Mukhtal et al., (2012) identify the relationship between dengue fever and risk factors in the patients admitted during dengue outbreak in Lahore. The data were collected from dengue patients in 2011 at private and public hospital of Lahore city and Descriptive analysis was used to identify the relationship between them. Findings show that, water supply is identifying the main source of higher risk factor of dengue illness. There was strong relationship between water pipe supply and dengue illness. Water storage vessel and pipe water supply was the higher risk factor for the dengue illness

Atique et al., (2017) conduct the study and the objective of the study was to show the related risk determinants at various union council in the Swat District and Spatio Temporal clusters. The data were collected from the health department of Swat District and the space time analysis was utilized to show the diffusion pattern. Two model were applied such as OLS and geographically weighted regression GWR to find out the effect of population density, elevation, and distance to river. Findings notified that; the dengue cases were started from Mid – Aug to Mid – Nov it is indicated by Temporal Diffusion Visualization. The dengue cases in swat were positively related with distance to river and population density, the increase in the elevation of the area the dengue cases were decreased.

2.7 Awareness and Prevention Practices of Dengue Control

Naig et al., (2011) identify the practice and knowledge level to control dengue at community base and find out the control factors practice of dengue in Malaysia. The data were collected through

questionnaire from 321 household via convenience sampling techniques. The linear regression analysis was used to show control practice factor of dengue mosquitoes and multivariate model were used for categorical variable. Findings shows that, 95% of the respondents had heard about dengue mosquitoes and 50% of the respondents had misconception that dengue can breed in dirty water and its biting time is sunset, the remaining 50% of the respondents could right answer that dengue can breed in small clean water at everywhere. 76% of the respondents were used sprays and 73% cleaned garbage bins, while 11% of the respondents were used bed nets at nighttime and 25% of the respondents were believed to inform their children to wear pants and long sleeves. A significant association were found among knowledge score of dengue and age, educational level, occupation, and material status. There are positive and significant relationship between practice on the dengue control and knowledge.

Benthem et al., (2002) identify the knowledge of the dengue and prevention measures and compared both aware and unaware groups. The data were collected from 1928 person through questionnaire in Northern Thailand and the logistic regression was used to find out the knowledge of dengue and Chi-Square test was used for the comparison of the both groups and univariate analysis was used for knowledge of dengue. The results stated that, 67% of the household were aware about dengue illness. With higher knowledge of the respondents were used to higher prevention measure for the dengue control. The older people had less knowledge of the dengue illness than the younger people. The students had higher knowledge about dengue as compared to unemployed and housewives.

Bota et al., (2013) identify the knowledge awareness among the students in Sindh. Data was collected from 385 students through questionnaires and random sampling technique was used. Sample descriptive analysis was used to calculate the percentage of categorical variable. Findings

stated that, 30% of the students belong to higher social economic status, 43% from middle and 26% from belong to low social economic status. The 94% of the students heard about dengue illness and 58% of the students believed that Aedes Aegypti mosquito as a vector dengue virus. 14% of the students stated that mosquito breed in flow dirty water, 19% stated that it breed in clean water, 38% stated that it breed in standing dirty water and 47% of the students stated that it breed in standing clean water. 44% of the students stated that the biting time as at dusk and similarly 51% stated that the biting time at Dawn and 21% of the students stated that the biting time at nighttime. The 77% of the students believed that the dengue can be prevent and the 45% of the students stated that still there are no vaccination available for the dengue.

Begonia and Leodoro, (2013) conduct the study on dengue knowledge and prevention and their objective is to identify the knowledge and preventive practice about dengue illness in Samar Philippines. Primary data were collected from 646 respondents in Samar province through questionnaire. The Fisher T Test was used to find out significance correlation between knowledge and dengue preventive practices and Pearson's correlation was used to check the association among knowledge and prevention practices. Results show that, 92% of the respondents knew about dengue fever is caused by dengue mosquitoes and 69% of the respondents knew that timing of the dengue feeding in the afternoon. 80% of the respondents knew that the dengue transmission from mosquito, and 39% of the respondents were informed about the pain behind the eyes is a dengue fever symptom. 61% of the respondents had information about signs, symptoms, causes, transmission, and preventive measure and 52% of the respondents were used preventive measures such spray, bed nets, mosquito coil, fans, and screen window. There was no correlation among knowledge and dengue preventive practices. Television and radio are the main source of awareness

for the respondents. The results also show that the good knowledge does not required to lead best way of dengue measures.

Itrat et al., (2008) conduct a cross sectional study to identify the attitudes, knowledge, and practice about dengue in Karachi. Primary data were collected from various patients and using convenience sampling method, and the multivariate regression and logistic regression were used. The results revealed that, 38% population had enough knowledge about dengue. The people who had insufficient knowledge about dengue they are mostly high income.

2.8 Summary of Previous Studies

The literature focused on both direct and indirect cost of dengue patients. Further there are studies which investigate in the dengue outbreak the income and productivity were affected of the household of dengue patients. The literature also points out the studies on determinants of the dengue illness, awareness and prevention practices were decline the dengue cases.

2.9 Contribution of the Present Study

Various studies have been conducted to explain dengue in the terms of clinical picture, diagnosis, treatment and preventing. However, little information is available from Pakistan in term of economic burden of dengue and its impact on the citizens. Dengue fever has been on the rise in many parts of Pakistan. It is important to know the cause, effect, and treatment to be taken in case of someone family, is already suffering from the dreaded disease but such type of studies is still lacking for Pakistan. There is only one study was conducted in Pakistan on economic side but KPK was not included in that study. This study will be conducted to assess the total health cost of dengue patients, and to check the awareness and knowledge use for the prevention of dengue control and find out the determinant of dengue illness in Swat, KPK. It will inform the policy maker to set health policy importance and to implement diseases control technologies.

CHAPTER 3

DATA DISCRIPTION AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents how to tackle the research problem and it is divided in to two sections. The first section is about discussion of data and variable construction, while the second section is discussed which is used for solving the research problem by applying the econometric modelling.

3.2 Data Collection and Sampling Design

The study is based on primary survey and the questionnaire is used for the data collection. The data has been collected in four union councils of Swat city under the use of simple random sampling technique. The population is divided into two groups – the ones who were affected by dengue and those who were not. So, two union councils are selected- one with dengue patients and one that did not have dengue patients.

3.2.1 Questionnaire Design

The questionnaire is designed to collect the data required for this study and questionnaire comprised on demographic characteristics, direct and indirect cost factors, determinants of dengue illness, awareness about dengue illness and prevention practices for dengue control for the residents of Swat.

3.3 Estimating Cost of Dengue Illness

The cost of dengue illness calculates the economic burden of a disease. There are two types of cost of illness one is direct cost and the other one is indirect cost.

3.3.1 Direct Cost

Direct cost of the illness are costs of the health care medical service in which include cost of hospitalization, cost of diagnostic tests, cost of the medicines, doctor checkup fee, overall transportation cost which are incurs for visiting hospital, and cost of food logging.

3.3.2 Indirect Cost

The indirect cost can be defined as value of resource lost, or productivity lost due to disease. It consists of the decline of the productivity due to loss of working days or work hours, decrease in income or loss of employment due to illness, and loss of work time which reward him less wage rate due to illness. There are two factors of indirect cost which affect the productivity such as, losses of productivity due to morbidity and mortality. In this study only took the productivity losses due to morbidity while the productivity losses due to mortality were skipped because of time constraint and Corona Epidemic. In the term of indirect costs, the patients being hospitalized, and they cannot work because the absence from work. During the time of illness, the individual cannot work and stop the work, this situation may adversely affect the household productivity. To calculate, the indirect costs of the individual by using their actual daily wage.

Productivity lost due illness = No. of working days lost multiply with daily wage rate.

3.4 Econometric Analysis

3.5 To Estimate Cost of Illness

Descriptive analysis is used to estimate the cost of illness for the dengue patient in which includes both factors of direct and indirect costs. The variables are direct and indirect cost which are affected the patient monthly income the factor such as outpatient care, inpatient care, non-medical care, loss of income per day, loss of working days, loss of productivity.

$$THC = Direct\_Cost + Indirect\_Cost$$

Table 3.1: Health Expenditures

Variables	Description
THC	Total health cost of dengue is the combination direct and indirect cost.
Direct Cost	Direct cost is vector variable in which includes various factor such as outpatient, inpatient, and self-medication at home. The direct cost of the dengue patient is the combination of various health expenditure such as mentioned in this table.
	Doctor fee of public hospital
	Doctor fee of private hospital.
	Cost Laboratory test.
	Cost per day bed cost of hospital
	Cost of food logging per day
	Cost transportation
	Cost of hospital expenses
	Treatment at home
	Total expenditure of home treatment
Indirect Cost	Total loss of income.
	Loss of working days
	Loss of productivity

3.6 Determinants and Model of Dengue Illness for Swat

In order, to study the determinants of dengue illness the Linear Probability Model is performed. The Linear Probability Model to show the relationship between dependent and independent variables, whether the factors of determinants play significant role in prevalence of dengue illness

and to find out those factors which are responsible in undertaking the illness of dengue among the people. The Linear Probability Model is appropriate because our data is comprising of binary responses.

3.7 Linear Probability Model of Determinants of Dengue Illness

$$\boldsymbol{Illness(0,1) = \beta^{\circ} + \beta 1(Age) + \beta 2(Education) + \beta 3(Residence) + \beta 4(Occu) + \beta 5(Income) + \beta 6(River_{Near}Home) + \beta 7\left(Housing_{Type}\right) + \beta 8(Open_{Sanitation}) + \beta(Hydrological_{Condition}) + \beta 8(TireShop_{Near}) + \varepsilon o}$$

Linear Probability Model is used when the dependent variable is dichotomous response variable based on probabilities related with the value of dependent variable. Variables are described in the following table.

Table 3.2: Potential Determinants of Dengue

Variables	Description
Illness	Y = 1 which is the presence of the dengue illness, similarly Y = 0 which mean that the responded is not dengue patient.
Age	Taken in number of years of respondents
Income	Monthly income of the respondents in PKR
Education	Number of schooling years of the respondents
Occupation	Occupation of the respondent is constructed in categories for different profession
Residence	Locality of the responded which is constructed in (1,0) form, if the household is resident of urban takes value 1 otherwise 0.
River Near to Home	Household within the vicinities of the river will hold the value of 1 otherwise 0.
House Type	Housing type means, 1 = if the household is Pucca house and otherwise 0.
Open Sanitation	Open sanitation is constructed in (1,0) form, 1 means If there is open sanitation near to household house otherwise 0.
Hydrological Condition	The hydrological condition is constructed in the multiple response options, 1 for good hydrological condition, 2 normal hydrological condition, and 3 for bad condition.
Tire Shop	If the household near to the tire shop takes value 1 otherwise 0.

3.8 Descriptive and Graphical Analysis are Used for Awareness and Prevention Practices of Dengue Illness Control.

Table 3.3: Awareness Level and Prevention Practices of the Respondents

Variables	Description
Illness	Y = 1 which is the presence of the dengue illness, similarly Y = 0 which mean that the responded is not dengue patient.
Age	Taken in number of years of respondents
Income	Monthly income of the respondents in PKR
Education	Number of schooling years of the respondents
Occupation	Occupation of the respondent is constructed in categories for different profession
Residence	Locality of the responded which is constructed in (1,0) form, if the household is resident of urban takes value 1 and otherwise 0
Awareness	If the respondent is heard about dengue illness takes value 1 otherwise 0. and it represent the awareness level of the respondents
Prevention Practices	What type of primary preventive practices the household are used to prevent the occurrence of dengue illness.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

This chapter include data analysis which consist of descriptive analysis and linear probability model for the attainment of the study objectives. The descriptive analysis explained to estimate the cost of illness for the dengue patient in which include the factors of direct and indirect costs, awareness level of the people and preventive practices the respondents are used to prevent the occurrence of dengue illness. The linear probability model is used to determine the environmental determinants of dengue illness.

4.2 Descriptive Statistics of Demographic Characteristics

Table 4.1 : Descriptive Statistics of Demographic Characteristics

Gender	**Frequency**	**Percent**	**Cumulative Percent**
Male	158	75.2	75.2
Female	52	24.8	100.0
Total	210	100.0	
Marital Status			
Marital Status	**Frequency**	**Percent**	**Cumulative Percent**
Married	132	62.9	99.5
Single	77	36.7	36.7
Widow	1	0.5	100.0
Total	210	100.0	
Residence			
Residence of the respondents	**Frequency**	**Percent**	**Cumulative Percent**
Urban	125	59.5	59.5
Rural	85	40.5	100.0
Total	210	100.0	
Education			
Educational Level of the respondents	**Frequency**	**Percent**	**Cumulative Percent**
Primary Education	15	7.1	7.1
Middle Education	26	12.4	19.5

Secondary Education	51	24.4	43.8
Higher Secondary	47	22.4	66.2
University Education	45	21.4	87.6
Illiterate	26	12.4	100.0
Total	210	100.0	
Occupation			
Occupations of the respondents	**Frequency**	**Percent**	**Cumulative Percent**
Minor Unemployed	38	18.1	18.1
Gov't Employee	7	3.3	21.4
Own Business	37	17.6	37.1
Housewife	39	18.6	81.0
Train Employee	17	8.1	91.0
Farm Worker	8	3.8	94.8
Pensioner	2	1.0	99.5
Military	1	0.5	100.0
Student	53	25.2	62.4
Others	8	3.8	98.6
Total	210	100.0	
Monthly Income			
Mean	**Std. Deviation**	**Minimum**	**Maximum**
40469.52	30742.60	3000.00	160000
Age of the Respondents			
Mean	**Std. Deviation**	**Minimum**	**Maximum**
31.45	12.49	7.00	70,00

Descriptive statistics explained the summary of the demographic characteristics of this study. In above table gender is define as male and female. The above table shows that the 72.2% data were collected male whereas 24.8% were collected from female in the study. The marital status shows that 62.9% data were collected married respondents, 36.7% were collected from single respondents whereas 0.5% from widow. The residence shows the place where respondents lives. In that study 59.5% respondents were taken from urban while the remaining 40.5% from rural.

In the above table education are explained the educational level of various respondents in the data. In this study 7.1% respondents were primary educated, 12.4% were in the middle education, 24.4%

respondents were in secondary education, 22.4% respondents from higher secondary education, 21.4% of the respondents from university education while the remaining 12.4% respondents were illiterate. Occupation were shows various profession of the respondents. 18.1%, 3.3%, 17.6% and 18.6% are indicated the profession minor unemployed, govt employ, own business and housewife, respectively. Similarly, 8.1%, 3.8%, 1.0% and 0.5% are indicated the respondent's profession train employee, farm worker, pensioner, and military, respectively. The 25.2% were students while the remaining 3.8 were others they not mentioned his professions.

Income were showing the household monthly income which are taken in Pakistani rupee. The above that show that the average monthly income, minimum and maximum monthly income of the household. The mean monthly income were Rs 40469.52, minimum monthly income were Rs 3000, and the maximum monthly income were Rs 160000. The age of the respondents was found in this study to be lying between 7 to 70 years. The mean age of the respondents were 31.45 years, the minimum was 7 year while the maximum age were 70 years

4.3 Descriptive Statistics of Dengue Illness Health Cost

***Table 4.2* :** *Health Cost of Dengue Patient*

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Total affected days	105	5.00	30.00	12.0571	3.8015
Total cost of transportation	105	20.00	6000.00	776.3810	833.13255
Doctor Fee	105	10.00	4200.00	306.9524	624.31058
Total cost of Laboratory tests	104	300.00	12000.00	1951.5385	1894.72788
Medicines Expenditure	105	300.00	15000.00	3578.0952	2750.10423
Total bed cost	5	20.00	18000.00	6184.0000	7088.74319
Total cost of food	35	300.00	5600.00	1871.4286	1239.68009
Total days of treatment at home	97	2.00	30.00	10.1649	4.12482
Total expenditure of treatment at home	85	200.00	14000.00	4316.4706	3403.83527
Total direct cost	105	2710	44400	11018.38	6354.862
Indirect cost	76	333.00	43333.00	7778.8421	7487.81373
Total number of observations	105				
Total Direct Cost		11018.38			
Total Indirect Cost		7778.8421			
Total Cost (Direct Cost + Indirect Cost)		11018.38 + 7778.8421 = Rs 18797.2221			
Total Cost in US Dollars		$ 111.503			

1 US Dollar equal to 168.58 Pakistani Rupees

The above table 4.2 of descriptive statistic explained all the health expenses which are occur due to dengue illness. Averages period of the dengue illness were 12.05 days, the minimum period were 5 days whereas the maximum period were 30 days of the dengue illness. The minimum cost of transportation were 20 rupees and the maximum transportation cost were 6000 rupees and the mean cost were 776.38 rupees which mean that during dengue illness the patient used transportation to the hospital and laboratory at various time. The minimum doctor fee were 10 rupee, the maximum doctor fee were 4200 rupee, and the mean doctor fee were 306.95 and the Std. deviation 833.13.The higher doctor fee mean that the patient were visited to the private doctor while the lower fee of doctor were explained that the patient were visited to the government hospital doctor at many time. The minimum cost of laboratory test were 300 rupees, the maximum cost of laboratory test was 12000, and the mean cost were 1951.53 rupees. Those patent who were visited to private laboratory the test cost of these patients were higher as compared those who were visited to government hospital laboratory.

Minimum cost of the medicines were 300 rupees, the maximum cost of the medicines were 15000 rupees, and the mean cost of the medicines were 3578.09 of the dengue patients. The patients who were affected from dengue illness for long period then their cost was higher for the medicines. The minimum cost of the hospital bed was 20 rupees, the maximum cost were 18000 rupees, while the mean cost of the hospital bed were 6184 rupees for dengue patients. Again, if we compared the private hospitals and government hospitals in the term expenditures so the private hospitals expenditure was higher as compared to government hospital. Similarly, the minimum cost on the food during the dengue illness in the hospital were 300 rupees, the maximum cost were 5600 rupees, and the mean cost on the food during hospital were 1871.42.

Majority of the dengue patient were treated at home because in the government hospitals have low capacity of the bed mean issue of availability of bed during dengue outbreak and the cost of private hospitals were very high for one day of bed. Minimum days of treatment at home were 2 days, the maximum days were 30 days, and the average period of dengue illness at home were 10.16 days. The minimum cost of dengue illness at home were 200 rupees, the maximum cost were 14000 rupees, and the mean cost of dengue illness at home were 4316.47 rupees.

Productivity Loss = Daily Wage Rate X Total Affect Days

To sum of all these costs which were spends on dengue illness we will get total direct cost. Average direct cost per patient of dengue illness was Rs 11018.38. The minimum total direct cost per patient of dengue illness was Rs 2710 and the maximum total direct cost of dengue illness per patient was Rs 44400. To calculate total indirect cost or productivity loss due to dengue illness is equal to daily wage rate multiply by total affected days. Average indirect cost or productivity loss per patient due to dengue illness was Rs 7778.84. The minimum indirect cost per patient was Rs 333 and the maximum indirect cost per patient was Rs 43333. Total cost of dengue illness per patient was Rs 18797.22 which included both direct and indirect cost.

4.4 Patient Visited Hospital and Self-Medication

Table 4.2.1 : Type of Hospital and Self-Medication

Treatment Place	Frequency	Percent	Cumulative Percent
Government Hospital	72	34	68.5
Private Hospital	33	15.7	100.0
Total Number	105	50.0	
Patient who did treatment at home	97	46.2	92.4
Patient who did not treatment at home	8	3.8	100.0
Total	105	50.0	

The above table 4.2.1 shows that the type of hospital either it is government hospital or private hospital which were used by the patient during dengue illness and explained the summary of self – medication. During dengue outbreak 34% of the patient were visited government hospital and 15.7% were visited private hospital. Majority of the dengue patient were treated at home because in the government hospitals have low capacity of the bed mean issue of availability of bed during dengue outbreak, the cost of private hospitals were very high for one day of bed, and most of the people stated during interview the treatment at home were compatible for us during dengue illness because in the government hospital were not available all facilities and private hospital were too costly. These are the reason most of the dengue patient were treated at home, 46.2% of the patient were treated at home and 61.9% of the respondent have own mosquito net at home. The remaining 3.8% did not treatment at home.

4.5 Patient Admitted in the Hospital and Type of Transport Uses

Table 4.2.2 : Hospitalized and Transport Type

Variable	Frequency	Percent	Cumulative Percent
Patient admitted in the hospital	32	15.2	30.5
Patient did not admit in hospital	73	34.8	100.0
Total Number	105	50.0	
Public Transport	46	21.9	43.8
Own Transport	20	9.5	62.9
Rental Transport	39	18.6	100.0
Total	105	50.0	

Table 4.2.2 explained the patient were admitting at hospital or not during dengue illness and type of transport used by the patient to the hospital and laboratory for test. 15.2% of the respondents were admitted at hospital for treatment while the 34.8% of the patient were not admitted at hospital for the treatment. All the patient was used various types of transport for travelling to hospital. So, 21.9% of the patient were used public transport, 9.5% of the patient were used own transport, and 18.6% patient were used rental transport during the period of dengue illness.

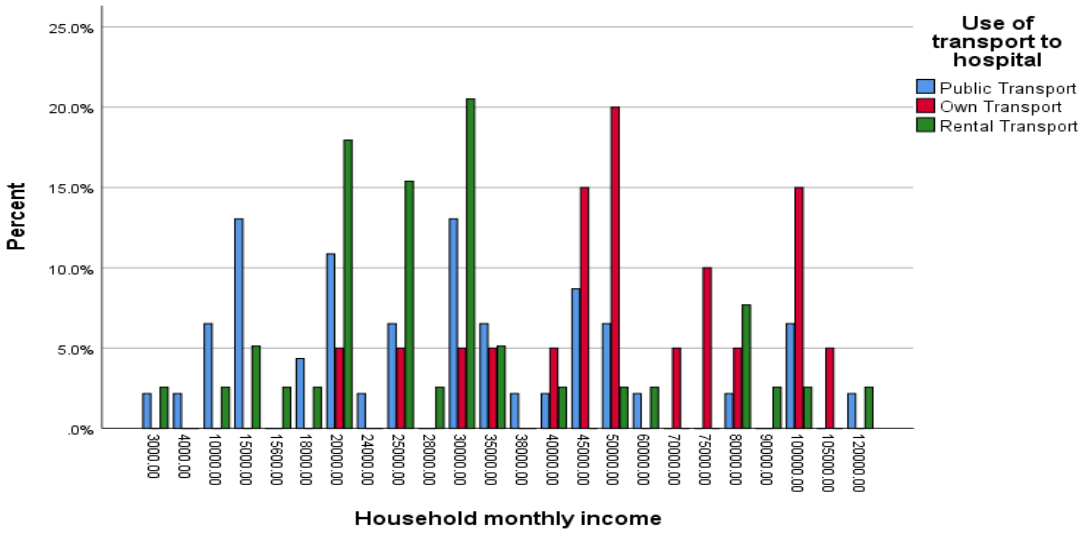

Figure 4.1 **:** Used of Transport to Hospital By Dengue Patient

Figure 4.1 explained the relationship between transport used by the patient and household monthly income. Those who were belong to lower income group they were public transport to hospital and few people were used the rental transport. The middle-income group were used rental transport to the hospital many times and some of the respondent have own transport, so they were used it. Those who were belong to higher income group most of them were used own transport for travelling to hospital during dengue illness and some of them used rental as well public transport.

4.6 Potential determinants of Dengue Illness

The determinants of dengue illness are explored using linear probability model and the results are given in Table 4.3.

Table 4.3: Potential Determinants

Variables	**Coefficient**
Age (Years)	-0.0036 (0.0028)
Education (No of Years)	-0.0015*** (0.0076)
Residence	0.2304*** (0.053)
Family Income	5.77e-07 (9.12e-07)
Home Type	0.032 (0.058)
Normal Hydrological Condition	0.107** (0.0527)
Bad Hydrological condition	-0.145 (0.235)
Solid Waste	0.090* (0.050)
Open Sanitation	0.438*** (0.057)
River Near to Home	0.180*** (0.054)
Tire Shop Near to Home	0.196*** (0.080)
Constant	-0.078 (0.157)
Adj R-squared	0.6113
Number of Observation	183

Note: ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively.
Although not show here, the model also controls for occupations of the respondents

Interpretation

In the above table 4.3 the dependent variable is dichotomous response variable and the value of dependent variable is (0,1) which mean to represent the probability that, Y = 1 which is the presence of the dengue illness, similarly Y = 0 which mean that the responded is not dengue illness patient. The independent variables are age, education, residence, family income, home type, hydrological condition, solid waste, open sanitation, river near to home, and tire shop near to home. Age of the respondents were taken in number of years. The above table shows that the age of the respondent has a negative relation with dependent variable but it statistically not significant. This means that both young and old could fall prey to dengue and people of all ages may vulnerable to this disease. Education were also taken in number of years. The result of education is significant at 1% significance level and the relationship is found negative. This suggests that a one year increase in education reduces that probability of becoming a dengue patient by 0.15 percent. This could because educated people are more aware and may take better health precautions to avoid get ill. Residence shows the place of living and the residence is highly significant at 1% and positively related with dependent variable. The residence variable takes the value 1 if respondent lives in urban areas. Hence, the probability of get dengue increase for urban residence compared to rural residents because in the urban region there are various issues of the sanitation and standing water due to high population. Income is also found to be statistically insignificant suggesting that every group of income could be victim of dengue if precautions are not taken. Similarly, dwelling type does not significantly associate with probability of getting dengue.

Hydrological condition shows the environmental condition near to home. In the above table the results of normal hydrological condition near to home is significant at 5% significance level. That is, compare to good hydrological condition near home, the probability of getting dengue is higher

even in normal conditions. The poor condition category is dropped because of fewer observations. But this does not affect the basic results. If the normal condition can increase the probability of dengue, the poor conditions will definitely do as well. Hence, attention is needed to improve to hydrological conditions near home.

The results of solid waste near to home is significant at 10% of significance level. Having solid waste near house increases the probability of getting dengue by 9 percent. similarly, open sanitation near home is highly significant at 1% of significance level and the coefficient is positive. Open sanitation near home increase the probability of dengue illness 44 percent. This could be because there is high chance of dengue mosquito in the open sanitation due to larvae stage of dengue mosquito needed only water. Similarly, the results of river near to home is also significant at 1% level which suggest that having river near home increase the probability of dengue illness by 18 percent. The results of having a tires' shop near home is significant at 1% level and the coefficient is positively related with dependent variable. This points that having tire shop in close proximity increases the probability of become a dengue patient by 19.6 percent. Most of the tire shops have open water for tires leak checking and this water stays in the open for 2 to 4 days so this water contributes to dengue mosquito breeding.

The adjusted R-square shows that the overall model explain more than 60 percent variation in the dependent variable which suggests that overall model is a good fit.

4.7 To determine the Awareness Level of the Respondent About Dengue Illness.

Various tables, graphs, and descriptive analysis ere used to explain the awareness level of the respondent about dengue.

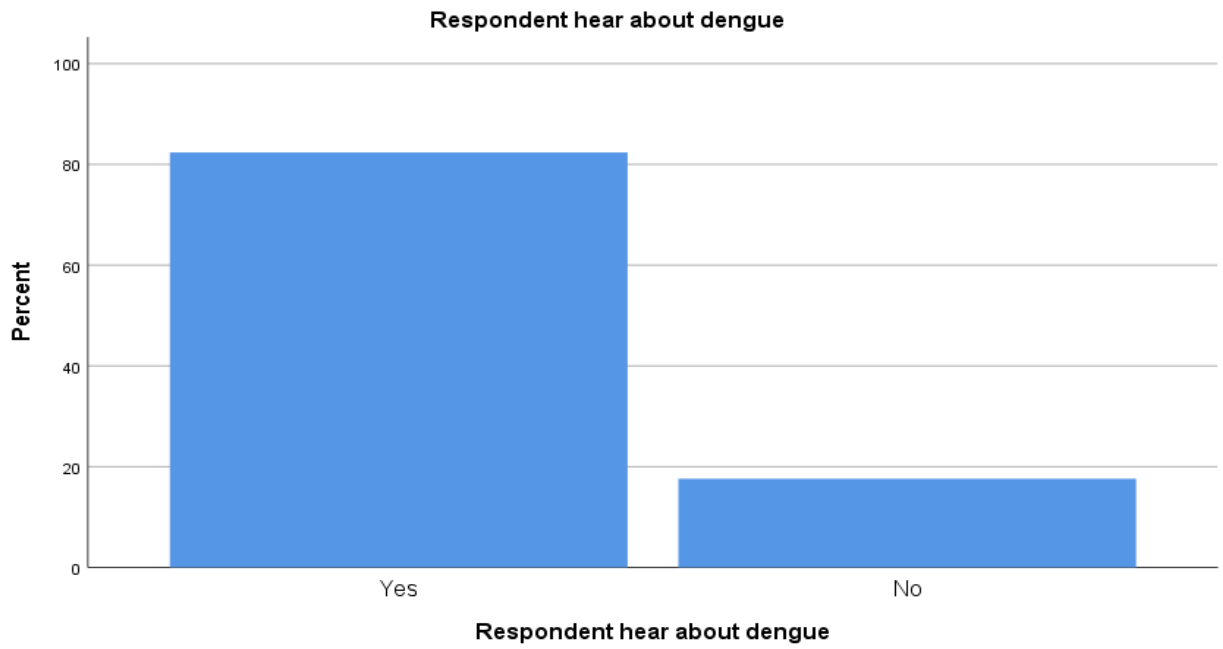

***Figure 4.2*:** The Awareness of the Respondents

The above figure 4.2 explained the awareness of the respondents that they have heard or not about dengue illness. The present study results revealed that 84.4% respondents have heard about dengue illness while 17.6% respondent have not heard about dengue illness.

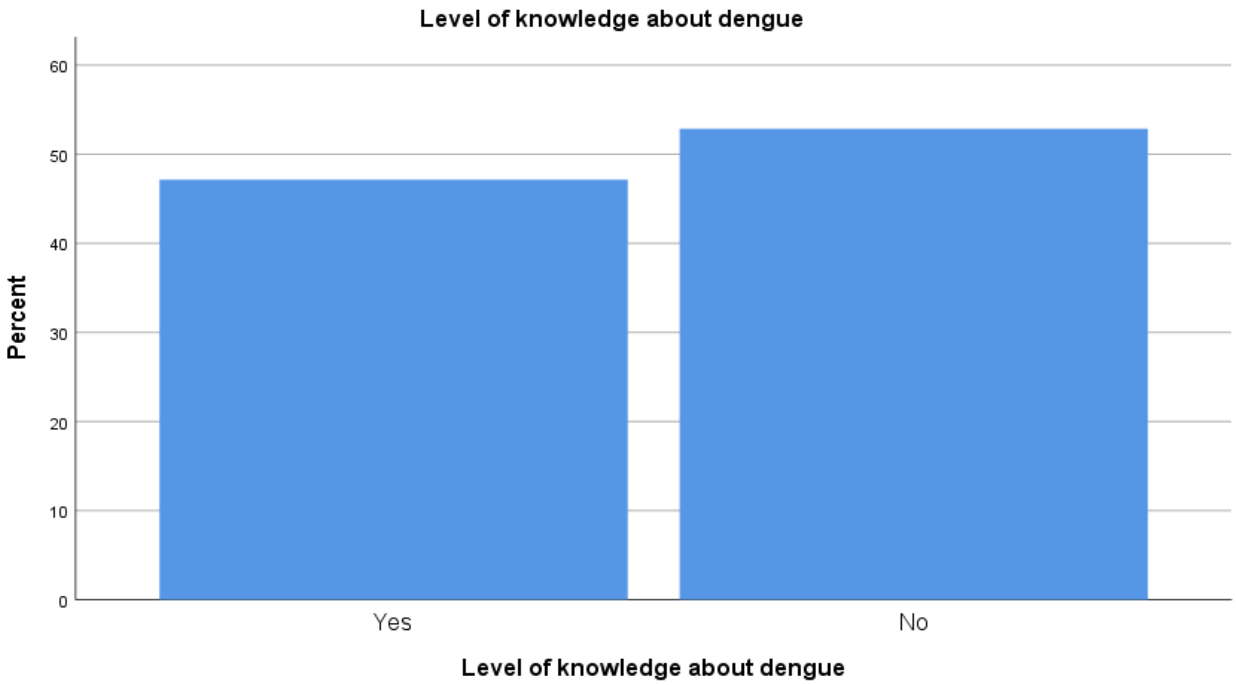

***Figure 4.2.1*:** Level of Knowledge About Dengue

Figure 4.2.1 indicates the level of knowledge of the respondent about dengue illness. The results explained that 47.1% respondents have high level of knowledge about dengue illness and they were aware that the dengue fever transmitted through mosquito bites in the time of sunrise and sunset. While 52.9% of the respondents were not aware about dengue illness transmitting and timing of bites.

4.7.1 Source of Information

Table 4.4: Source of Information

Variable	Frequency	Percent	Cumulative Percent
Tv	94	44.8	90.8
Newspaper	8	3.8	36.8
Radio	3	1.4	92.5
Social Media	7	3.3	96.6
Community Meeting	2	1.0	97.7
Friend	35	16.7	20.1
Family Member	21	10.0	32.2
Community Health Worker	4	1.9	100.0
Total	174	82.9	
Missing system (Not Aware)	36	17.1	
Total	210	100.0	

Multiple Response Options

The above table 4.4 are shows the source of information about dengue illness. 44.8% of the respondent were aware through Television, 3.8% were aware through newspaper, 1.4% were aware from Radio, 3.3% from social media, 1% from community meeting, 16.7% were aware through friends communication, 10% were aware from family member during dengue outbreak, and 1.9% respondents were aware from community health worker while 17.1% were not aware about dengue illness.

4.7.2 People Would Like Various Channel of Communication to Get Knowledge About Dengue Illness.

Table 4.4.1: Channel of Communication

Variable	Frequency	Percent	Cumulative Percent
Family member	30	14.3	14.3
Friends	2	1.0	15.2
Radio	3	1.4	16.7
TV	74	35.2	51.9
Newspaper	24	11.4	63.3
Social media	19	9.0	72.4
Community health workers	26	12.4	84.8
Posters	14	6.7	91.4
Traditional healer	4	1.9	93.3
Health facility	8	3.8	97.1
School	6	2.9	100.0
Total	210	100.0	

Multiple Response Options

Table 4.4.1 indicates that people would like various channel of communication to get knowledge about dengue illness. 14.3% of the respondent would like to share the information about dengue illness with family members, 1% would like to share with friends, 1.4% to share through radio, 35.2% respondents would like to share the information on Television about dengue illness, 11.4% would like to share the information through newspaper, 9% would like to share the information on social media, 12.4% like to share information through community health worker, 6.7%

respondents like to share information through posters on walls at different village councils, 1.9% respondent like the traditional healer for information, 3.8% would like the health facility to share the information, and 2.9% respondents which are school and university students they would like to share the information about dengue illness in the institutional organization.

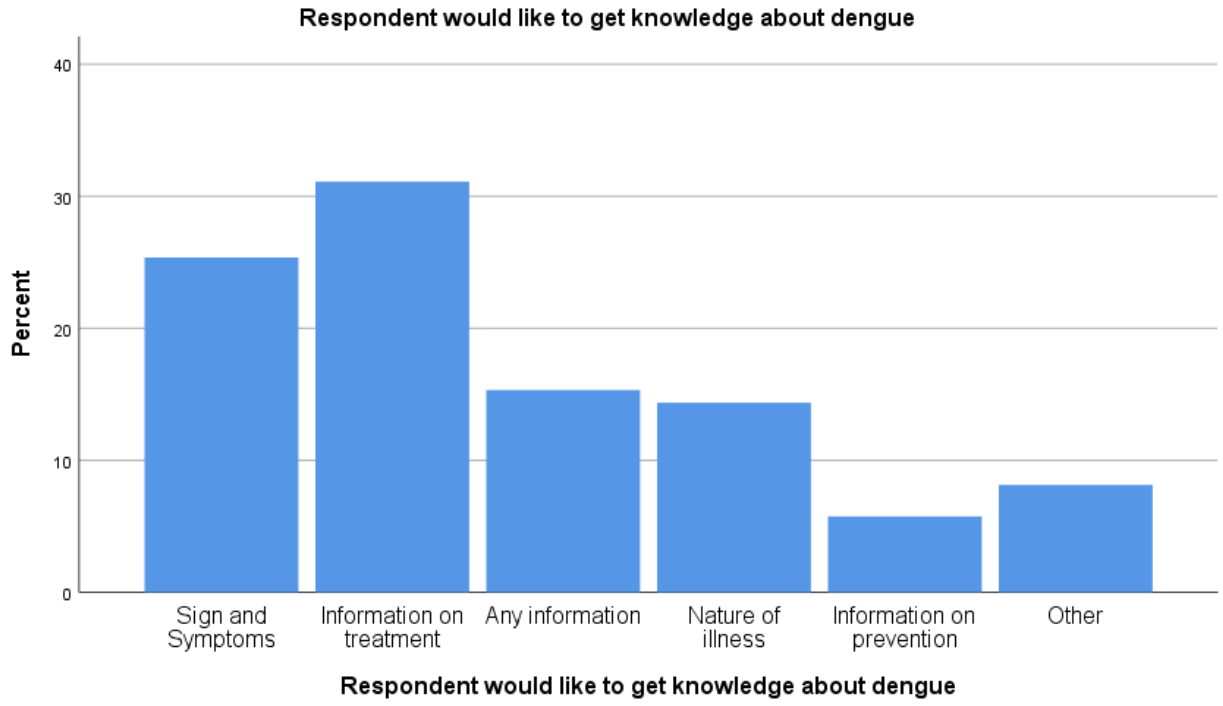

***Figure 4.2.2*:** Respondent Would Like to Get Knowledge About Dengue Illness.

Figure 4.2.2 shows the respondent would like to get knowledge about dengue illness. 25.2% of the respondents would like to get knowledge about sign and symptoms of dengue fever, 31% respondents would like to get information about the treatment of dengue fever, 15% of respondent would like to get any information regarding dengue illness, 14.3% like to get knowledge about nature of dengue illness, 6.2% of the respondents would like to get information on prevention of dengue illness, and the remaining 8.1% of the respondent would like to get others information.

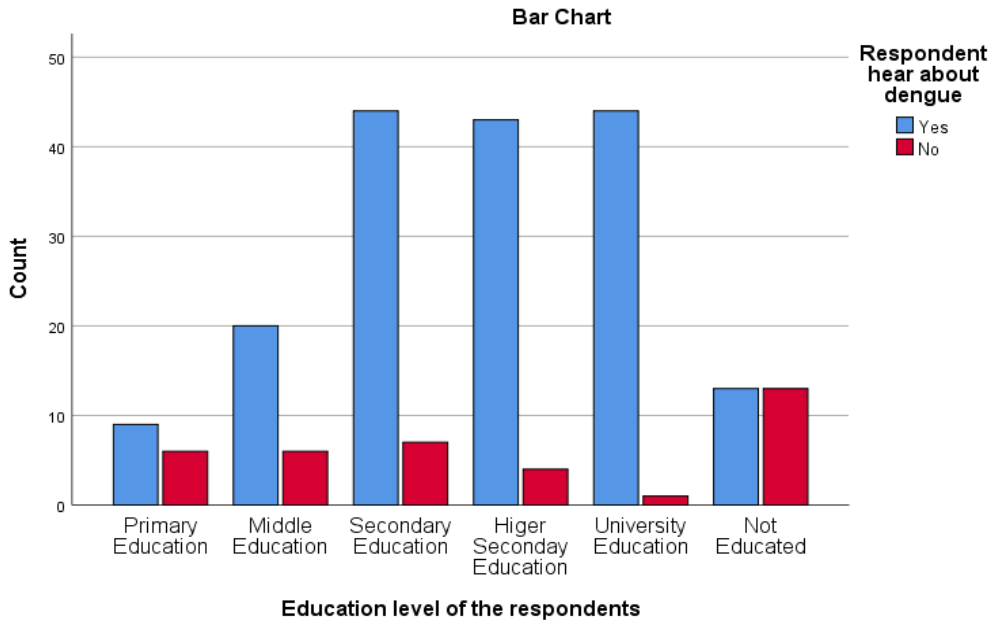

Figure 4.2.3: Relationship Between Dengue Awareness Level and Education

The figure 4.2.3 explained the relationship between dengue awareness level and education. Pearson Chi – Square value 35.061 and P – value 0.00 statistically significant shows that there are positive correlation between degree of education and awareness level about dengue illness those who were highly educated they have more information about dengue illness as compared those who were less educated and illiterate.

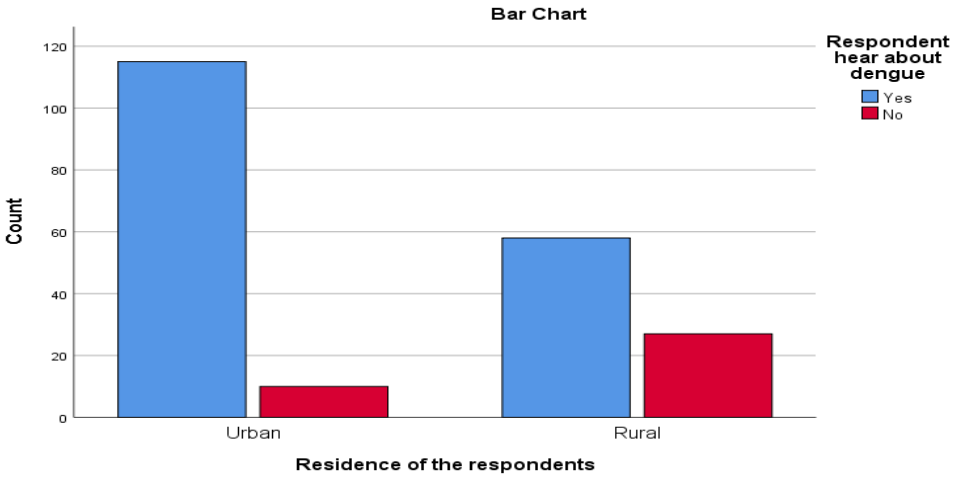

Figure 4.2.4: Relationship Between Residence and Awareness

Figure 4.2.4 indicates the relationship between residence and awareness. In the Chi – Square test the Pearson Chi – Square value is 19.686 the P – value is 0.00 which are statistically significant which mean that there are association between residence and awareness. Those who are the resident of urban they were more aware about dengue illness as compared to those who were from rural.

4.8 To Determine the Prevention Practices of Dengue Control

Various tables, graphs, and descriptive analysis are used to explained the prevention practices of the respondent about dengue.

Table 4.5: Controlling Strategies

Variable	Frequency	Percent	Cumulative Percent
Do you think Dengue illness can be prevented?			
Yes	176	83.8	83.8
No	1	0.5	84.3
Do not Know	33	15.7	100.0
Total	210	100.0	
Does this household have bed nets?			
Yes	130	61.9	61.9
No	80	38.1	100.0
Total	210	100.0	
Did your household spray last year?			
Yes	146	69.5	69.5
No	64	30.5	100.0
Total	210	100.0	
Are you happy with the spraying services?			
Yes	119	56.7	56.7
No	34	16.2	72.9
Do not Know	57	27.1	100.0
Total	210	100.0	
Did your household paint the home last year?			
Yes	86	41.0	41.0
No	94	44.8	85.7
Forgot	30	14.3	100.0
Total	210	100.0	

The above table 4.5 summarized the controlling strategies against dengue mosquito during outbreak. In the present study 83.8% of the respondents stated that dengue illness can prevented, 0.5% stated cannot prevented while 15.7% of the respondent's response do not know. 61.9% of the respondents have own mosquito bed net and 38.1% have no own mosquito bed net. 69.5% of the respondents sprayed during dengue outbreak while 30.5% of the respondent's response No. During sprayed 56.7% respondent were happy from spray service, 16.2% were not happy, and the remaining 27.1% of the respondents were stated do not know. Similarly, 41% of the respondents painted the inner walls of the home, 44.8% did not painted the home, and 14.3% of the respondent stated forgot.

4.8.1 Protective Methods Used By Household to Guard Against Dengue Spreading

Table 4.6: Protective Practices

Variable	Frequency	Percent	Cumulative Percent
Use mosquito Net	78	37.1	37.1
Eliminates standing water around the house	31	14.8	51.9
Use mosquito coils	38	18.1	70.0
Cuts down bushes	6	2.9	72.9
Use electric repellents	8	3.8	76.7
Gauze wires in windows	6	2.9	79.5
Uses Fan to reduce Mosquitoes	12	5.7	85.2
Mosquito Spray	21	10.0	95.2
Burring of Agri Residual	6	2.9	98.1
Lotion	4	1.9	100.0
Total	210	100.0	

The above table 4.6 shows the protective methods used by household to guard against dengue spreading. All household were used various protective methods during dengue outbreak. In the respondents 37.1% were used mosquito net during dengue illness, 14.8% of the respondents eliminates standing water around the house, 18.1% of the respondents were used mosquito coils, 2.9% of the respondents stated that they were cut down the bushes at home, 3.8% of the respondents were used electric repellents, 2.9% were used gauze wire in the windows, 5.7% of the respondents were used fan to reduce the mosquitos, 10% of the respondent were used mosquito

spray, 2.9% of the respondent were used burning the agriculture residuals, and 1.9% of the respondent stated they were used lotion to guard against dengue mosquitos.

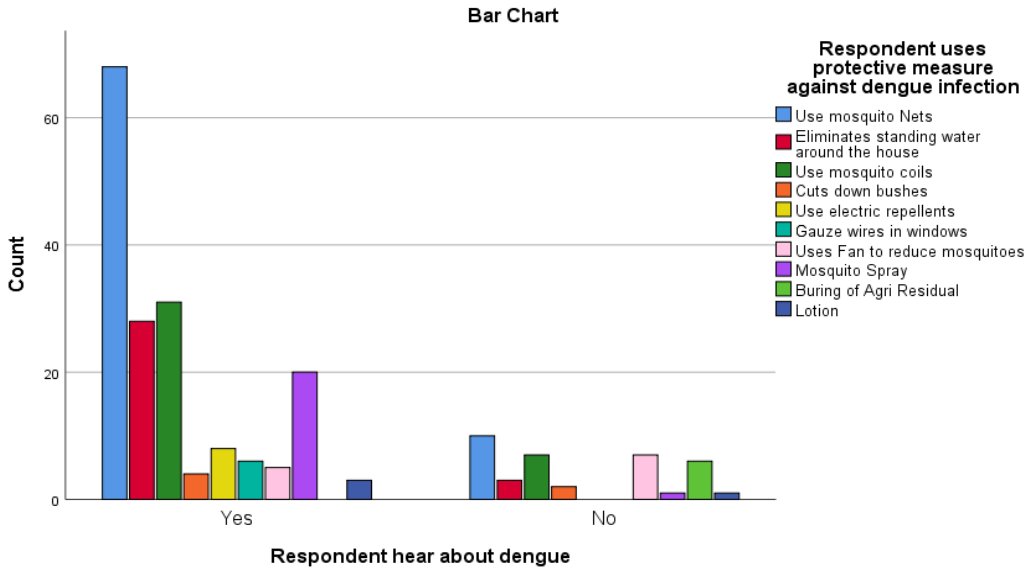

Figure 4.3: Relationship Between Awareness Level and Uses the Protective Methods By Respondents.

The above figure 4.3 explained the relationship between awareness level and uses the protective methods used by the respondents during dengue outbreak. The Pearson Chi Square value is 50.917 and P – value is 0.00 which are statistically significant which mean there is association between awareness level of the respondents and uses of protective methods. The results revealed that those who have higher level of awareness about dengue illness they were used good and higher quantity of protective methods as compared those who are less aware.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Dengue disease is spreading very rapidly in all over the world. Approximately 390 million, dengue cases are reported every year, approximately 70% of dengue cases are reported in Asia, 16% in Africa and 14% in Latin America (Constenla et al.,2015). According to WHO in 2015, dengue outbreak is highly viral in various countries approximately 85,488 cases are recorded in Asia Pacific region. The South Asian countries are mainly responsible for the dengue outbreak viral in Pakistan. Majority cases have been recorded from developing countries, such as Nepal, Sri Lanka, and India. In South Asia, Pakistan is one of the most affected country. In Pakistan from July to November 2019, total confirmed dengue cases were reported 47,120 of dengue illness with 75 deaths.

The main objective of the present study to calculate health cost of dengue patient both direct and indirect cost. Dengue fever has been on the rise in many parts of Pakistan. There is only one study was conducted in Pakistan on economic side but KPK was not included in that study. This study is conducted to assess the total health cost of dengue patients from KPK side, and to check the awareness and knowledge use for the prevention of dengue control and find out the environmental determinants of dengue illness in Swat, KPK.

Total health cost of dengue illness per patient was calculated Rs 18797.22 (US$ 111.503) which included both direct and indirect cost which is less than the previously study reported by (Rafique et al., 2011) and his study calculated average cost of dengue patient was Rs 35823 (US$ 358.23)[1] but the average period of dengue illness was 32 days and this study calculated the average time

[1] In 2011 One Dollar is equal to 100 Rupees

period was 12 days. Same study was conducted by (Dinh et al., 2016) in Vietnam they calculated the average costs of dengue patient was US$ 139 in which includes both direct and indirect costs and the average indirect cost of dengue patient was US$ 51. However, if we compared our study to the other countries the costs of dengue illness treatment in our study was lower as compared to other countries, the average cost of dengue disease treatment in India was US$ 432.2 in 2008. Similarly, the average cost of treatment in Bangkok was US$ 184.06, in Suphan Buri US$ 162.35 in 1998, in Malaysia the average cost was US$ 863.21 in 2012.

Average direct cost of dengue patient was Rs 11018.38. The minimum total direct cost of dengue patient was Rs 2710 and the maximum total direct cost of dengue patient was Rs 44400. To calculate total indirect cost or productivity loss due to dengue illness is equal to daily wage rate multiply by total affected days. Average indirect cost or productivity loss of dengue patient was Rs 7778.84. The minimum indirect cost of dengue patient was Rs 333 and maximum indirect cost of dengue patient was Rs 43333.

Averages period of the dengue illness were 12.05 days, the minimum time were 5 days whereas the maximum period were 30 days of the dengue illness. During dengue outbreak 34% of the patient were visited government hospital and 15.7% were visited private hospital. 46.2% of the patient were treated they were not admitted at hospital and 3.8% did not treatment at home. Average time of treatment at home were 10 days. All the patient was used various types of transport for travelling to hospital. 21.9% of the patient were used public transport, 9.5% of the patient were used own transport, and 18.6% patient were used rental transport during the period of dengue illness.

According to the results of present study determine the environmental potential determinants are highly contributed the dengue illness. The normal hydrological condition, solid waste, tire shop,

and river near to home are arises the probability of dengue illness. Our result same with Cuba country, Spiegel et al in 2007 were find out the environmental determinates of dengue illness his study revealed that poor hydrological condition, water tanks located at ground level located outside from the respondent home they were with high risk factor for dengue illness. In Lahore study the hydrological condition contributed the dengue illness and the water supply was the higher risk factor for the dengue illness. Similarly study in Swat District by Atique et al., 2017) find out positive relationship between dengue illness and home located near to river, those who were near to river they were affected from dengue illness.

The present study results revealed that 84.4% respondents have heard only about dengue illness while 17.6% respondent have not heard about dengue illness. 47.1% respondents have high level of knowledge about dengue illness and they were aware that the dengue fever transmitted through mosquito bites in the time of sunrise and sunset. While 52.9% of the respondents were not aware about dengue illness transmitting and timing of bites. There is positive correlation between degree of education and awareness level about dengue illness those who were highly educated they have more information about dengue illness as compared those who were less educated and illiterate. Same study conducted by Begonia and Leodoro in Philippines during 2013 the 92 percent of the people were heard about dengue illness and TV, Radio were the main source for awareness. Another study was conducted in Malaysia they were found the significant relationship between educational level and knowledge about dengue illness and also a significant association between practices for dengue control and knowledge level.

All the household were used various protective methods during dengue outbreak. Most of them were used mosquito net, spray, eliminate standing water around the home, mosquito coils, and some other protective methods were used. Those who have higher level of awareness about dengue

illness they were used good and higher quantity of protective methods as compared those who are less aware.

5.2 LIMITATION OF THE STUDY

The endeavor of this study does not covers the cost of services offered by the house wives. However the future research should take into account the indirect cost of females services.

5.2 POLICY RECOMMENDATIONS

This study provides the following policies which may help to reduce the economic burden of dengue patient.

- According to the results the average productivity lost was Rs 7778. Government should facilitate the lower income people economically if they are affected for long period.
- Local government should improve the quality of hydrological condition, open sanitation and to clean all the solid waste where high number are cases reported because the factors are highly contributed to the dengue mosquito breeding and provides better environmental management.
- The above results show that most of the people are still not aware about dengue illness and they don't know about the nature of dengue. Government should provide health education and awareness campaign about dengue fever on various sources such as Television, Newspaper, Social Media, also start awareness campaign at community based and also in educational institutions because these factors played major role in the control group.

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Appendix A
Questionnaire

Compromised Environment and Health Hazards: Calculating the Economic Costs of Dengue, A Case Study of Swat

1) Name _____ Sample No.

2) Age ☐

3) Gender: Male ☐ Female ☐

4) Highest level of education

No Education ☐ Grade – 2 ☐ Grade 3 – 7 ☐

Grade 8 – 12 ☐ Tertiary student ☐ Tertiary qualification ☐

Vocational School ☐ Other ☐

5) Martial Status

Single ☐ Married ☐ Widow ☐

6) Residence

Urban ☐ Rural ☐

7) Occupation

Minor Unemployed ☐ Subsistence Farming ☐ Farm worker ☐

Trained employee ☐ Small trader ☐ Civil servant ☐

Military ☐ Student ☐ Housewife ☐

Pensioner ☐ Other ☐ Don't know ☐

8) Total family member (Household size). ☐

9) Family Income ☐ Rs.

10) Are you suffered from the dengue ?

Yes ☐ No ☐

11) Total affected days from dengue? ☐

12) Which one hospital did you visit?

Gov't hospital ☐ Private hospital ☐

13) How do you travel to the hospital?

Pub transport ☐ Own transport ☐ Rental transport ☐

14) How many time you used the transport? ☐

15) How much amount you spent on per trip for the transport? ☐

16) How much total fee you paid when you visit the doctor? ☐

17) Laboratory tests total fee you paid in the period of dengue? Rs. ☐

18) How much total amount you spent on the medicines during illness? Rs. ☐

19) Are you admitted in hospital ?

Yes ☐ No ☐

20) How many days you are admitted in hospital? ☐

21) How much you paid for bed per day during hospital? Rs. ☐

22) Any other expenditure? Yes ☐ No ☐

If yes how much? ☐

23) You have any caretake during hospital ? Yes ☐ No ☐

24) If Yes what is his/her job or occupation ? ☐

25) How much amount you spent on the food per day during hospital stay? ☐

26) Are you did the treatment at home? Yes ☐ No ☐

27) If Yes how many days you did treatment at home? ☐

28) How much amount you spent per day on treatment at home stay? ☐

Environmental Condition

29) Doweling type,

Paved (Pucca) ☐ Semi-paved ☐ Unpaved ☐

30) House located

At 1st floor ☐ At 2nd floor ☐

31) How is your hydrological condition?

Good ☐ Normal ☐ Poor ☐

Don't know ☐

32) Is there any solid waste near to your house

Yes ☐ No ☐

33) Is there open sanitation system near to your home?

Yes ☐ No ☐

34) Is there Rive near to your home?

Yes ☐ No ☐

35) Is there any old tires shop near to home?

Yes ☐ No ☐

Awareness about dengue illness.

36) Have you heard about dengue ?

Yes ☐ No ☐

37) If Yes to Question 36, where did you hear about dengue?

Friend ☐ Family member ☐ Poster ☐

Newspapers ☐ Radio ☐ TV ☐

School ☐ Community Meeting ☐ Mosque ☐

Health facility ☐ Community health worker ☐

Dengue Camp ☐ Other ☐

38) Do you think you have enough information on dengue?

Yes ☐ No ☐

39) If no to question 38, what information would you like to get about Dengue?

Sign & Symptoms ☐ Information on treatment ☐ Any Information ☐

Nature of illness ☐ Information on prevention ☐

Information on control ☐ Other ☐

Don't know ☐

40) Where would you like this information communicated to you? (Mean through what channels of communication?)

Family member ☐ Friend ☐ Church ☐

Radio ☐ Community meetings ☐ Posters ☐

Newspapers ☐ Health facility ☐ Traditional healer ☐

TV ☐ Community health workers ☐ Other specify ☐

Don't know ☐ Not applicable ☐

Controlling strategies

41) Do you think Dengue illness can be prevented?

Yes ☐ No ☐ Don't know ☐

42) What personal protective measures do you use to guard against Dengue infection?

Use repellents ☐ Gauze wires in windows ☐ Use mosquito nets ☐

Uses fans to reduce mosquitoes ☐

Eliminates standing water around the house to reduce mosquitoes ☐

Cuts down bushes in the yard to reduce mosquitoes. ☐

Uses mosquito coils to reduce mosquitoes. ☐ Other (Specify) ☐

43) Does this household have bed nets?

Yes ☐ No ☐

44) Did your household sprayed last year (2018)?

Yes ☐ No ☐

45) Are you happy with the spraying services?

Yes ☐ No ☐ Don't Know ☐

46) If no to question 45, please give the reason?

Smell unsightly ☐ Absence of household head ☐ Inconvenience ☐

Excites other insect ☐

Discoloring house walls ☐

No Dengue (few cases) ☐

Other (Specify) ☐

47) Were your inner house walls painted after last year spraying?

Yes ☐ No ☐ Forgot ☐