UK Journal of Pharmaceutical and Biosciences

Available at www.ukjpb.com

Correlaton of Primary Dengue Viral Infection With Body Mass Index (BMI)

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Abstract

The objective of this study is to assess the correlation of body mass index (BMI) with primary dengue viral infection in urban and rural population of district Rawalpindi. Descriptive Cross Sectional Comparative Study. Microbiology Department, Benazir Bhutto Hospital, Affiliated with Rawalpindi Medical College (RMC), Rawalpindi. It was carried out from 1st March 2010 to 30th September 2011. A Stratified random sampling was adopted for 240 (N) subjects residents of urban and rural areas of District Rawalpindi. Urban residents were 144(n) while rural ones were 96(n). The height in meter square and weight in kilogram (kg) were the parameters used to calculate BMI. A 3ml venous blood sample was drawn from each participant for the detection of IgG antibodies against dengue virus by 3rd generation ELISA (Enzyme linked Immunosorbant Assay). The prevalence of primary Dengue viral infection (DVI) for urban residents according to the current study is 34.7% (n=50 out of the total 144 subjects). While 19.7% prevalence of primary DVI (n=19 out of the total 96 subjects) was noted for the residents of Rural strata. The correlation of primary DVI with five categories of BMI amongst urban and rural residents is evaluated by applying chi square test. The p-Value was not found to be significant for any of the five categories of BMI either an urban or rural resident. There is no significant association of primary dengue viral infection with BMI of an individual.

1 Introduction

Dengue virus belongs to a group of enveloped ssRNA flavivirus. The virus comprises of 04 serotypes i.e I, II, III, and IV. The cross reaction amongst minimum two serotypes is the main pathogenesis for secondary dengue infection[1,2].

Global statistics showed that annually about 50-100 million people are getting infected from dengue infection. Out of which >2.5 million develops a complication i.e Dengue haemorrhagic fever (DHF). While 24,000 deaths annually results from a serious complication of DHF i.e Dengue shock syndrome (DSS)[3]. The estimated mortality rates from either of these two conditions is 5%. While a report by WHO for the year 1992 revealed 33% mortality rate from DHF[4,5].

In Pakistan first outbreak of DHF was reported in 1994, Karachi followed by second one in 1995, Baluchistan. After 2006, dengue infection has spread to all over Pakistan with frequent epidemics in various regions[3,6].

The reported data concluded that the presence of increased number of infected persons in the community is the reason for this resurgence[7]. The highlighted risk factors for disease predisposition includes, poor sanitation, malnutrition, unplanned urbanization, increased air travel, deforestation, and lack of health care facilities[8,9]. Few more published studies showed no association between immune status, age, health status, BMI and socioeconomic status. Moreover, emphasis was only given to the interaction with mosquitoes and the infected dengue patients[10,11].

Therefore the current study was planned to assess the correlation of primary dengue infection with individuals having

different BMI. So that the specific etiological factors can be assessed and focus may be given to those at risk population.

2 Materials and Methods

The *Objective* of this study was to assess the correlation of various basal metabolic index (BMI) with primary dengue viral infection in urban and rural populations of district Rawalpindi.

This Descriptive Cross Sectional Comparative Study was conducted at Microbiology Department of Benazir Bhutto Hospital (BBH), Rawalpindi. The study was carried out from a period between 1st March 2010 to 30th September 2011. The ethical review board approval was taken from the ethical review board committee of RMC prior study proceedings.

The sample size of study was 240 with a distribution of 144(n) urban residents, and rural ones were 96(n). The sample size was calculated by taking 34% prevalence of dengue fever in Rawalpindi, Pakistan. A stratified random sampling was used for the current study. The apparently health adult individuals of $\geq$18 age groups and from any profession were amongst the *inclusion criteria* of study. While individuals having a history of dengue infection or those having a history of vaccination to other flavivirus illnesses (Yellow fever, Japanese encephalitis or Tick borne fever) were amongst the *exclusion criteria.*

A written informed consent and biodata proforma filling were the pre requisites of study. The nominated subjects were asked various questions based upon biodata proforma.

The height in meter square and weight in kilogram (kg) were the parameters used to calculate BMI. A 3ml of venous blood sample was drawn from each participant for the detection of IgG antibodies against dengue virus by 3rd generation ELISA on Microplate reader, Dia 710, Diamate). It was performed on separated (and thawed) serum samples by using Omega (UK-97% accuracy) and Vircell kits(Scotland-96.6% accuracy). The test was done by following the guidelines of manufacturers twice weekly. For quality assurance calibrator, positive and negative control samples were run with each batch.

SPSS version 16 was used for data interpretation. For qualitative variables, frequencies were calculated in terms of percentages. While Chi Square test was applied to evaluate statistical significance. The p-Value was considered significant if less than 0.05

3 Results

The study results have shown over all 29 % prevalence of primary DVI (n=69 out of total 240) subjects residing in Rawalpindi District. The prevalence of primary DVI for urban residents according to the current study is 34.7% (n=50 out of the total 144 subjects) and 19.7% (n=19 out of the total 96 subjects) respectively for the residents of Rural strata. Out of the total 34.7 % (n=50) urban strata exposed residents, 72% (n=36) were males and 28% (n=14) were the females. While in

19.7% (n=19) rural strata residents, 47.3% (n=09) males and 52.6% (n=10) females were the exposed ones. This is shown in table 1.

Results revealed that total 2.8% (n=02) participants were under weight (<18 - BMI). 52.1% (n=36) were having BMI between 18 to 25 (Normal). 31.8% (n=22) have a BMI between 25 to 30 (Grade I Obesity). 31.8% (n=22) have a BMI between 30 to 40 (Obesity). None of the subjects was amongst the morbidly obese category (BMI > 40). The distributions of various BMI in urban populations is shown in Fig 1. The distributions of various BMI in rural populations is shown in figures 2.

The comparison of primary dengue viral infection with five categories of BMI amongst urban and rural residents is evaluated by applying chi square test. The p-Value was not found to be significant for any of the five categories of BMI either an urban or rural resident. This is shown in table 2.

4 Discussions

The study results have highlighted the high prevalence of Dengue infection in Rawalpindi city (Urban area) of Pakistan. This is in favor of many Internationally published studies, that had shown the high prevalence of dengue infection in urban areas[12]. An annual published report by US centers for disease control have considered dengue fever a major health threat for Brazil, Pakistan and India[14].

The current study result revealed that there is no significant association of primary dengue viral infection with the BMI or health status of an individual. This is in accordance with the published studies who concluded that there is no significant association between the primary dengue infection and health / nutritional status of an individual[10,13]. Calabro P etal, concluded that there is significant association of primary dengue infection with obesity. He concluded that obesity can triger the inflammation pathways by activating Tumor Necrosis Factor-Alpha (TNF-α), Interleukin-six (IL-6), and Interleukin-eight (IL-8)[14].

It was also concluded in one study that the key factors for dengue transmission involves person to mosquito and to another person pathway. Dengue infection is not a contagious one and cannot spread directly from person to person[15].

The current study results focused on the prevalence estimation of primary dengue viral infection because it was reported in one study that primary dengue infection can be a subclinical one[16].

The sero epidemiological studies for the Dengue viral infection helps to evaluate the real size of epidemic in the specific area. Moreover, with these studies the important regional risks factors can be identified and assessed[17,18].

The choice of test for dengue infection was ELISA. This is in light of study results, who concluded that the accuracy of ELISA is 93.3% for Dengue viral antibodies detection[19].

The prognosis of DVI depends upon early diagnosis and timely provision of supportive measures for shock. The results of study had shown that DVI can infect any person and with any health status. Thus, the threat of DVI is equal for all.

Table 1: Distribution of Study Population (N=69)

Gender	Urban		Rural		Total (N=69)
	n=50	%	n=19	%	
Male	36	72	9	47	45
Female	14	28	10	53	24
Total	50	100	19	100	69

Table 2: Comparison of Different BMI amongst Urban & Rural Residents

BMI	Urban		Rural		Total	Chi Square (X^2)	p-Value
	n=50	%	n=19	%	N=69		
Under Weight;<18	0	0	2	11	2 (2.8%)		
Normal; 18-25	26	52	10	53	36 (52.1%)		
Grade-1 Obesity; 25-30	18	36	4	21	22 (31.8%)	0.343	0.246
Obesity; 30-40	6	12	3	16	8 (11.5%)		
Morbidly Obese; >40	0	0	0	0	0		
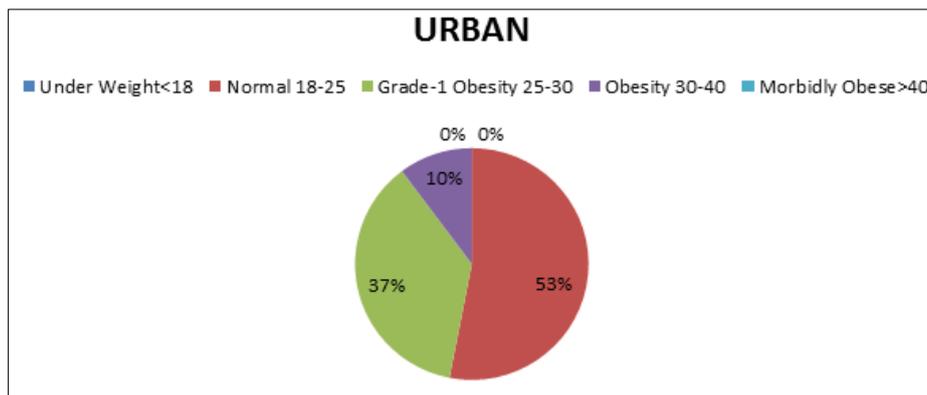
Fig 1: BMI distribution in Urban Residents
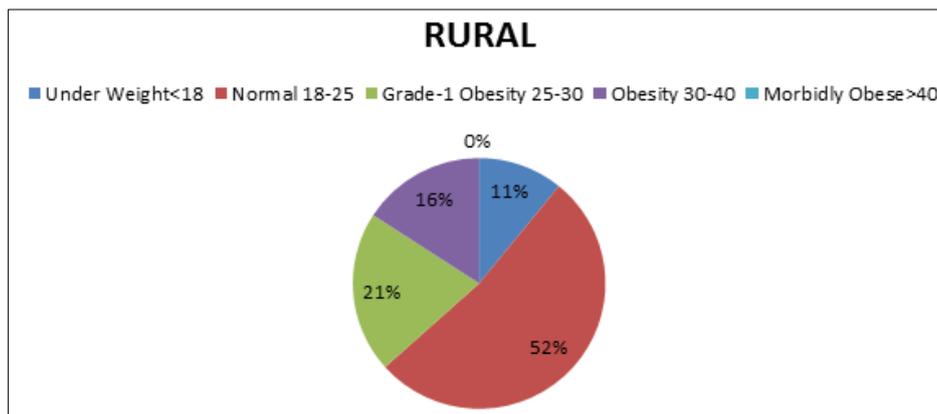
Fig 2 : BMI distribution in Rural Residents

5 Conclusion

There is no significant association of primary dengue viral infection with BMI of an individual. Primary dengue infection can involve any health status individuals

6 Recommendations

- It has been observed from the current study that the regular cross sectional, age stratified, serological surveys are the surveillance tools for monitoring the impact of Dengue prevention and control. It also helps to plan for potential epidemics.

- Policies regarding vector control activities, screening policies, health education, awareness campaigns, early and confirmatory serological diagnosis along with community participation can reduce the morbidity and mortality rates.

- All this will successfully serve as an epidemiological tool in early warning system for DF potential epidemic.

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